

PROMOTION OF ENVIRONMENTALLY SUSTAINABLE TRANSPORTATION IN THE PACIFIC ISLANDS

FIJI'S LAND TRANSPORT SECTOR from an Energy Perspective



COUNTRY REPORT

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ABBREVIATIONS AND ACRONYMS

\$	Fiji Dollar
ADB	Asian Development Bank
DNR	Department of National Roads
DoEnv	Department of Environment
DoE	Department of Energy
FIRCA	Fiji Islands Revenue and Customs Authority
GEF	Global Environment Facility
GHG	Greenhouse Gas
GDP	Gross Domestic Product
km	kilometres
LTA	Land Transport Authority
Ltr	litres
M	million
MTCA	Ministry of Transport and Civil Aviation
MWE	Ministry of Works and Energy
MFNP	Ministry of Finance and National Planning
MCBDI	Ministry of Commerce, Business Development and Investment
NRSC	National Road Safety Council
PICs	Pacific Islands Countries
PESTRAN	Promotion of Environmentally Sustainable Transportation in the Pacific Islands
PIB	Prices and Incomes Board
PIEP	Pacific Islands Energy Policy
SOPAC	South Pacific Applied Geoscience Commission
SDP	Strategic Development Policy
TPU	Transport Planning Unit
UNDP	United Nations Development Program
VAT	Value Added Tax

EXECUTIVE SUMMARY

The purpose of this 'Country Report' is to assist the South Pacific Applied Geoscience Commission (SOPAC) prepare a Global Environment Facility (GEF) medium-sized project that will essentially cover key priority areas for energy efficiency improvement within the land transport sector in the region. Accordingly, the report presents a glimpse of the energy landscape of the land transport sector in Fiji. As such, it attempts to provide an understanding of the current state of the sector by reviewing the information available on its key elementary factors (vehicles, roads infrastructure and land transport services) as well as its energy use. A complementary purpose therefore of the report is to assess the potential for energy efficiency or conservation in the land transport sector.

Land transport plays a significant role in contributing to Fiji's economy, accounting for about 2.3% annual average growth rate of GDP over four years since 1999. In 2002, the transport sector contributed some 9.8% of total GDP and is the fourth most important sector in terms of its total economic contribution. Of the total transport sector contribution, land transport alone account for about 14%. The combined contribution of transport and communications in 2002 was around 13%.

Fiji has a relatively well-developed land transport system particularly in terms of roads infrastructure network, which provides the necessary platform for provision of road-based transportation services. As a result, Government's ongoing public investment in roads (maintenance, upgrading etc) to support economic activities has somehow induced more demand for travel and consequently more vehicle use and number on the road. As at June 2004 total number of registered vehicles allowed on the roads reached 134,085 representing an increase of 883% since 1965. Vehicle importation in Fiji operates in a virtual deregulated environment without any restriction or quantity control.

Fiji spends an average of around F\$70 million yearly worth of imports on vehicles from 1995 to 2004. In 2004 alone, Fiji spends almost \$110 million on vehicles. The influx of second-hand vehicles into Fiji has largely been facilitated by the absence of comprehensive national vehicle policy. Fiji should develop appropriate national vehicle standards that encourage the import of more efficient vehicles.

The seemingly lack of both quantity and quality control in the vehicle supply market in Fiji has naturally increased the size of the domestic vehicle fleet. Annual vehicle numbers entering the fleet, based on publicised statistics continues to rise with an increasing trend. Private vehicle (mainly cars, vans, 4WD etc) typically accounts for a large proportion of total distribution of registered vehicles, reflecting a majority of private motorised transport or personal travel in Fiji. Fiji had an average growth rate of 16% in newly registered private vehicle alone over a ten-year period since 1993 compared to only 7% in public service vehicles for the same period. Almost 90% of the public transport businesses are mainly concentrated in urban and semi-urban centres with buses, taxis and mini-buses appear to be the primary means of public transport.

Although Fiji's contribution to greenhouse gas emission is insignificant in global terms, there is however, formal recognition and appreciation of the significance of the greenhouse warming as evidenced in Fiji being a signatory to many international protocols relating to global warming. The Environment Management Act, which was recently enacted in April 2005, provides a very broad mandate to the Department of Environment (DoEnv) to be responsible for the protection and conservation of Fiji's natural environment. The new Act empowers the DoEnv to monitor and control developmental activities that can potentially degrade the environment.

The new legislation covers all economic sectors including transport sector. This entails the requirement for an Environment Impact Assessment (EIA) for development proposals relating to the construction of airport, jetty, bridge and wharf. Of interest to note is that the construction of roads is implicitly covered in the list of development proposals that are to be subject to the EIA process.

The current focus of attention in Fiji is primarily being targeted at the problem of black smoke emission from diesel vehicles. In Fiji, emission of black smoke is widespread, particularly from diesel engines, many of which are attributed to poor maintenance standards. Black smoke emissions from diesel-fuelled vehicles are largely a result of the engine being overused outside its normal operating conditions without proper or regular maintenance. In essence, vehicle owners, mechanical workshops and garage owners and of course the mechanics must recognise the importance of the maintenance factor.

Fiji retains around 60 – 70% of total imported fuels for local consumption with the rest being re-exported. On average, Fiji imports about 98 million litres of unleaded petrol a year for the period 1995 to 2000 with an average cost of around F\$35 million up to 2004. As for diesel, Fiji receives an average of around 175 million litres per year costing around F\$50 million. The transport sector is the most significant user of energy, accounting for an average of 65% of total energy supply for the period 1995 to 2000 with land transport being the major consuming sub-sector. On annual average, land transport sector alone accounts for more than 90% of total diesel and petrol consumption within the transport sector for the same period.

The petroleum sector is somewhat loosely regulated by different agencies of Government. Current administration and management of the petroleum sector is divided among several agencies each dealing with different elements of fuels: pricing, quality standards, etc. Given the present situation however, it might be appropriate to strengthen the coordination activity between the concerned agencies within Government in its pursuit of promoting energy savings.

Fiji is not immune to commonly perceived transport-related environmental problems (air pollution and greenhouse gas from vehicle emissions), social problems (road accidents and congestion) and economic problems (fuel costs/pricing, vehicle costs and road maintenance costs). In particular, the combination of increased energy use and emissions/pollutants within the land transport sector has largely been the main cause of these problems. A pre-condition to addressing these problems is the fundamental need for Fiji to institute appropriate national capacity (facilitated on regional basis) in order to systematically develop and implement strategies and related measures that can help bring about energy efficiency improvements in the land transport sector.

The policy challenge for Fiji is to integrate energy conservation strategies in the planning and decision-making of its land transport sector. This would augur well with the overall global objective of reducing greenhouse gas emissions as well as achieving an environmentally sustainable transport system that is compatible with Fiji's socio-economic growth and development. The strategy or perhaps catchphrase is the promotion of environmentally sustainable land transport systems.

At the centre of the need to promote such strategy is the underlying goal of reducing greenhouse gas emissions. This can be realised in a variety of ways such as:

- promoting energy efficiency measures;
- best practice for reducing vehicle emissions;
- effective road use management;
- best practice for vehicle maintenance; and
- improve/encourage public transport use.

The challenge is to put in place a management strategy that will require policy, technical, economic/fiscal and institutional measures to reduce their environmental impacts. It is the external costs of land transport that would warrant an energy-integrated transport- environmental strategy covering the following measures:

1. Regulations and standards requiring cleaner and high quality fuels;
2. Regulations and standards requiring the import of environmental sound vehicles with low emission build standards;
3. Introducing high standards for vehicle maintenance;
4. Encouraging public transport usage; and
5. Technical measures for road-use or mobility management through transport demand management (TDM), transport system management (TSM) and use of intelligent transport systems (ITS), and information and communication techniques (ICT) and public transport improvement.

1.0 INTRODUCTION AND BACKGROUND

1.1 General Context

Transport plays a vital role in Fiji's economic and social development. It enables people to gain access to the country's economic, educational, social, medical cultural and governmental opportunities and resources. Transport services and related infrastructure allows the country to pursue socio-economic activities, trade and investments to improve people's well being. Fiji's transportation system (roads, seaports, airports) is relatively developed when compared to other developing countries with similar geographical size.

In the same vein, however, transport cannot exist in a vacuum – it depends, if not entirely, on non-renewable resources particularly fossil fuels for its main energy source. By its very nature, petroleum fuels are arguably an indispensable component of the global market economy fuelling the world's transportation system. This interdependency between transport and energy comes at a cost not only to the human health but also to the environment. Land transport sector alone is universally known to be a major contributor to greenhouse gas emissions resulting from its massive energy use or fossil fuels. In particular the demand for fossil fuels is an absolute necessity for the Pacific Island Countries (PICs) transport sector, which accounts for about 50%¹ of total energy consumption in the Pacific region.

On a global scale, petroleum products account for more than 95% of the energy consumption by transportation modes². Like elsewhere in most industrialised / developed countries, petroleum fuels (gasoline and diesel) are the main energy source for the mainstream transport modes in the Pacific region as without which it is impossible to secure the mobility and accessibility needs of the economy. As the main energy source for the transportation sector around the globe, fuel consumption by the automobile industry has largely been regarded as the main culprit behind the emissions they produce to the environment.

1.2 Problem Statement

The prominence of the transport sector particularly to its over dependence on fossil fuels has largely been the cause of the ever-growing global environmental problems in terms of the global climate change and its consequences for global warming. The land transport sector has been a key contributor to greenhouse gas (GHG) emission and related pollutants and a cause of growing concern worldwide. The onus is therefore on PICs to embrace measures that could contribute to minimising the effects of greenhouse gas emissions. This should require local measures and strategies that are compatible with the developing status of PICs.

Given the geographical constraints (smallness, isolation etc) and economic vulnerability of PICs to the global market forces (especially in terms of increasing crude oil prices), the global environmental problems are the most critical areas that need to be tackled with local solutions/measures that are appropriate to the PICs.

¹ Pacific Islands Energy Policy

² World watch Institute, <http://www.worldwatch.org/>

1.3 Transport – Energy Conservation in the Regional Context

The strategic importance of transportation is underpinned in Chapter 4 of the Pacific Islands Energy Policy (PIEP, December 2004) as an essential service and crucially the enabler of economic and social development of PICs. The significance of the potential impact of transportation on the environment has also been factored in the PIEP, and importantly recognised as part of national agenda through various sectoral policies of Fiji.

The stated goal of the transportation component of the PIEP is “environmentally clean, energy efficient and cost effective transportation within the region”. Of interesting to note is that the diverse nature of the environmental impacts of transport is well captured into the above policy goal encompassing three key elements namely energy, environment and transport. The transportation goal of PIEP is accordingly translated into five key policy objectives as follows:

1. Evaluate and encourage the application of emerging environmentally clean technologies and alternative fuels for transport, and promote markets and create regulatory frameworks to make more affordable and reliably available;
2. Promote emission control regulations and effective enforcement procedures;
3. Promote vehicle efficiency standards and encourage the import of more efficient vehicles;
4. Promote policy mechanisms that create a framework for greater use of appropriate and energy efficient modes of transportation including public transport; and
5. Promote the use of non-fossil fuels in both new and existing vehicles.

The above policies appear to highlight the need to integrate sound energy conservation and/or efficiency improvements framework (strategies and measures) designed for national application. By the same token, such energy efficiency measures and strategies are to be consistent with the overall goal of promoting a land transport system that is environmentally sustainable and least damaging to human health and welfare.

1.4 Purpose of Country Report

A regional project, ‘Promotion of Environmentally Sustainable Transportation in the Pacific Islands (PESTRAN)’ is to assist PICs in implementing energy efficiency improvement measures within their land transport sector. At the heart of the PESTRAN project is the underlying goal of conserving or reducing the increasing use of energy (fossil fuels) in the operation and management of land transportation systems. To this end, the South Pacific Applied Geoscience Commission (SOPAC) in collaboration with the United Nations Development Programme (UNDP), and with the support of three (3) participating PICs (Fiji, Samoa, and Vanuatu) have accordingly made an undertaking to launch the initiation phase of the PESTRAN project. This initiation phase provides the basis for the current Fiji Country Report, which attempts to provide a broad idea of the land transport sector.

Consistent with the above, this ‘Country Report’ provides a review and assessment of Fiji’s land transport sector. As such, it gives an understanding of the current state of the land transport sector in terms of vehicle, road transport operations and roads situation. The report also documents and analyses the two complementary

dimensions of the land transport sector: energy and environmental situation. The report is therefore a mere distillation of information from the review and assessment of the various elements that constitute the land transport sector. The findings, assessment, and recommendations of this report are expected to contribute to the formulation of a Project Brief Proposal to be submitted to GEF as a medium sized project.

2.0 SOCIO-ECONOMIC PROFILE

2.1 Social and Demographic Features

Fiji consist of some over 300 islands of which one-third are uninhabited, and lies in the Pacific Ocean midway between the Equator and the South Pole between longitudes 175 degrees and 178 degrees west and latitudes 15 degrees and 22 degrees south. The country has a population of some 840,000 people³ widely dispersed on approximately 100 islands over a 1.29 million square kilometres of the Pacific Ocean. A large concentration of the population of Fiji lives on the two main islands of Viti Levu and Vanua Levu.

The population distribution throughout the country is heavily concentrated around the main urban centres, especially the greater Suva-Nausori area, Lautoka-Nadi, and Labasa. Given the ever-increasing trend of urbanisation of Fiji's population, it has been postulated that by 2016 the majority will reside in urban areas. The rather compelling 'pull' effects of both perceived and real opportunities in the main urban centres, particularly, the greater Suva-Nausori urban area, for social, economic, financial, education, and personal development is reinforced by the 'push' factors relating to the lack of these development opportunities in mainland rural areas and island communities.

In remote areas including outer islands and inland within the two main islands, the population is invariably clustered around villages, settlements and farming settlements spreading over the cane growing areas of the north and west region of the country. The need to provide basic goods and services to the population of Fiji is obviously a challenging task and further suggests the need for a cost-effective as well as environmentally sustainable transport system for the social and economic development of the country.

2.2 Economic Profile

Fiji's economy is heavily dependent on commodity exports⁴ and tourism with the later being the Fiji's main economic mainstay in terms foreign exchange earnings. Prior to that, sugar has been the backbone of Fiji's economy since independence in 1970. On average, the economy has performed reasonably well with an average annual growth rate of about 2.8% for six years since 1997. As shown in **Table 1**, in 2002 Fiji had a 4.3% growth rate of gross domestic product (GDP)⁵. Key economic development sectors of the country are agriculture, tourism, fisheries, forestry, mining, manufacturing, construction, wholesale and retail.

Table 1 Annual Growth Rate

Year	1997	1998	1999	2000	2001	2002
Annual GDP Growth (%)	2.2	1.2	9.2	-2.8	2.7	4.3

³ FIBS Provisional Estimate Population as at 31st December 2004

⁴ Mainly sugar, garment, gold, agricultural produce, timber products.

⁵ GDP at factor cost of constant prices of 1985

3.0 TRANSPORT AND ECONOMY

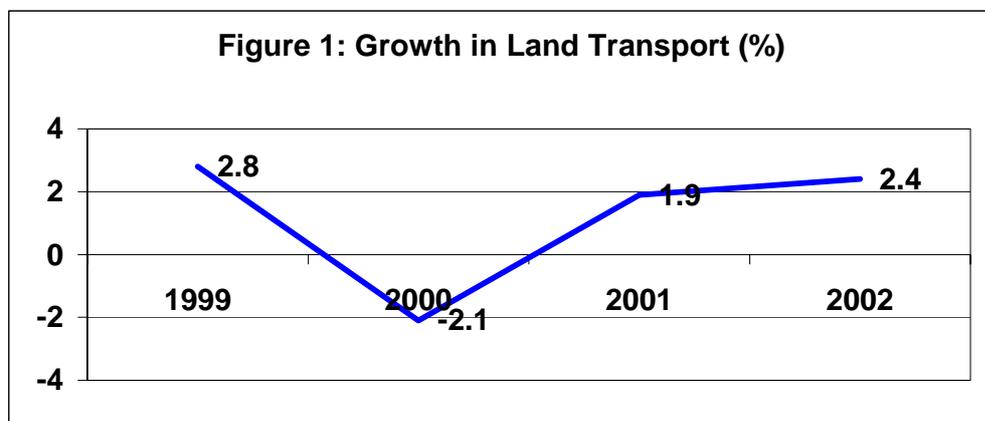
3.1 Significance of Transport Sector

Transportation is one of the key economic sectors driving Fiji's developing economy. The sector is of particular importance to the island economy as it provides the necessary vehicle to link people to places of opportunities and/or resources and means to transfer goods from one place to another. As a small island nation with an open economy, Fiji depends heavily on three modes of transportation (road, sea and air) to meet the mobility needs of the population, goods and services within as well as to/from the outside world. The provision, operation and ownership of transport services is exclusively private sector while the public sector traditionally provide and own the public transport infrastructure system (roads, ports, jetties, and airports).

With regards to energy use, the transport sector accounts for almost two-thirds of total commercial energy consumption and more than one-half of this is consumed within the land transport sector. Because of economic growth and the resulting increase in motorisation, energy use in the land transport sector has been and/or will continue to increase despite spiraling increasing global oil prices.

3.2 Land Transport Sector Contribution to GDP

It is self evident that land transport plays a significant role in contributing to Fiji's economy, accounting for about 2.3% annual average growth rate of GDP over four years since 1999 as can be seen in Figure 1.



In 2002, the transport sector contributed some 9.8% of total GDP and is the fourth most important sector in terms of its total economic contribution. Of the total transport sector contribution, land transport alone account for about 14%. The combined contribution of transport and communications in 2002 was around 13% as illustrated in Figure 2.

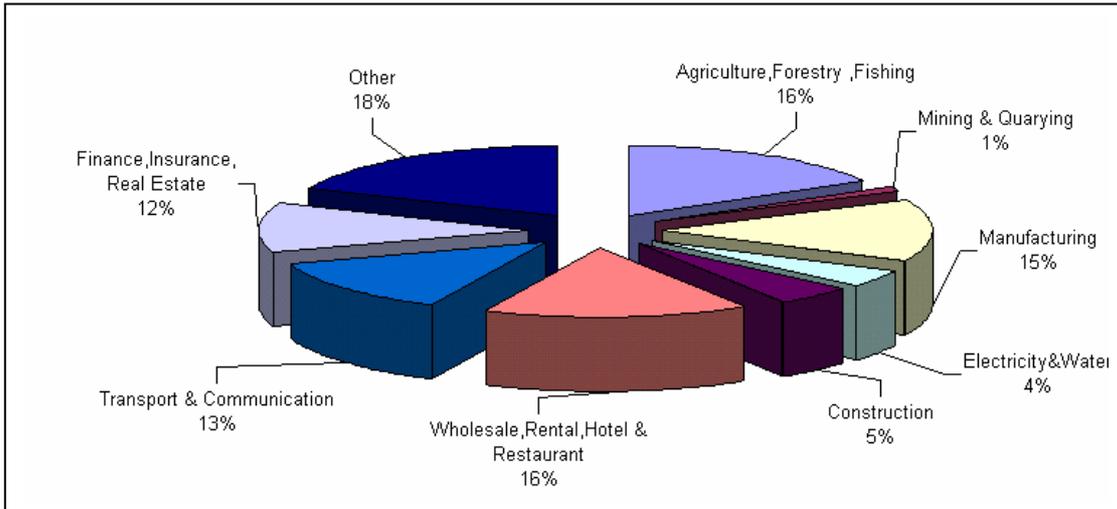


Figure 2 GDP by Economic and Social Sectors-2002

3.3 Land Transport Key Drivers

Generally, there are many and diverse range of factors that affect the supply and demand situation relating to vehicles, road transport services, road infrastructure, and energy use (fuel) in the land transport sector. Key drivers for the growth and development of road transport operations in Fiji includes, but not limited to:

- economic activities in the country and its consequential effect on the demand of the population to produce, trade and consume goods and services;
- competition among suppliers of road transport passenger and goods services such as taxis, buses, minibuses, rental & hire, carrier and road haulage;
- domestic roll-on-roll-off shipping services;
- containerised port-related freight services;
- cargo freight delivery services;
- economic regulatory environment and associated control on land transport market access and pricing;
- land-use development including residential, commercial and industrial developments particularly in the urban sector;
- other social trends and development such as rural-urban drift/migration, education, etc;
- international air services; and
- the tourist industry.

4.0 LAND TRANSPORTATION SECTOR

This section provides a review and assessment of the land transport sector by providing a systematic description and current situation analysis of perhaps the most three crucial elements of the sector:

- (i) vehicle;
- (ii) road transport services and operations; and
- (iii) road infrastructure or systems.

4.1 Fiji's Vehicle Fleet Management.

4.1.1 Vehicle Supply

Vehicle importation in Fiji operates in a virtual deregulated environment without any restriction or quantity control. The domestic supply of vehicle is predominantly through car importers (or vehicle car dealers), which is naturally driven by market supply-demand situation. There is no government policy or legislation for that matter that can limit or restrict the supply of vehicle imports into Fiji. However, the Inspection Branch of the Fiji Islands Revenue and Customs Authority (FIRCA) or Customs and Excise Department, by virtue of its inspectional role for fiscal purposes, may exert some degree of control and influence in as far as vehicle imports are concerned. On average, Fiji spends around F\$70 million worth of imports on vehicles as reflected in Table 2.

Table 2 Vehicle Import Value: 1995 – 2004

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Value F\$ m	64.2	47.7	60.7	59.9	79.9	58.9	70.6	85.6	108.1	109.3

Source: Fiji Islands Bureau of Statistics (FIBS), June 2005

All vehicles imported into the country are subject to FIRCA's documentary requirements upon examination at the port of entry, mainly in Suva and Lautoka. Vehicle background information such as country, and date or year of manufacture, name of exporter or overseas seller, chassis and engine numbers, certificate of deregistration for used vehicles, and bill of sale documentation are basically the sort of requirements that vehicle importers need to comply to. As regards to the imposition of the fiscal duties, calculation of vehicle import duty is appropriately carried out by FIRCA's Customs Department in the course of the examination / inspection process.

The other form of control that could perhaps have a marginal influence on the supply side management of vehicle is through the LTA regulation governing the commercial conduct of motor vehicle dealing business. Regulation 28-34 of the Land Transport (Vehicles Registration and Construction) Regulations 2000 provides the specific details on key considerations on vehicle trade in Fiji.

Fiji's main vehicle source market is Japan where the vast majority of both new and used or reconditioned vehicles are imported. Other countries are Korea, Thailand, and Singapore. The vehicle import market in Fiji, like in other countries, operates in two main market segments: new and used vehicle import markets. The used vehicle import market, which started to penetrate the local vehicle market industry in the early 1990s, appears to dominate in terms of sales. In 2001, almost two-thirds of the 3,329 newly registered were used vehicles. There has also been an increasing trend in the second-hand vehicle dealer start-ups in the vehicle import market especially

visible in the Suva area and Nadi-Lautoka regions. This trend may be attributed to the non-existence of quantity and/or quality control on vehicle import.

While the current scenario on the rather uncontrolled influx of second-hand vehicle may signal to Government for appropriate intervention, it might worth considering that stopping or limiting the supply of vehicle is neither feasible nor desirable, given the economic and social benefits to the population. However from an environmental standpoint, Government may consider introducing policies and regulations that can encourage the import of environmentally friendly vehicles in terms of high-energy efficient technologies or less energy intensive or fuel-efficient technology vehicle. Given that the current practice and standards for vehicle import in Fiji does not entail any environmental quality consideration, Government should review relevant laws governing vehicle importation.

The suggested review should be oriented towards establishing a sound regulatory and policy environment that can bring about improvement in the quality and standards of vehicles being imported into the country particularly in terms of the environmental soundness of vehicles. A rather simple step that Government can take is to incorporate a 'vehicle import policy' within existing national transport policy framework that can address the accumulated environmental impacts of vehicles in Fiji's land transport sector. The need for a comprehensive 'vehicle import policy' would be obviously a multi-dimensional focus covering energy use, environment, transport, and fiscal or tax incentive considerations.

4.1.2 Vehicle Classification

Vehicle classification in Fiji is defined under the LTA Act as "any automobile, motor car, motor carriage, motor cycle, traction engine, tractor, or other carriage or vehicle propelled or capable of being propelled by means of an engine powered wholly or partly by any volatile spirit, steam, oil, gas, or electricity, or by any means other than human or animal power..."

For administration of vehicle importation, vehicles are generally classified as new and used or reconditioned vehicles under the terms of the Customs Tariff Act, 1986. For imposition of import duty, vehicles are further classified according to their use, type and engine capacity (cc) size. Table 3 shows the different classes of vehicle for import duty application.

Table 3 Vehicle Classification for Import Duty Administration under the Customs Act

Vehicle Classification	Description
Tractors	Including road tractors for semi-trailers, track-laying tractors, agricultural tractors and others
Motor Vehicle for transport of 10 or more person, including the driver	With compression ignition and spark ignition internal combustion engine
Motor Cars and other motor vehicle principally designed for the transport of person	With compression ignition and spark ignition internal combustion engine
Motor Vehicles for the transport of goods	With compression ignition and spark ignition internal combustion engine
Special purpose motor vehicles other than those principally designed for the transport of persons or goods	Example breakdown of lorries, crane lorries, fire fighting vehicles, concrete-mixer lorries, road sweeper lorries, spraying lorries...etc
Motorcycles	

For national registration of vehicles (post importation), vehicles are also generally classified as either new, second hand, reconditioned, and/or reconstructed. Specifically, the LTA carry out its vehicle registration function according to its intended purposes as shown in Table 4 below.

Table 4 Vehicle Classification for Registration Purpose

Vehicle Classification	Types
Private Vehicles Taxis Rental Hire Cars	Car, Van, 4WD, etc
Goods Vehicles Buses Tractor Motorcycle	Heavy and light goods vehicle including vans, trucks, pickups, ambulance and fire engine
All other vehicles	Trailer, crane, loader, forklift, garden, excavator, roller, skidder, digger, caterpillar etc

For public identification, the above vehicle classification is further subdivided into the following classes, which reflects what the vehicle is licensed for. Private motor vehicles with P label; public service vehicles are sub-classified into taxis with T label, hire vehicles with H label, rental vehicles with R label, omnibuses with B label, minibuses with M label; commercial goods vehicles with C label, and all government vehicle with G label.

4.1.3 Vehicle Taxation Regime

Vehicle-related taxes comprises of vehicle import duty, value added tax (VAT) on vehicle import value, which is an additional 12.5% impost on top of the vehicle import value (cost, insurance and freight value, CIF), and the annual vehicle registration or licensing fees (commonly known as wheel tax). The FIRCA administer the first two components of vehicle taxes (duty and VAT) while the wheel tax is administered by the LTA. There are other vehicle-related fees such as vehicle inspection fees, driver licence test and renewal fees and re-licensing fees to name a few, all of which are administered by LTA. Vehicle and fuel duties are also a major source of customs revenue for Government.

4.1.4 Vehicle Import Duties

The Customs Tariff Act 1986 and its inherent Customs Tariff (Budget Amendment) 21 of 2004 provides the current customs import tariffs levied on imported goods including vehicles and related parts. Chapter 87 of the Customs Tariff (Budget Amendment Act) 2004 provides specific details of current import duty applicable to all vehicle types and associate engine size classes (1000, 1200, 1500, 1800, 2500, 3000 cc). The level of import duty is structured into new and used or reconditioned vehicle and varies for the later according to engine size and vehicle type. The duty structure also separates vehicles with spark-ignition and compression-ignition internal combustion piston engines. The percentage of import duty is generally based on the cost, insurance and freight value (CIF).

With the exception of tractors and dumper or special purpose vehicles with over 5 and 20 tonnes GVH where an import duty of 15% applies, all new vehicles under 5 tonnes are taxed with a fixed import duty of 27% irrespective of its engine size or cylinder capacity (cc) and vehicle type. For used or reconditioned vehicles, again a fixed import duty of 27% or a predetermined duty whichever is the greater depending on the engine size and vehicle type.

At present, vehicle duty concessions appear to favour the bus industry through tax exemption and/or rebate on new chassis, tyres and fuel. Table 5 shows the current tax concessions granted to the bus industry. From energy conservation perspective, government may also consider duty concessions on vehicles that are equipped with Euro 3 specification environmentally friendly engines.

Table 5 Current 2005 Duty Concessions for Bus and Coachwork Industry

BUS OPERATORS

Description	Fiscal	VAT
Tyres	\$25 per tyre size 825 X 20 \$35 per tyre size 900 X 20 \$50 per tyre size 1100 X 20 \$50 per tyre size 1100 X 20 (Refund)	12.5%
New Chassis fitted with engine for body building purposes & new bus engines of old bus engines	Free	12.5%
Identifiable fixtures & components not available locally for use in bus body building	5%	12.5%
Fuel	18 cents per litre (full fuel duty rebate)	12.5%

COACHWORK BUILDERS

Description	Fiscal	VAT
New Chassis fitted with engine for body building purposes	Free	12.5%
Identifiable Fixtures and Components	5%	12.5%

Source: FIRCA's Customs Tariff (Budget Amendment) Act-21 of 2004.

As indicated earlier, it is interesting to note that import duty on new vehicles (except tractors and dumpers over 5 tonnes) are fixed at 27% suggesting the current emphasis on promoting newer vehicles with latest engine technologies as opposed to used vehicles which pays for more duty. Appendix 1 presents the current levels of import on used or reconditioned vehicles by vehicle engine size, classes, and types.

At present there are no duty or tax concessions, under the fiscal regime of Government, for importation of vehicles that are equipped with more recent emission build and standards. There is scope within the tax concession regime in Fiji (of course with the needed awareness on the part of the Finance Ministry) that can be explored to improve environmental significance of vehicles in Fiji.

4.1.5 Vehicle Fleet Size and Trends in Vehicle Growth

The seemingly lack of both quantity and quality control in the vehicle supply market in Fiji has naturally increased the size of the domestic vehicle fleet. Annual vehicle numbers entering the fleet, based on documented statistics continues to grow with an increasing trend. In general, vehicle supply and demand tends to be dictated by the level of economic activities and to some degree demographic pattern. As the economy expands there is consequent relative increase in the standards of living and household income, thus stimulating increased demand for vehicle. This in turn boost

the local vehicle trade environment especially importers having unrestricted access to vehicle exporting countries to meet local demand. In sum, it appears that Fiji's vehicle fleet is cyclical with local economic conditions reflecting high vehicle sales when economy is performing well and low sales falls when the economy is under-performing.

The current practice for registration of vehicle normally occurs after and/or during the sale of a vehicle by the motor vehicle trade dealers. The number of registered vehicle permitted on Fiji roads reached 134,085 by the end of June 2004, with an increase of 24,809 since 2000. Between 2000 and 2003 there was an increase of about 16% in the number of vehicles. Table 6 shows the total number of registered vehicles in Fiji between the period 2000 and 2003, which represents the cumulative number of vehicles for which registration plate have been issued.

Table 6 Annual Stock of Registered Motor Vehicles for the period 2000-2003

Year	Private Cars	Taxis	Rental & Hire Cars	Goods* Vehicles	Buses	Tractors	Motor Cycles	All** other Vehicles	TOTAL
2000	52,344	3,207	5,015	35,706	1,910	5,543	4,541	4,607	112,873
2001	57,702	3,340	5,095	36,365	1,936	5,572	4,587	4,757	119,354
2002	61,410	3,462	5,330	37,111	1,972	5,598	4,636	5,083	124,602
2003	66,028	3,729	5,511	38,025	2,019	5,619	4,670	5,277	130,878

Source: Land Transport Authority

Note: *Light and heavy goods vehicles including vans, trucks, pick-ups, ambulances and Fire vehicles.

** Includes trailers cranes ,loaders, forklifts ,etc.

It is to be noted that the numbers represented in Table 6 does not give a true or accurate reflection of vehicles that in operating conditions or are actually on the road since it does not take into account scrapped vehicles or those that are deregistered from the vehicle master registry supposedly administered by LTA. It could be argued that the registration statistics might be perhaps an exaggeration of the vehicle numbers as well as its rate of growth in Fiji. A detailed and expanded version of annual distribution of registered vehicles for the last four decades is reproduced in Appendix 2.

The annual number of new registrations (both new and second hand vehicles) for a ten-year period 1993 – 2003 is presented in Table 7 reflecting an increase of 63% since 1993. It should be noted that the numbers represented in Table 7 is the statistics of newly registered vehicles that are added into the registration yearly, which is lower than total fleet number represented in Table 6.

Table 7 Vehicles Newly Registered 2000 – 2003

Period	Private Car	Taxi	Rental and Hire Cabs	Goods* Vehicles	Buses	Tractor	Motor Vehicles	All** Other Vehicles	Total
1993	1,796	153	209	1,318	95	89	74	110	3,844
1994	2,092	136	210	1,189	89	46	62	186	4,010
1995	1,769	73	126	856	82	36	32	92	3,066
1996	1,819	82	126	727	90	34	40	134	3,052
1997	1,438	45	145	743	53	27	21	111	2,583
1998	1,424	21	155	482	25	31	49	78	2,265
1999	2,952	135	197	856	53	73	79	171	4,516
2000	2,339	116	104	668	56	66	53	195	3,597
2001	2,207	133	80	659	25	29	46	150	3,329
2002	3,709	122	235	746	36	27	49	270	5,194
2003	4,618	267	181	914	47	21	34	194	6,276

4.1.6 Vehicle Registration Fees (Wheel tax)

The structure of vehicle registration fees varies according to their intended use. As for private vehicles, the fee is structured along vehicle engine cubic capacity (cc), which is not applied for public service vehicles and others. Table 8 shows the current fee structure for vehicle registration fees for private vehicles and public service vehicles.

Table 8 Annual Wheel Tax

PRIVATE VEHICLES

Engine Cubic Capacity (cc)	\$ (VAT Inclusive)
1. 0 to 1,000	44
2. 1,001 to 1,250	50
3. 1,251 to 1,500	60
4. 1,501 to 1,750	66
5. 1,751 to 2,000	79
6. 2,001 to 3,000	119
7. 3,001 to 4,000	172
8. 4,001 to 6,000	277
9. over 6,000	\$332 + \$11 per 100cc in excess of 6,000cc

PUBLIC SERVICE VEHICLES

Description	\$ VAT Inclusive
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a. Ominibus, Minibus, Carriers and Rental Vehicles Licensed to carry:

i) Less than 4 passengers	66.00
ii) Less than 7 passengers	82.50
iii) Less than 8 passengers	88.00
iv) Rental Motor Cycles.	33.00

b. Taxis Licensed to carry

i) Less than 4 passengers	66.00
ii) Less than 6 passengers	77.00

c. Hire Vehicles Licensed to carry

i) Less than 4 passengers	66.00
ii) Less than 7 passengers	82.50
iii) Less than 8 passengers	88.00

Source: LTA Regulations

4.1.7 Vehicle Ownership

The annual number of newly registered vehicle (Table 7 and Appendix 2) could represent the spread of vehicle ownership. The current trend in vehicle ownership and usage (motorisation) in Fiji continue to rise. This has largely been attributed to recent economic recovery since the crisis in 2000. The inescapable fact is that increasing vehicle population has been maintained since 1965; and this is generally linked to strong economic recovery, which inevitably means pressure or growth in car ownership and use.

The annual registration statistics can provide a relative measure of vehicles in use or legally on the road (but note there is no allowance made for scrapped / deregistered vehicles) and so a comparison can be against annual population to gauge changes in ownership levels. Table 9 shows the vehicle ownership growth rates for the indicated years.

Table 9 Population, Annual Registered Vehicles and Growth Rate

Year	Population	Annual Registered Vehicle	Ownership Growth Rate (%)
1996	775,000	100,254	-
2001	818,000	119,354	19
2002	825,000	124,602	4
2004	840,201	134,085 (June04)	8

It is also important to note that there has been a strong relationship between growth of per capita income and growth in vehicle ownership. Thus, increasing levels of GDP will undoubtedly mean pressure to increase car ownership and use. There is a marked constant increase in motorisation in Fiji (based on documented statistics on annual distribution of registered vehicles) in almost over the last four decades since the mid- 60s.

In the second quarter of 2004, total number of registered vehicles reached 134,085, representing an increase of 883% since 1965. Vehicle ownership and use in Fiji may be relatively low compared to other developing nations but the current level of motorisation has started to show symptoms of heavy traffic congestion (especially in some parts of the urban roads network) and road fatal accidents which are becoming a worrying trend and a cause of concern. Nevertheless, Fiji has not yet reached the rather worse level of motorisation already experienced in other developing countries where government restriction is needed to bolster public transport patronage.

4.1.8 Vehicle Regulatory Service

All vehicles including registered vehicles that need to be re-licensed annually are required to undergo mandatory inspection process. Authorised Vehicle Inspectors carry out the inspections of vehicles at the LTA's inspection stations throughout the country. According to Part 13 of the Land Transport (Vehicles Regulation and Construction) Regulation 2000, inspection of vehicles means *"inspection of standards to ensure that a vehicle complies with these Regulations and any additional standards of road worthiness, safety, emission, fitness in the interests of road safety, the environment and safe public transport"*.

Vehicle inspections are conditional upon vehicle owners holding a 3rd Party Insurance Policy valid for the period up to 12 months or less. Vehicles are issued with the appropriate fitness certificate with a prescribed validity period once they passed the inspection. Fees collected from vehicle inspection are one of the main revenue streams for LTA accounting to 13 % of its total revenue in 2004. Vehicle inspection is traditionally carried out with the proper equipment and machines such as electronic vehicle inspection system, portable weighing scales, the rather controversial smoke emission-testing machine.

In addition to the normal in-house vehicle ramp-based inspection, LTA also undertake on-road spot checks as part of its enforcement activities for vehicle safety and related compliance. The Fiji Police Force also has a highway traffic unit responsible specifically for road traffic policing of all vehicles including highway patrol under its traffic laws. The National Road Safety Council (NRSC) also has an obligation under its charter on related enforcement basically towards the overarching objective of promoting road safety in Fiji. Despite the many agencies involved, coordination between LTA, DoEnv, Police, DNR and NRSC has resulted in joint campaigns involving on-road enforcement.

The Regulations also made allowance for the contracting out of vehicle inspection service to the private sector. To date only few private inspection stations have been granted license by LTA to operate vehicle inspection business. For sake of efficiency of service delivery function, there is scope for LTA to outsource its vehicle inspection activity to the private sector. Although there are concerns relating to the need to maintain required standards by the private business, it is possible that this can be effectively achieved with proper policing on the part of LTA.

4.1.9 In-Use Vehicle Maintenance and Servicing Practice

Vehicle maintenance in Fiji is rather unregulated. There is neither an explicit national regulatory or policy framework nor guideline to set industry standards and practice for maintenance and related servicing requirements for vehicle. Nor there is a code of practice or some kind of maintenance manual for national adoption by automotive workshops to assess the mechanical condition and maintenance performance of vehicles.



Vehicle inspection by a LTA Officer

The maintenance responsibilities rest entirely with vehicle owners and of course with the involvement with the maintenance service providers (garages, mechanical workshops) while LTA oversees the safety aspect. It appears that there is weak link between the private sector driven maintenance activities and the LTA's safety oversight role. There is no provision in the current LTA legislation to coerce vehicle owners to adopt preventive and/or compulsory maintenance of vehicles. The current practice largely is that vehicle owners take their vehicles for maintenance when their certificate of roadworthiness and/or certificate of fitness for heavy vehicles are nearing their expiry date. This seems to be pattern for most vehicle owners in preparation for the next inspection to coincide with the one-year anniversary of the vehicle.

As a developing country, the money factor may dictate to a certain degree the maintenance requirements of vehicles in Fiji. This is normally evident in the large number of smoky vehicles on Fiji roads, which is in relative terms, reflect on poor attendance to required maintenance. However, business enterprises that own large vehicle fleets including road haulage and public passenger vehicles (mainly buses) with mechanical workshops have proper in-house preventive maintenance schedules.

A relevant point worth making in this context is that there are no national standards to regulate the technical activities of garages or vehicle workshops that carry out maintenance vehicles purely as business. As a result, there is an increased trend in small home-based garages cropping up in Fiji mostly in urban areas, let alone the general lack of awareness on the importance of maintenance needs of vehicles.

It would appear that there is a need for Fiji to have a national standard for vehicle maintenance that can enforce best international practices for maintenance of vehicles. Of importance to such national standards is a mechanism for industry code of practice to serve as guidance to the motor industry in the vehicle maintenance area. Given that the level of vehicle emissions depends largely on the fuel aspect of the engine, that is whether it is petrol-fuelled or diesel-fuelled vehicle engine, it is vitally important that Fiji should have a national manual that can legally prescribe the required maintenance standards and practices. This could also place an obligation to vehicle owners to pay regular attention to the maintenance of their vehicles. From an environment perspective, this would augur well with the current national campaign (via LTA and Department of Environment) to reduce smoke emissions.

4.2 ROAD TRANSPORT OPERATIONS

People and goods are moved around Fiji by air, sea, and road. Given the geographical nature of Fiji, road transport mode appears to be the dominant one in connecting people to commercial and/or employment centres especially for the two main islands of Viti Levu and Vanua Levu.

Vehicle user profiles can be generally segmented into private transport, public transport, and road haulage transport are the mainstream vehicle user profiles in Fiji which constitute the key make up of the land transport industry.

4.2.1 Private Transport

Private vehicles (mainly cars, vans, 4WD, etc) typically account for a large proportion of total distribution of registered vehicles, reflecting a majority of private motorised transport or personal travel in Fiji. Although there are no reliable or real time-trend national data on road-based modal split distributions to ascertain the level of private transport operation in Fiji but available statistics on vehicle fleet sizes (refer to Appendix 2) presents in relative terms the magnitude of private vehicle transport as well as public vehicle transport activities in Fiji. This in itself could reflect the level of both form of land transport operations in Fiji, which generally increase as the economy recovers from the 2000 crisis as shown in Table 10.

Further, Fiji had an average growth rate of 16% in newly registered private vehicle alone over a ten-year period since 1993 compared to only 7% in public service vehicle for the same period.

Table 10 Newly Registered Private Transport and Public Transport Vehicle against Economic Performance

Year	Newly Registered Private Vehicles	Newly Registered Public Service Vehicles	GDP (%)
1999	2,952	385	9.2
2000	2,339	276	-2.8
2001	2,207	238	2.7
2002	3,709	393	4.3
2003 (Proj)	4,618	495	4.8

Of the 6,276 newly registered vehicles in 2003, 74% and 8% were registered as private vehicles and public service vehicles, respectively. It might worth mentioning that the sprawling development in most urban areas around Fiji particular the greater Suva-Nausori and Lautoka-Nadi areas has somehow made private vehicles becoming increasingly used by commuters for business, work and leisure travel. This is mainly attributed to the local economy situation since rising personal incomes among the working class (middle and upper) have resulted in private vehicle ownership and use increasingly affordable especially imported second-hand cars.

4.2.2 Public Transport

Public transport in Fiji has traditionally been driven and developed by the private sector. It originally became a subject of Government regulation through the then Transport Control Board (TCB) since the mid-50s when public transport was predominantly pioneered by the bus industry. The current practice is that vehicles are

legally required to be issued with public service vehicle (PSV) licences and related permits to provide road-based public transport services like buses, taxis, rentals, hire vehicles and omnibuses. Such vehicles are classified as public service vehicles under Land Transport (Public Service Vehicle) Regulations 2000.

LTA is legally mandated to regulate and control the operation of all public land transport services. Apart from its main oversight role in land transport safety, LTA determines the economic infrastructure on which public transport services are conducted. It essentially stipulates the economic conditions in terms of routes to be serviced, fares to be charged, and seating capacity of vehicles to be used. In 2000 Government through LTA introduced (after almost 10 years of illegal service) specific legislation permitting the commercial operation of minibuses as part Fiji's public service transport. Almost 90% of the public transport businesses are mainly concentrated in urban and semi-urban centres with buses, taxis and minibuses appears to be the primary means of transporting people across the two main islands of Viti Levu and Vanua Levu.

4.2.2.1 Ownership of Public Service Operators

A key feature of public transport services in Fiji is that the ownership profile of all land transport enterprises is entirely owned by private individuals, family-owned firms or companies (mostly buses), and associations. The private sector has a long history of presence in the land transport business in Fiji and this is why Government's intervention is warranted to safeguard the interests of the travelling public in terms of safety and pricing control (bus fares taxi fares).

4.2.2.2 Profitability of Public Transport

Public transport services in Fiji are generally profitable business especially in the trunk routes connecting various towns in Viti Levu and Vanua Levu. Despite being heavily regulated with strict controls on fares and service areas/routes, public transport is traditionally the main mode of road transport/travel for most people in Fiji. Economic performance of public service vehicle operators is difficult to ascertain, mainly because of the family orientation of their ownership. Financial information on almost all public transport service operators is often not formally published, if not even collated. This in itself is worrisome since lack of publicised financial reporting indicates that true financial health (profitability) of bus industry cannot be authenticated.

As regards to buses, available information indicates that bus operators on average performed reasonably, especially in urban and semi rural operators but considerable variance in profitability on national wide. Newer buses on the road give a relative indication of the financial status of bus operators. Common complaints from bus operators relates to high operating costs due to ever increasing fuel price and also deteriorating road conditions especially in rural areas. Because of the poor operating environment of some bus companies, this would normally result in poor financial returns.

With the absence of reliable financial data, it would be fair to assume that nearly all road-based public transport operators in Fiji are profitable as reflected in the increased number of new entrants (based on the number of PSV permits) in the PSV market especially taxis, rentals and minibus services. The number of newly registered public service vehicles (bus, taxi, and rental hire) can support the above assumption on yearly basis, which supposedly mirror the corresponding number of PSV permits/licenses issued by LTA. Generally speaking, the current scenario appears to suggest that PSV market is relatively profitable in the face of current

supply control vested in LTA. It is also noticeable that those PSV operators enjoying reasonable profit are in better position to replace old vehicles. As can be seen in Table 11, the number of newly registered public service vehicles annually fluctuates with an annual average of 7.2%.

Table 11 Number of Newly Registered Public Service Vehicles

Year	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
# Public Service Vehicles	457	435	281	298	243	201	385	276	238	393	495

There are no comprehensive national statistics on public transport carriage by buses, taxis, and minibuses, let alone the number of riders (i.e. trips or passenger /km) largely because of the private nature of ownership profile of service providers therefore public transport statistics is not centrally administered. The current ticketing mechanism used by buses however can be used to assess bus passenger loadings or level of public patronage.

Although the provision of public transport in Fiji is cheap and relatively of good quality, the popular belief is that improved public transport service will satisfy peoples travel demand, persuade them out of their cars and solve the problem of road congestion and air pollution. Having said that, however, the lack of formal statistics on public transport carriage proves difficult to assess the level of public transport patronage or passenger loadings.

4.2.2.3 Competition in Public Passenger Transport Market

There is virtually no limit/restriction of market access into domestic public transportation market. The basic mandatory requirement for vehicles engaged in any form of public transportation trade has to be licensed by LTA with the required permit. A vehicle operator has to meet all the standard safety and related technical requirements stipulated under the relevant legislation prior to it being a public service permit. Of worth noting is that a vehicle operator has to first comply with all the necessary attendant procedural requirements for PSV of the proposed service, proposed fares, etc. As regards to public transport pricing, bus fares, taxi fares, and minibus fares are controlled/determined by LTA.

Competition within the public passenger transport service providers i.e., mainly between taxis, buses and minibuses and to some extent light goods vehicle (mainly carriers in the interior of Viti Levu and Vanua Levu) has naturally improved frequency and mobility rather than the quality of service. It has also led to greater choice of services to the benefit of the travelling public. Although public passenger transport services in Fiji are largely profitable, Government, as part of its social obligation, still provides fiscal assistance in the form of duty concession and even tax exemption as a means of easing the burden of operating costs to operate bus services especially to uneconomic routes in remote rural areas characterised by sub-standard roads.

With the widespread emergence of unlicensed minibuses, the financial viability of most bus operators particularly those servicing routes linking towns and cities as well as semi-urban areas are no longer guaranteed. Minibuses obviously offer choices to the travelling public and undoubtedly more convenient by nature but this has also proved to be an 'inconvenience' to many areas due to the withdrawal of bus services to some areas.

4.2.2.4 Buses

Buses are still arguably the most frequently used public mode of road transport in Fiji. They have been and are still the backbone of both rural and urban passenger transport, providing low-cost service particularly for low-income groups. Scheduled bus and coach services in Fiji are quite extensive and frequent connecting various towns as well as rural and urban centres around the two main islands of Viti Levu and Vanua Levu. Town services or intra-city services in most urban corridors particularly in the Suva-Nausori and Nadi-Lautoka areas are generally high due to high density of passenger demand. In addition, inter-city or non-stop bus express service particularly around Viti Levu is also generally very frequent with multiple bus operators servicing the same routes. Country services within rural-based village areas with sparse population or on routes where passenger loadings are relatively small, services are generally sparse compared to urban areas with high density of traffic loading where frequent services are the norm.



Buses in Fiji



Table 12 shows the number of new bus registrations and the corresponding accumulative number of total registered buses annually from 1993 to 2003. The number of operators currently providing these services is around 50 with a fleet size of close to 2000 buses. Bus operators have to be issued with Road Service Licenses (RSLs), which are prerequisite requirement for all bus operators prior to commencing public passenger service. The RSL stipulates the area or location of operation of bus operators and their respective timetable.

Table 12 Newly Registered Buses and Cumulative Annual Registered Buses

Year	Newly Registered Buses	Total Annual Registered Buses (Accumulative)
1993	95	1,483
1994	89	1,572
1995	82	1,654
1996	90	1,744
1997	53	1,797
1998	25	1,801
1999	53	1,854
2000	56	1,910
2001	25	1,936
2002	36	1,972
2003	47	2,019

Source: Land Transport Authority

As indicated earlier, there are about 50 operators (excluding tourist-based bus operators) in the bus industry with varying levels of operating costs depending on the location of routes they serve (intra city/town services, inter-city services, or country services). Bus operators are not required under the current terms of LTA regulations to furnish detail of their operating costs, let alone audited financial reports, for evaluation of new fare increase proposal.

The only formal data available on their financial cost details was compiled by the then Bureau of Statistics in 1991 on a Census of Transport and Communication based on 83% response by bus operators on their survey. The results from the 1991 survey shows that fuel accounted for more than 40% of their operating expenditures. Today, fuel cost component for bus operators represent a substantial portion of their operating cost.

It is also important to note that Fiji's bus fleet range from the ageing open buses to the relatively new with glass window to the modern air-conditioned tourist-based coaches. All of which uses diesel-fuelled engines with some new fleet of buses equipped with Euro 3 specification environmentally friendly engines that are essentially designed to have minimal impact on the environment. Typically, many buses that are subject to poor or infrequent maintenance emit



Notice at the Bus Station in Suva

heavy black smoke, which may be partly attributable to inadequate diesel injector maintenance, poor driver skills and habits or perhaps related to fuel quality. With the imposition of air pollution control by municipal councils, buses are required to turn off engines at bus terminal during the course of picking up and dropping off passengers. The municipal councils have however not strictly enforced this.

It would appear that the bus industry in collaboration with LTA and Training and Productivity Authority of Fiji (TPAF) should set an appropriate standard of training of drivers and mechanics as they play a pivotal role in ensuring the proper operation and maintenance of buses. Another seemingly drawback facing the bus industry that limits the ability of bus operators to respond to fuel price increase is the current control over fares. Given the current fare control regime and the increasing trend in the price of fuel, let alone maintenance costs, it is therefore reasonable to accept that investment in new buses within the bus industry is relatively low.

Perhaps allowing some flexibility in price control may place bus operators in a position to invest more in the training of bus drivers and mechanics on maintenance aspect of buses. Provided there is some relaxation of price control, operators should be given the latitude to set fares reflecting market operating conditions and accordingly they should be encouraged to pay more attention in better maintenance and ultimately invest in more environmentally-friendly engines (bus replacement).

4.2.2.5 Minibuses

Minibuses are becoming an integral part of Fiji's public passenger transport system. Minibus services provided both by licensed and unlicensed (or illegal) minibus operators are mainly concentrated on inter-city services. At present, it is not clear as to how many minibuses engaging in public transport services are on the road. Apart from the number of minibus permits that have been issued by LTA, there seem to be no reliable information available on their cost structure but it is reasonable to assume that fuel comprises significant portion of their expenditures considering that they mainly concentrate on long-distance travel between Suva-Lautoka. Almost all minibuses operate on diesel-fuelled engines making them one of the main source of black smoke emissions as can be easily seen on Fiji roads. Given the growing number of minibuses and coupled with the seemingly no access control and industry standards in terms of their maintenance requirements it is not surprising that minibuses are posing big threat to the urban environment. There is definitely a need for some kind industry standards or code of practice to encourage minibus operators to pay more attention on their maintenance and serving of vehicles.

Of notable interest is that there has been a rising trend in people travelling to work by minibus. Fares for minibuses are somewhat unregulated and generally a little higher than the scheduled/regular buses. Like taxis and buses, all minibuses are privately owned and their operations are more demand driven without any fixed timetable compared to the LTA-approved bus trip timetable schedule.

4.2.2.6 Taxis

Taxis play an important role in the public passenger transport system. It provides greater flexibility in meeting the needs of individual travellers. Fiji has over 3,500 registered taxis in 2003. Table 13 shows the newly registered taxis and accumulative annual registered over a ten-year period from 1993. There seems to be no shortage of taxis in Fiji particularly in main urban centres, which are largely driven by land use related development (residential and commercial). Even though there is a common perception within the industry that there is over-supply of taxis in urban areas, this has not discouraged new entrants to enter the taxi industry. The seemingly surplus of taxis has also been one of the main causes of congestion especially during peak morning and afternoon hours. This is a common feature in Suva City where taxis tend to leave their bases and rove for business into the central business district (CBD) poaching for passengers.



Taxis in Fiji



Table 13 Newly Registered Accumulative Annual Registered Taxis

Year	Registered	Total Annual Registered Taxis (Accumulative)
1993	153	2,598
1994	136	2,734
1995	73	2,807
1996	82	2,889
1997	45	2,934
1998	21	2,956
1999	135	3,091
2000	116	3,207
2001	133	3,340
2002	122	3,462
2003	267	3,729

The taxi industry is operated by both petrol-fuelled and diesel-fuelled vehicles, and is generally poorly maintained, perhaps partly because of the lack of industry standards to reinforce best vehicle maintenance practices. Again based on the 1991 Census of Transport and Communication conducted by the former Bureau of Statistics, fuel and oil typically accounted for more than 40% of operating costs. Because of the private nature of ownership of taxis, there seem to be poor attendance made to the proper maintenance of taxi vehicles as visibly evidenced in an overwhelming number of smoky taxis operating on Fiji roads.

Taxis, by their nature of apparent high utility rate, should be subject to scheduled maintenance programme. This may reinforce the need for a taxi industry code of practice on maintenance standards, which should be rigorously enforced. From an environment standpoint, such industry standards will obviously raise the needed awareness among taxi operators about the importance of maintaining environmentally sound vehicles to improve air quality. Although the imposition of such standards may drive up costs to some extent but this can be a disincentive for would be operators to join the taxi industry. The desirable effect then could be of course a potential for reduction of petrol and diesel use by within the taxi industry, thus reducing vehicle emissions.

4.2.2.7 Rentals

Vehicles used for rentals and hires are also considered, under the terms of LTA regulations, as a form of public passenger service vehicles. The rental industry is largely designed to cater a small portion of the PSV market mainly the tourist industry and business sector. Fiji experienced a sudden influx of vehicle rental operators signifying the increased demand for rental not only in the tourism industry but also for Fiji residents living abroad for short visits.

4.2.2.8 Trends in Public Travel Behaviour

From observation, typically a high proportion of public travel in urban and rural areas of Fiji is by buses. This pattern is mainly attributed to two factors: first, buses are equipped with large seating capacity compared to other PSV-type vehicles; and secondly, buses offer cheap fares and so since much of the population, being a developing nation, cannot afford private form of transport or even taxis, or rentals. Minibuses in urban areas (cities and towns) are also becoming popular in accommodating public passengers who value time and speed. Among the municipalities, Suva-Nausori and Lautoka-Nadi appears to have much higher

proportions of commuting by public transport using minibuses. Public transport in these two areas depends largely on a mix of taxis, minibuses and buses.

Transfer from private cars to public transport modes (especially buses, minibuses) is only expected or common in urban areas and on long distance travel. Nevertheless, the potential of transfer is not believed to be significant, even if Government will undertake large investment in the public transport. Efforts will be needed to optimise the use of public transport. Government should secure, foster and enforce the public transport sector especially in urbanised areas with a large passenger potential and where the problems related congestion and environment are considerable. The challenge is for Government to introduce measures and interventions that encourage people towards public transport. However, the transport user should always be free to choose the mode of transport but the price of transport should include the full external costs related to transport.

4.2.2.9 Goods Transport (Road Haulage)

The road freight industry in Fiji is essentially a make up of the transport component of key economic sectors like sugar, forestry, maritime (port related), manufacturing and commerce. These sectors depend on roads extensively to transport agricultural, manufacturing and industrial freight cargo and bulk goods. Heavy goods vehicle fleet mainly trucks and also truck/trailer combinations that are more than 20 tonnes are used for hauling sugar cane, hardwood, pine-logs, timber, and export/import based containerised port cargo.



Goods vehicle fleet recorded an average annual growth rate of 0.42% over a 10-year period from 1993. As at June 2004, total number of goods vehicles reached 38,167, which represent almost 30% of the total vehicle fleet in Fiji. Table 14 shows the newly registered goods vehicle yearly for the period 1993 to 2003.



Table 14 Newly Registered Vehicles and Annual Registered

Year	Newly Registered Goods Vehicles	Total Accumulated Registered Goods Vehicles
1993	1,318	30,228
1994	1,189	31,417
1995	856	32,273
1996	727	33,000
1997	743	33,743
1998	482	34,182
1999	856	35,038
2000	668	35,706
2001	659	36,365
2002	746	37,111
2003	914	38,025

The haulage industry is not regulated by price, route or service provision, as such no formal statistics are recorded by Government or LTA on freight transport volumes and utilisation. However, there are few public corporations (namely Fiji Ports Corporation Limited, Fiji Sugar Corporation, Fiji Pine Limited, Fiji Hardwood Limited and many others) that rely heavily on road transport to have statistical records on the movement of freight within Fiji in terms of volumes (tonnages), origin/destination and utilisation.

In the absence of route licensing requirement for road freight operators, it appears that enforcement of prescribed axle weight load limits permissible for heavy goods vehicle together with the vehicle emission control are the two aspects of LTA regulation used to address overloaded trucks as they pose safety hazard as well as damage they cause on road pavements. The practice of overloading trucks is to the operators' economic advantage in terms of volume but this imposes a cost to Government in terms of damage on roads its inherent maintenance costs.

As regards to energy consumption in the road freight industry, it is practically difficult to determine how much diesel fuel is consumed within the industry since there are no statistics available on fuel consumption in the road freight industry. However, it is reasonable to make a claim that heavy trucks consume substantial amount of fuel judging by the extraordinarily heavy load nature (if not overloading) of freight transported by road. In the interest of the environmental quality of heavy vehicles, there is an obvious need for Government to introduce some kind of national standard, similar to what is previously presented to buses, taxis and minibuses, to regulate the vehicle maintenance requirements of the road freight industry. This would undoubtedly lead to better vehicle performance and thus improving fuel efficiency.

4.3 ROAD INFRASTRUCTURE NETWORK

Fiji's transport system is an extensive and interconnecting network of roads (both national, local government and private owned roads), airports (domestic and international airports), seaports (national and private owned ports) and jetties. Within the overall transport system, roads play an important role in Fiji's land-based transportation sector by providing the enabling infrastructure to meet the accessibility and mobility needs of the country.

4.3.1 Roads

Access through the public road network is not only confined for cars, buses, trucks, and other road users, but also for providing the required infrastructure access to public utility services such as water and sewerage, electricity and telecommunications. Roads are therefore vital for supporting Fiji's economy. Government has traditionally perceived construction of public roads, like in other countries, as part of its social community obligation. Government expenditures on the main trunk road network (upgrading, rehabilitation, expansion, and maintenance) have never been more than a fraction of perceived total revenues from road users. Annual investment in road construction and improvement has risen steadily. In parallel to this, major upgrading projects on national roads around Viti Levu and Vanua Levu have continued to be part of ongoing capital projects of government to support local trade and economic development. Since 1983, there has been a number of major road upgrading funded by the Asian Development Bank (ADB), World Bank and other funding agencies.

4.3.2 Public Road Classification

Public roads in Fiji are generally classed according to their geometric standards and are linked closely to their level of service or traffic volume as a measure of their performance. The four main road classes under which the Department of National Roads (DNR) is responsible for are main, secondary, country, and residential /institutional roads. With the exception of country roads, each of the road class exists in both urban and rural areas. The main and secondary roads in urban areas appear to be the most populated in terms of traffic volume as most of which connects to major commercial and administration centres. A summary of public road network including other non-DNR roads is presented in Table 15.

Table 15 Summary of Fiji Road Network

Ownership and Responsibility	Road Class	Distances (km) Approximate
Department of National Roads	Main Secondary County Residential / Institution	5000
Municipalities	Urban Roads	200
Other Authorities: Forestry Agriculture Regional Development FSC	Forestry Roads Coco Roads Rural Access Roads Cane Access Roads	2800
Total		8000

Source: DNR

4.3.3 Road System Management and Planning

The responsibility for planning and supply management of Fiji's public roads rests with Government through its road portfolio agency (i.e., the Ministry of Works and Energy, MWE). The MWE through the newly formed Department of National Roads provides and manages public roads in Fiji. Government invests around \$50 – \$60 million annually for the public road infrastructure network, let alone the other municipal/local government owned roads with city/town boundaries. The problem being faced by Government, which is also common to all other aspects of the infrastructure sector (like water, airports, and seaports/jetties) is that it cannot carry on with the burden of capital investment in infrastructure alone.

4.3.4 National Road Budget

National roads have been always funded by specific allocation from consolidated government revenue. There is no designated road user charging system and virtually no hypothecation of revenue derived from road related use such as vehicle duty and wheel tax, let alone a road funding mechanism. As stated earlier, the DNR budget is about \$60 million of which about a third is for maintenance.

4.3.5 Total Roads Length

Fiji's public road network has undergone rapid expansion from some 4,995km in 1990 to about 8000km in 2002, of which the DNR manage about 5000km. Other authorities manage some 2000km of the total road network. Out of this, municipal councils manage about 200km and approximately 1800km are forestry, cane access and agriculture-based project roads. Only about 900km of the DNR-managed roads are sealed. The two main islands of Viti Levu and Vanua Levu accounts for 90% of the total road network, with Viti Levu having 77% of the sealed roads. Out of the total

road network managed by DNR, only 17% of the length is sealed in 2002 as can be seen in Table 16.

Table 16 DNR Road Network as at 2002 (Kilometres)

Road Class	Sealed	Unsealed	Total
Main	501	844	1345
Secondary	120	445	565
Country	63	3028	3091
Residential/Institutional	206	23	229
TOTAL	890	4340	5230

Source: DNR

4.3.6 Physical Condition of Roads

The country's road network is relatively good. However, on general observation it appears that parts of the sealed road network around Viti Levu and Vanua Levu are in need for maintenance and rehabilitation in order to maintain good operating condition. The condition of roads in most parts of the urban network in Viti Levu is considerably better than that on the rural areas. The condition of roads, let alone vehicle quality, can have a significant effect on the energy consumption and greenhouse gases produced by road traffic. Despite the complexity in the link between better quality road network and vehicle energy consumption it still appears that there is not much attention given to the environmental quality consideration of roads by Government. In general terms improved roads increase energy efficiency by allowing for higher sustained speeds of vehicles. However, at the same time improved roads in Fiji particularly in urban areas have naturally increased traffic (and so inevitably increase energy use). Given the potential benefits of increased road traffic to Fiji's overall economic development, road maintenance and related upgrading activity are an expensive undertaking, and so the energy efficiency benefits accrued are difficult to measure.

Since the mid-1980s, Government has been embarking on major road-upgrading programmes to improve the standard of public road infrastructure under a series of projects: Fiji Upgrading Projects (Stage I, II, III, and IV) – the underlying objective of supporting Government's social and economic development activities. Government loans from World Bank and the Asian Development Bank have assisted these projects. As indicated earlier, operational improvements in roads could also have the potential to improve efficiency or fuel economy of vehicles by ensuring sustained high speeds of energy efficient vehicles that are equipped with fuel conservation/saving technologies. It would be advisable that Government through the DNR have in place some kind of energy efficiency considerations in its road upgrading and maintenance programme.

4.3.7 Road Maintenance Responsibility

Maintenance of public roads network is the responsibility of Government through the DNR while local government-owned roads including local streets is the responsibility of municipal councils. The provision, maintenance and upgrading of public roads is the responsibility of Department of National Roads within the Ministry of Works and Energy. Some road segments that come under the ownership and management responsibility of local



Tarsealing of roads, a common site in road upgrading projects throughout Fiji

governments are delegated to the Department of National Roads for financial reasons particularly as to their maintenance requirements. Some classical examples are Edinburgh Drive connecting Suva capital and Samabula town within the city area, Fletcher Road in Vatuwaqa, Suva, to name a few.

Provision and maintenance of other roads built for specific purposes such as cane access roads, agricultural, forestry, and pine access roads are the responsibility of the respective providers (for example, Fiji Sugar Cane Growers Association, Ministry of Agriculture, Fiji Pine, and Fiji Mahogany). Road maintenance work depends on physical conditions of roads and its associated actual maintenance needs, however by large it generally involve simple grass mowing of road sides, repainting of road markings, minor road surface repairs and major periodic maintenance works.

The lack of provision of adequate funding to effectively meet major maintenance works, both on the part of national government and local governments, for most part of the road networks in rural and urban areas has always been an ongoing issue. Despite suggestions by road related agencies for setting up of a dedicated road funds as a means to secure reliable source of funding for road maintenance, it appears that national treasury is not too keen to advance the road fund concept.

4.3.8 Road Maintenance Cost

Heavy commercial vehicles (both goods and passengers) are the primary cause of road wear, and contribute disproportionately to the maintenance cost. It is estimated that the impact of the passage of an axle on the life of the road surface increases with the fourth power of the axle load. If roads are poorly maintained, vehicle-operating costs (fuel, tyres, and maintenance) are higher. Traffic speeds are lower, resulting in higher wage costs for commercial and public service operators. The estimated optimum level of road maintenance expenditure requirement by DNR is around \$30 to \$40 million, but Government currently provides only \$25 million.

It is clear that there are issues relating to the total money collected from road users and the share of costs contributed by goods vehicles. The spiralling cost of road maintenance and the high cost of road construction and upgrading has meant that government has insufficient funds to keep up with demands to maintain existing infrastructure in roadworthy condition. Local governments (municipal councils) have similar predicament on lack of funding for maintenance and upgrading of roads and streets that are under their control.

From an energy conservation perspective, poor infrastructure in terms of rough surface and deteriorated pavements could impede the potential benefits of more energy efficient vehicles, as their benefits would accrue largely at smooth roads with higher speeds.

4.3.9 Road-Related User Fees and Taxes

According to a previous study, total annual revenue collected from road users are estimated to be about \$60 million, of which \$30 million is excise duty on imported petrol and diesel fuel and another \$25 million excise duty on distillate. About \$7 million is from vehicle registration and re-licensing fees (wheel tax). The import duty on diesel is much lower than that on petrol which helps explain the high proportion of diesel vehicles in the Fiji islands, and results in commercial vehicles paying less than their share of the total tax paid.

There is scope under the LTA legislation that Fiji can use to introduce regulations that can mirror road user related costs such as imposing fees which would better reflect the costs imposed by each vehicle type on the roads, and regulating through appropriate licensing mechanism the use of heavy goods vehicle so that their impact on road maintenance is controlled. By ensuring that transport decisions takes into account the impact on road costs, the total transport cost for Fiji will be reduced. Increasing penalty fees for heavy goods vehicles in order to decrease the level of road maintenance activity and increase road improvement would over time lead to a reduction in vehicle operating costs and thus a net benefit to operators.

5.0 ROAD USE MANAGEMENT

5.1 Road Utilisation

Road management agencies such as DNR and municipal councils are supposedly required to measure the utilisation and performance of road system in a variety of ways. Typical indicators used are:

- Traffic volume, as measured by automated traffic counters and vehicle detectors associated with traffic signal systems;
- Average speed on major roads, as measured by probe vehicles;
- Fatalities in road accidents

These measures are useful for management, reporting, and planning purposes. Some municipal councils like Suva City Council have targets for these indicators but there is no nationally coordinated programme of measuring and monitoring road utilisation. Congestion has traditionally been measured through peak-hour volume/capacity ratios. Standards measures of system performance should incorporate travel time reliability, trip length predictability, and, and customer satisfaction. In addition, weigh-in-motion systems can also be able to gather information on weight/mileage measures of freight transport.

5.2 Road Safety

Road safety in Fiji has generally been perceived by road users (drivers and passengers in cars, public transport users in buses, drivers of freight trucks, cyclists and pedestrians) as the most important transport issue. Government through its relevant authority (National Road Safety Council – NRSC) focuses a lot of attention on road safety-related issues and education. There is a perception that roads and vehicles are gradually becoming safer but statistics show the otherwise. Speeding and drink driving are considered to be the main factors causing road accidents.

In some rural and remote areas of Fiji, where the fatality rate is also on the increase, the need for more public awareness on road safety is required. Other concern on conditions of roads, line markings and reflectors and signage are related to road safety issues in Fiji. It appears that the most common safety issue of concern to Fiji at present is how safely people drive rather than how safe the roads and/or vehicles are. Road safety is or should therefore be more oriented towards driver quality than road quality.

Given that safety is of paramount importance in the design, construction and maintenance of roads, Government in collaboration with the Asian Development Bank Fiji developed the Fiji Road Safety Action Plan (FRSAP) as a means of strengthening the capabilities of key organisations involved in road safety activities in Fiji. The FRSAP 1 was instrumental in the establishment of the NRSC.

5.3 Road Traffic Management

Responsibility for traffic management in Fiji is fragmented according to ownership and planning/management of the roads system. Government through the DNR has the responsibility for traffic management within national/public roads system. The LTA also has responsibility for traffic management but has no active involvement in traffic management in practical terms. In addition, the local governments have responsibility for traffic management within municipal-controlled roads. Of worth noting is



A policeman controls traffic in downtown Suva

that the traffic management system on major trunk urban roads with high traffic volume within major urban areas particularly the corridors linking Suva- Nausori and between Lautoka-Nadi is under the active control of DNR.

There are no traffic management systems on Fiji's main highways (such as the Queens Highway) except the static signs and road humps, let alone the non-existence of intelligent transport systems (ITS) technology. On local streets within urban areas traffic is controlled by road rules and static signs with the use of common traffic management devices (such as roundabouts, speed humps, etc), which are common features in Fiji's urban roads.

Traffic management activities are conducted in the main urban areas, jointly by DNR and municipal councils. Projections of Fiji's traffic flows and congestion are available based on previous consultancy studies carried out, for instance the Greater Suva Transportation Study and the National Urban Sector Study. The resulting study reports contain large amounts of data collected mainly for the urban road networks. However, it seems that DNR collect information on vehicle through specific roads (including vehicle classification) as and when required. In other words, DNR does not conduct ongoing nationwide traffic count on national roads. Any analysis of road traffic data for upgrading or rehabilitation purposes is normally carried out on a case-by-case basis.

Government through the DNR should improve its monitoring of road traffic by establishing a database with the view to analysing traffic flows and developing road performance measures in order to direct spending more effectively. Such database can be used to predict traffic flows and growth. Government should also improve its monitoring of road composition in order to develop a maintenance strategy for vehicle loads, particularly heavy trucks. For example New Zealand's Transfund collect and manage information on road use through a National Traffic Database, which contains traffic volumes and estimated/projected road traffic for nearly all of New Zealand's roads.

There is also a need for greater push toward sharing of traffic information across jurisdictional boundaries especially between Lami, Suva, Nasinu and Nausori municipal councils as well as Nadi, Lautoka, Ba, and Sigatoka municipal councils. Local governments have legislation to implement traffic management strategies but not congestion management strategies. There is also need to integrate ITS technologies into transportation systems. These proposed changes presents new

institutional challenges for both national and local governments in data collection and the implementation of interoperable traffic management systems.

5.4 Urban Transport and Land Use Planning

Improvements to urban transport are attracting considerable attention in Fiji with the recent Urban Sector Strategy prepared by ADB and the consequent Fiji's Urban Policy Action Plan. The Plan identifies priorities for action to improve all aspects of urban development including urban transport system.

Like other major urban areas in both developed and developing countries, the greater Suva-Nausori urban area is facing unprecedented growth in motor vehicle traffic, which threatens to overwhelm the city transport system through increased congestion. Traffic congestion naturally delays all traffic, with consequent economic losses and restraints on personal mobility. Bus and other public transport suffers acutely and is deteriorating at a time when demand for travel is generally rising with increasing affluence. Increased traffic noise and air pollution, and reduced safety are also closely associated with increased motorisation.

Currently most land developers are directly involved in construction of new local roads especially in new residential locations. Upon completion, ownership and funding responsibility for ongoing maintenance is then vested with the local authority. Typically there is no analysis made by land developers for any increased traffic flow that may result from the land development.

Urban transport systems should be managed and monitored by a network of traffic control devices such as incident management systems, and traveller information systems. A critical aspect of traffic control systems is that much of their capability is in the integration of individual components. Hence municipal councils falling within the greater Suva urban area should endeavour to better integrate these components into a fully integrated traffic management systems.

5.5 Road Traffic Congestion

Congestion is a negative externality, which dilute the quality of land transport service due to the slow flow of traffic. Increase in traffic leads to increase in travel time, thus incurring the social cost, not to mention more fuel consumption and emissions of air pollution from stop-and-go movement during congestion.

The four main side-effects of congestion worth highlighting are:

- i) it causes traffic delays;
- ii) causes increased vehicle emissions/pollution mainly because of stop-and-go driving conditions during congestion
- iii) results in instability of travel times, hence its economic costs; and
- iv) impacts the living environment in terms of noise, pollution and neighbourhood character, etc.

From an engineering perspective, traffic congestion may indicate a high level of utilisation of road infrastructure and facilities. In general, there are two main types of traffic congestion common to all-metropolitan cities around the world including Fiji's urban centres. These are incident-related and recurring congestion. As regards to incident-related congestion, this may occur anywhere in the road system as result of accidents, road works, temporary road closure and other extraordinary events that uses the road system. Such congestion occurs at unpredictable locations and times,

which are very relevant to the Suva-Nausori link road. Incident-related congestion can be best managed by quick response methods such as use of smart signal or intelligent transport systems (ITS) technology to provide congestion relief.

The attraction of ITS⁶, as employed in some metropolitan cities, is that it utilises real-time traffic data to automatically show traffic status. There are many forms of ITS that are feasible to Fiji's urban traffic situation like the simple use of traffic data bulletin board that can provide traffic information on specific busy intersections along the Suva-Nausori corridor. Other response strategies that can be used are road sensors and CCTV cameras to spot incidents sooner which can then be transmitted to relevant agencies to improve response time by police and tow trucks.

On the other hand, recurring congestion naturally occurs at 'bottlenecks' caused by:

- i) reduction in number of lanes
- ii) vehicles entering the system
- iii) traffic lights that are in failing cycles
- iv) other permanent road capacity reductions

There are varieties of countermeasures that can be used by Fiji's DNR and municipal councils to reduce the undesirable effects of recurring congestion such as:

- i) supply more capacity or transport supply management (TSM);
- ii) change travel behaviour; and
- iii) manage demand through travel demand management (TDM), ITS, and voluntary behaviour travel modification (VBTM), for example – car pooling.

The current local scenario is that increasing traffic congestion has been more prevalent to peak morning and afternoon rush hours in the greater Suva-Nausori urban as well as Nadi-Lautoka areas. It would appear that more physical and technological intervention would be needed to reduce traffic congestion in peak morning and afternoon hours along these highly populated urban areas. In addition, heavy goods trucks seem to travel around the same time and same roadways in peak morning and hours when roads are already packed with private and public service vehicles. This freight movement in peak morning hours only compounds the problem of congestion especially in some parts of the road that are inherently crowded with slow moving traffic. A variety of measures have been and currently being undertaken to reduce traffic congestion in the above urban areas through the construction of back roads bypass as well as widening of roads with four lanes in order to optimise the capacity utilisation in rush hours. Nevertheless, on a global scale congested roads are still a small problem in Fiji.



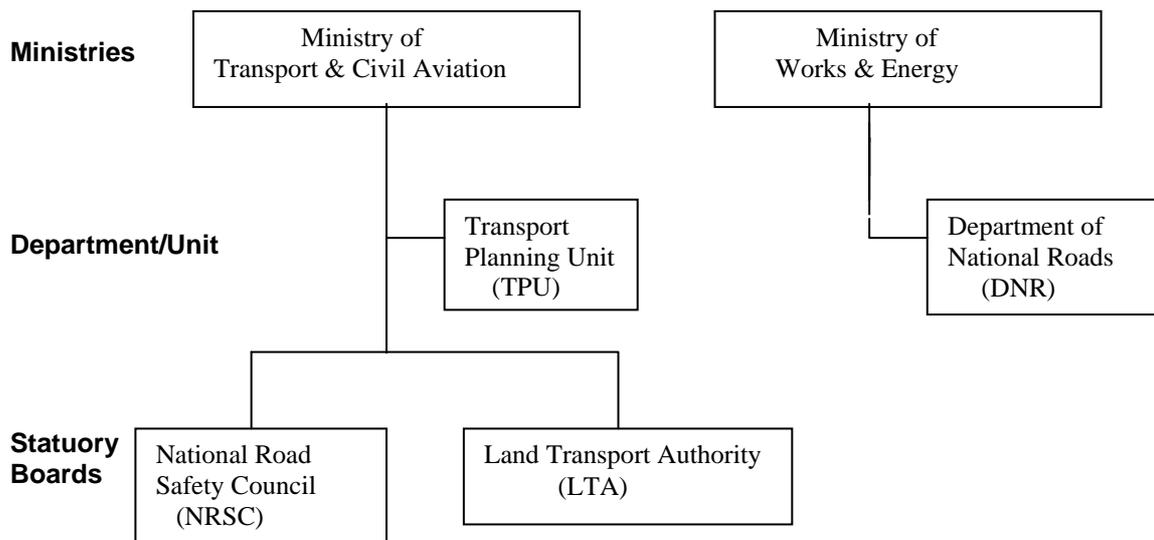
⁶ Examples of ITS in use in other countries are Sydney's SCATS, Singapore's ANTSS, LA's ATSAC, Toronto's COMPASS,

6.0 LAND TRANSPORT SECTOR ORGANISATIONS AND RESPONSIBILITIES

6.1 Institutional Arrangement of the Sector

A snapshot of the present organisational arrangement for the land transport sector and the road sub-sector is provided in Figure 3.

Figure 3: Current Institutional Structure of the Land Transport Sector



6.2 Sector Management and Organisational Responsibilities

At strategic policy level, the administrative apparatus of the land transport sector functions is split between two Ministries, MTCA and MWE, with the later being responsible for roads and energy sectors. Government through the MTCA guides the strategic management of the land transport sector, which serve as government agent for the transport portfolio. The primary task/core function of the MTCA is largely policy oriented ensuring that government delivers a land transport system that is consistent with the overall strategic policy goal of the transport sector. MTCA represents government's national interest in ensuring an integrated transport system that is safe, affordable, accessible to all and environmentally sustainable. As the transport portfolio agent, the MTCA plays an important role in overseeing the operation of its relevant statutory bodies: LTA and NRSC. The LTA, which came into being in 2000, is the sole regulatory body for the technical, safety, and economic aspects of land transport activities in Fiji. In the main, Government's role in the transport sector is policy, planning and regulatory functions and provision of road infrastructure.

At national level, the planning, administration and management responsibilities of the sector are currently being shared between MTCA and MWE with the later being responsible for the public road infrastructure network. Other stand-alone organisations operating autonomously and serving as the regulatory arm of Government are the Land Transport Authority (LTA) and the National Road Safety Council (NRSC). Both LTA and NRSC fall under the jurisdiction of the Minister for

Transport and Civil Aviation. The Department of National Roads⁷ within the MWE provides and manages Fiji's public road sector

The main body responsible for road infrastructure delivery is the Department of National Roads (DNR), formerly known as PWD Roads, under the MWE. It is responsible for the administration and management of national roads network under the Roads Act. It may also carry out construction and maintenance works for the other Departments, for example for access roads for Ministry of Agriculture and Forests, minor wharves and jetties that falls outside the scope of responsibility of the Fiji Ports Corporation Limited (FPCL). The DNR also has legislative task, under the Roads Act, of enforcing vehicle axle loads, as well as vehicle mass and dimensions. The condition and life span of roads and bridges are dependent on large terms on vehicle loads.

The LTA is responsible for the regulation and control of both commercial (passengers and goods and/or public) and non-commercial (private) land transport services operated in Fiji. In addition, the LTA has jurisdiction over all technical and operational matters pertaining to the conduct of private and public land transport activities in Fiji such as vehicle registration, inspection, personnel licensing, and vehicle safety. LTA is empowered by the LTA Act and its subsidiary regulations to exercise economic control of the PSV market or local land transport market by way of regulation. As regulatory authority, economic issues like pricing (bus fares, taxi fares) and quantitative control or supply (as represented by number of PSV permits issues by LTA) as well as non-economic issues (vehicle safety and registration, personnel licensing and environmental/vehicle emission) are the responsibilities of LTA.

With its legal mandate, LTA has the statutory obligation to come up with new initiatives geared towards improving/enhancing the safety standards of vehicles and likewise the environmental effects/aspects associated with vehicle emissions. Overall, LTA acts as the specialised agency for the 'mobile' aspects of land transport in Fiji i.e., with particular focus on motor vehicle and drivers as well.

⁷ Formerly operating as Public Works Department (PWD)'s Roads Section

7.0 LAND TRANSPORT SECTOR POLICY

7.1 Government Overall Policy Direction

Government's socio-economic policy is articulated in the Strategic Development Plan (SDP) 2003-2005 which set key strategic priorities to take the country forward towards its stated vision of "*Rebuilding Confidence for Stability and Growth for a Peaceful, Prosperous Fiji*". The 'Mid-Term Review' of SDP 2003-2005 dated November 2004, provides an assessment of the progress made in the implementation of policies as well as modification and reinforcement of existing policies where necessary.

In the transport sector, Government's stated goal is "*to provide an integrated transport system that is safe, affordable, accessible to all and environmentally sustainable*".

7.2 Policies and Strategies

At present, Government's policy objectives towards the land transport sector are:

- To protect the high level of investment in the national road network through effective controls on vehicle overloading and ensuring adequate maintenance through road-cost recovery;
- To continue investment in the construction, maintenance, and upgrading of the national road network, with emphasis on maintenance and upgrading; and
- To reduce vehicle emissions to internationally accepted standards.

The Review and Policy Update of the FNTSP also provides comprehensive updated policy framework for the transport sector by establishing a consistent set of policies and development strategies within the context of the SDP 2003-2005. It is of interesting to note that the FNTSP Review and Policy Update make no explicit policy strategies to address environment as well as energy considerations. The main policy emphasis for the land transport sector as enshrined in the FNTSP Review and Policy Update 2004 are towards addressing issues relating to the:

- Institutional Arrangements in Land Transport
- Regulation of Road Transport and Traffic
- Road Management and Cost Recovery
- Road Infrastructure Delivery
- Sugar Transport

As indicated earlier, there are no national policies addressing the critical relationships between road-use (mobility issues) and the need to improve energy efficiency. Also there are no provisions, under both SDP and FNTSP Review and Policy Update, aimed at encouraging mode shifts from private car use to public transport. There also seems to be lack of attention being paid to policies that can be aimed at reducing road traffic congestion in urban areas such as increasing the capacity of existing roads using ITS technologies (particularly advanced traffic management and traveller information systems) and other mobility management measures, let alone alternative energy source for the sector. At present, Government is committed to advancing the conceptual development of Fiji's biofuel industry as an alternative energy source, particularly for both the generation of electricity from bagasse and for sugar-based fuel ethanol production. The economic imperative behind this biofuel industry seems to be largely premised on the pressing need to revive the sugar export sector.

8.0 LAND TRANSPORT LEGISLATION

The current legislation governing the various aspects of land transport sector comprises mainly:

- The Roads Act (Cap 175, 1978) administered by the Department of the National Roads (DNR) within the Ministry of Works and Energy;
- The Land Transport Act 1998 administered by the Land Transport Authority (LTA) under the Ministry of Transport & Civil Aviation;
- The Motor Vehicles (Third Party Insurance) Act administered by the Ministry of Finance
- The Police Highway Traffic Act administered by Fiji Police Force
- Town Planning Act (Cap 139) administered by the Department of Town and Country Planning within the Ministry of Local Government, Housing, Squatter Settlement & Environment

8.1 Roads Act 1978

Under the Act, the Minister responsible for public works may declare any road a public road, apart from those roads, which are within the limits of a town under the Local Government Act. Also excluded from public roads are private roads including those under the management control of other Government departments like Agriculture, Forestry, and Regional Development. The Roads Act empowers the Department of National Roads, as the executing agency, to undertake road construction works and also control traffic. Section 3 of the Roads Act provides a schedule of the declared public roads. It is worth noting that DNR is the controlling authority of main roads including highway network where it cuts through municipalities but it has no powers of a urban planning nature.

8.2 Land Transport Act 1998

The Land Transport Authority (LTA) Act came into being in 1998 and majority of its subsidiary regulations subsequently came into force in 2000. The Act gives LTA statutory power to regulate the land transport sector in a wide range of areas such as vehicle registration and licensing, vehicle safety and emission standards, driver licensing, road rules, and vehicle weights limits and traffic management. Appendix 3 presents a list of national legislation relating to land transport in Fiji.

Other subsidiary regulations created under the LTA Act are:

- Land Transport (Vehicle registration & Construction) Regulations 2000
- Land Transport (Driver) Regulations 2000
- Land Transport (Public Service Vehicle) Regulations 2000
- Land Transport (Fees and Penalties) Regulations 2000
- Land Transport (Breath Tests and Analyses) Regulations 2000 and
- Land Transport (Traffic) Regulations 2000

8.3 Economic Regulation

The operating environment in which public transport or PSV industry operates in Fiji is marked by heavy regulation (both safety/environment and economic regulation). The economic viability of Fiji's land transport market is largely depended upon the economic regulatory control of LTA over the number of PSV permits/operators ('quantity'), routes, and pricing (bus fares and taxi fares). In contrast to free market, LTA regulates entry or market access of all commercial mode of road transport through issuance of permits/licenses to bus, minibus, taxi, rental and hire. It

determines the quantity of public transport services through strict licensing system (based on the evaluation of PSV applications) taking into account competition, need for service improvement, and welfare considerations. In practical terms, the price control of public transport services (bus fares and taxi fares) rests ultimately with Government. Fare increases are normally triggered by increases in fuel prices and are subject to Government approval. The relevant regulation covering the economic aspects of land transport as regards to market access, route licensing, pricing (bus fares, taxi fares mini-bus fares) is the Land Transport Authority [Public Service Vehicles] Regulation 2000.

8.4 Safety and Environment Regulation

The safety and environmental aspects are primarily concerned with the 'quality' control of land transport rather than quantity, particularly as regards to vehicle safety standards including vehicle emissions control. This also includes vehicle inspection, vehicle registration and licensing to ensure safety and related technical standards are adhered to. The relevant pieces of legislation that concerns vehicle inspection and vehicle emission controls are Land Transport [Vehicle Registration & Construction] Regulation 2000.

The environmental quality consideration of land transport is not adequately covered under current LTA legislation except the visibility-based excessive vehicle smoke emissions. For obvious safety and environmental reasons, there is a need to formulate appropriate regulation permitting the use of new technologies, for example Electronic Smoke Detection Machine (ESDM) for smoke analyses since current regulation on the 10 seconds test on visible smoke is inadequate. Many of vehicles on Fiji roads especially buses are more than 10 years old and the engines emit excessive smoke. Current LTA regulations do not have age limits prescribed on public service vehicles and this may be the reason why many public service and goods (light /heavy) vehicles emit visible excessive smoke.

8.5 Town Planning Act

The Town Planning Act gives power to the Department of Town and Country Planning (DTCP) to authorise application for planning permission to develop land use for use as roadway. In essence, the DTCP is the legal planning authority for road development proposals outside municipal council boundaries.

The municipal councils also have responsibility for all urban roads within their declared boundaries, with the exception of national roads proclaimed under Roads Act. Municipal councils also exercise town and planning jurisdiction over all development within their boundaries, including national roads. The locus of transportation planning and related investment decisions in roads has largely been vested with national government through DNR and DTCP.

9.0 LAND TRANSPORT AND ENVIRONMENT

9.1 Environment Management Responsibility

The Department of Environment has the overall mandate for environment management including emissions control responsibilities but does not have specific legislation to address greenhouse gas emissions, let alone vehicle-related emissions. Given the obvious prominence of land transport sector as being the dominant contributor to greenhouse gas emissions, it would be appropriate for Fiji to strengthen its existing regulations to cover the greenhouse gas emission and other related local air pollution from vehicle emissions.

9.2 Environment Policy

Government's stated policy goal for the environment, under the SDP 2003-2005, is the '*sustainable use of all natural resources*'. Given the relative fragile nature of Fiji's environment, Government has recognised that is an obligation to address various environmental-related problems and concerns through a comprehensive environmental legislation. To this end, the Environment Management Act, which was recently enacted in April 2005, provides a very broad mandate to the DoEnv to be responsible for the protection and conservation of Fiji's natural environment. The new Act empowers the DoEnv to monitor and control developmental activities that can potentially degrade the environment.

Some key features of the new legislation are:

- the establishment of the National Environment Management Council to coordinate the formulation of the environment management policies;
- the mandatory requirement for Environmental Impact Assessment (EIA) to be undertaken for all major development works; and
- declarations, enforcement orders, stop work notices aiming at ensuring environmental compliance with laws.

The new legislation covers all economic sectors including the transport sector. This entails the requirement for an EIA for development proposals relating to the construction of airport, jetty, bridge and wharf. Of interest to note is that the construction of roads is implicitly covered in the list of development proposals that are to be subject to the EIA process. From an environmental standpoint, road contributes indirectly to greenhouse gas emissions since it provides the enabling infrastructure for motorised transport. As a result, moving vehicles are among the key emitters of the rather invisible toxic gaseous including CO₂ emissions to the local environment.

It is important to note that there is no legislation addressing the invisible component of vehicular related gaseous emissions of carbon monoxide (CO), nitrogen oxides (NO₂), hydrocarbons or volatile organic compounds (VOC). All these invisible components have toxic properties that are harmful to human life. Non-visible emission of these toxic vehicular gases or air pollution from vehicles is not formally recognised in the current LTA legislation, let alone the newly enacted Environment Management Act 2005. This in itself may suggest the need for a comprehensive study of the environmental impact of Fiji's land transport sector.

9.3 Global Commitment to Environmental Sustainability

Fiji is a signatory to numerous international environment-related conventions and instruments including its national commitments under the United Nations Millennium Development Goals (MDGs), in particular goal 7 on *'Ensuring Environmental Sustainability'*. In its mid-term review of the SDP 2003-2005, Government has added the 'carbon dioxide emissions (per capita)', which is one of the 7th MDG indicators, as part of its key performance indicators (Table 17) under its first policy objective for the environment to minimise the degradation of natural resources and protect biodiversity.

Table 17 **Fiji's Progress on the MDG 7 and Indicators**

Year	1990	1995	2000
GDP per unit of energy (as proxy for energy efficiency)	-	-	0.086 kgoe
Carbon dioxide emission (per capita metric tons)	1,120	983	911 (1998)

Source: SDP Review, November 2004

9.4 Vehicle Emission

In the Strategic Development Plan (SDP) 2003-2005, Government has declared to *'reduce vehicle emissions to internationally accepted standards'* as one of its policy objectives for the transport sector. In support of the above policy, Government has accordingly set key performance indicators relating to vehicle emissions in both the transportation and environment sectors in the SDP as follows:

- Vehicle emission levels to be reduced by 50 percent by 2005;
- Alternative biofuel identified by 2005;
- Total suspended particles level in the atmosphere to be below 60-90µg cubic metres by 2004; and
- Use of adulterated fuel banned by 2004.

The above key performance indicators are linked to the second policy objective on environment i.e., *'to maintain a healthy and clean environment through the reduction and elimination of pollution and proper management of waste'*. The responsibility for management of these environment-based performance indicators is currently shared between four different Ministries/Departments namely the MTCA, Department of Energy within the MWE, Department of Environment under the MLGHSS, and Department of Fair Trading within the MCBDI.

The MTCA and DoEnv, as the policy arm of the transport sector and environment sectors respectively, are both responsible for implementing the first bullet-point on vehicle emissions. To this end, an ADB-sponsored technical assistance study on vehicle emissions has been completed in 2004 the outcome of which is an action plan on vehicle emission reduction measures. The second bullet-point on alternative biofuel falls perhaps under the responsibility of the Department of Energy. The Department of Environment is responsible for implementing the third bullet-point but so far there has been no substantive action taken to implement it. As regards to

adulterated fuel usage fourth bullet-point), the Ministry of Commerce's Trade Standards Department is responsible for setting and implementing fuel standards and specifications.

9.5 Current Situation

Vehicle emission is the most commonly known negative externality of land transport sector. In Fiji there is widespread road transport related pollution from the exhaust emissions of vehicles, particularly from diesel engine public service vehicles like buses, taxis and minibuses, not to mention other commercial goods and private vehicles. There is the need for strict enforcement of vehicle maintenance standards and more importantly, the monitoring of vehicle emissions.

The current focus of attention in Fiji is primarily being targeted at the problem of black smoke emission from diesel vehicles. Emission of black smoke from diesel engines consists mainly of carbon and soot which is caused largely by incomplete combustion and is emitted when the resultant air/fuel ratio is too low and hence there is not enough air to burn all the diesel fuel. In Fiji, emission of black smoke is widespread, particularly from diesel engines, many of which are attributed to poor maintenance standards. Black smoke emissions from diesel-fuelled vehicles are largely a result of the engine being overused outside its normal operating conditions without proper or regular maintenance.

Technically, in a well-designed and maintained diesel engine, excessive black smoke may be caused, among other things, by air starvation (blocked air cleaner) and faulty fuel injection equipment (that is fuel pump and the timing of fuel injection). This in itself suggests that setting high standard of maintenance and servicing of vehicles in Fiji can effectively reduce the levels of black smoke emissions in Fiji. In essence, vehicle owners, mechanical workshops and garage owners and of course the mechanics must recognise the importance of the maintenance factor (i.e., in terms of ensuring correct injection timing, ensuring well-maintained engine and injection pump). Currently there is no explicit requirement under the LTA legislation to coerce the motor industry to adopt preventative maintenance.

9.6 Vehicle Emission Regulations

Vehicle emission control efforts started recently in Fiji with the enactment of the Land Transport Act of 1998 and subsequent promulgation of relevant subsidiary regulations in 2000. At present, the only national regulation dealing with motor vehicle emission control can be found under Regulation 47 of the Land Transport (Traffic) Regulation, 2000. Regulation 47 states: "*A driver of a motor vehicle on a public street must not cause or permit visible smoke to be projected from the exhaust-pipe or from any other part of the machinery of the motor vehicle for a period in excess of 10 seconds*". The said Regulation addresses the visible smoke only, which largely involve the emission of respirable particulate mass (which forms black smoke) especially from diesel-fuelled vehicles. The maximum penalty stipulated under the emission of visible smoke offence is \$500 fine or 3-months imprisonment. Visible smoke of course does not address the issue of invisible toxic gases/pollutants such as carbon dioxide, nitrogen oxides, and unburnt hydrocarbons.

Other regulations associated with vehicle emission are Regulation 38, 77 and 106 of the Land Transport (Vehicle Registration and Construction) Regulations 2000, all of which are targeted towards vehicles exhaust system. Regulation 38 stipulates that modification of, among other things, emission control equipment is not permissible

without the prior approval of the LTA. Regulation 77 concerns the position of exhaust outlets for vehicles. Regulation 106 empowers the LTA and the Fiji Police Force to issue defect orders to a vehicle, after inspection, if the defects are such that it could affect the safety or emission control of the vehicle. Table 18 provides a summary of existing legislation concerning vehicle emissions.

Table 18 Current Vehicle Emission Regulation

Regulation	Aspect of Emission
Regulation 47 of Land Transport (Traffic) Regulation 2000	Visible smoke based on 10 seconds rules
Regulation 68 of Land Transport (Vehicle Registration and Construction) Regulation 2000	Notification of exhaust system
Regulation 77 of Land Transport (Vehicle Registration and Construction) Regulation 2000	Position of exhaust outlets
Regulation 106 of Land Transport (Vehicle Registration and Construction) Regulation 2000	Defect order on vehicle that is unfit for safe use or protection of the environment

Until recently, vehicle emissions in Fiji become a growing concern following the heavy influx of second-hand vehicle imports. The current joint campaign by LTA and DoEnv in enforcing vehicle emission requirement particularly relating to Regulation 47 on visible smoke has made significant impacts to Fiji's motorists in terms of public awareness of the need to embrace the environmental soundness of vehicles. It is worth noting that the 10-second rule under Regulation 47 is purely based on observation or visibility without requirement for the use of any government-certified timepiece device or stop watches to enforce the prescribed 10-second provision. It would appear that there is a case for the use of a test equipment or timepiece certified by the Ministry of Commerce's Weights and Measurement Division to provide a more reliable and decisive platform. However, the current scenario has to be appropriately addressed by way of incorporating the necessary legal provision for such physical test equipment for the 10-second rule.

As regards Regulation 106, LTA's decision to use the Electronic Smoke Detection Machine (ESDM) was quashed by the Fiji Court of Appeal, on 29th July 2005, citing that the ESDM lacks the necessary legal foundation for it's under the relevant regulations for it to be used as an enforcement device for vehicle emission control. Another recent development in smoke emissions in Fiji is through the private sector involvement in the form of chemical products that could cut down pollution from smoke emissions from vehicles and thus save on fuel costs and improving vehicle engine performance. Chemplex Automotive Group, an Australian-based company has been recognised and approved by LTA to issue 'certificate of cleanliness' to vehicles that are checked by Chemplex. A chemical is added to the fuel pump of vehicle to reduce heavy smoke emission and thus improving the flow of diesel in the system. The chemicals are used in Australia and the United States of America. The cost of the engine cleaning service is \$175.

9.7 Environmental Impact of Roads

Planning of national road projects of national and regional economic significance that are co-funded by national budget and foreign loan (ADB or World Bank) usually undergo an environmental impact assessment (EIA) before actual construction and upgrading works are carried out. It is unclear whether such an EIA include local emission mitigation strategies (LEMS) to ensure that each road project responds to local social, economic and environmental concerns. This process should provide extensive public review and comment on the characteristics and of the project and

more importantly on the negative externality relating to improved roads such as road congestion and vehicle emissions resulting from increased fuel consumption.

As far as road infrastructure is concerned, there has traditionally been a practice of 'predict and provide' policy of the 1980s, where the road building programme was tailored to cater for forecasted demand. As a result, not much emphasis was paid to environmental concerns until in the late 1990s.

Public pressure to add or widen road capacity simply made travel easier, thus stimulating more demand, rather than curing congestion or 'black-hole theory'; hence more attention should be paid to

- environmental consideration to any development proposal for construction of new roads, upgrading of existing road network; and
- promotion of public transport and non-motorised alternatives.

9.8 National Recognition of Greenhouse Gases

Although Fiji's contribution to GHG emission is insignificant in global terms, there is however, formal recognition and appreciation of the significance of the greenhouse warming as evidenced in Fiji being a signatory to many international protocols relating to global warming. Of particular importance is the United Nations Conference on Environment and Development convened in June 1992 Rio de Janeiro (Brazil) which produced the UN Framework for the Convention on Climate Change. The Rio Climate Change Convention which Fiji is also a signatory to is essentially on commitments to achieving the objective of the Convention i.e., *to achieve... stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system,.....(United Nations 1992)*. The most vital provisions under the commitments include the preparation of national inventories of GHG sources and national programmes to address them. In line with the above, Fiji has already put in place a national inventory of GHG sources.

In supporting the Rio Convention, in particular to the UN Framework for the Convention on Climate Change, Fiji has declared under the SDP 2003-2005 to '*minimise degradation of natural resources and protect biodiversity*' as one of its policy objectives for the environment. Among the prescribed key performance indicators for the above policy objective is the development of a National Implementation Strategy and First National Communication to the Framework Convention on Climate Change the draft of which is still under consultation and is likely to be endorsed by Government in 2005.

9.9 2004 Vehicle Emission Study

In July 2004, a New Zealand-based consulting firm, Fuel Technology Limited, was engaged by the Asian Development Bank (ADB) to assess vehicle emissions in Fiji and accordingly develop an action plan for the reduction of vehicle emissions in the country. The study was a subsidiary of the ADB Technical Assistance (TA) Project *TA No. 2850 FIJI: Road Safety Reform and Safety Improvement* and accordingly commissioned by government through a memorandum of understanding (MOU) between the MTCA and Department of Environment. The study centred on the current practices in two focus areas: i) vehicle management (from its importation, maintenance and enforcement of vehicle regulatory standards including safety inspection and emissions control); and ii) fuel management (from its importation, and other related qualitative aspects on fuel specification etc).

The study found, perhaps the highlight, many deficiencies in current practices relating to vehicle and fuel management in Fiji, which is largely attributed to a general lack of awareness of vehicle emissions-related issues not only in the public sector but also in the motor industry. Specifically there is lack of quality information available in Fiji on the 'what' and 'why' aspects of vehicle emissions and the measures that can be done to mitigate emissions. The resulting Action Plan provides the implementation detail for the various strategic measures for reducing vehicle emissions in Fiji. A number of issues relating to vehicle emissions have also been identified in the study report, among which, perhaps the highlight is the major deficiencies in awareness on pertinent issues on the causes of emissions, both in the public sector and virtually throughout the motor industry.

Of particular interest, in the context of the general desire to abate the emission of GHG, are the observations and findings made in the report stating that emission of invisible gaseous emissions (CO, NO_x, VOC, HC and CO₂) mainly associated with petrol-fuelled vehicles does not seem to be a significant issue for Fiji. The reasons are reproduced as follows:

- the number and density of the petrol vehicle population in Fiji is relatively low;
- roads in Fiji are also relatively sparse; in combination with frequent sea breezes and obliging topography, little build up of these gaseous emissions are expected; and
- emissions from petrol-fuelled vehicles are also expected to improve over time as business-as-usual fleet turnover introduces more advanced engine technology that better maintains its engine calibration and emissions performance.

The study also found NO_x emission levels (from both petrol and diesel vehicles), are expected to be relatively low due to the vehicle population. The current trend in business-as-usual fleet turnover towards more advanced engine technology is also expected to improve or reduce emission level in the future. Typically the synergetic and cumulative effects of large-scale diffusion of NO_x combined with other air pollutants (CO, VOC, HC and CO₂), which result in the formation of smog is not serious concern for Fiji mainly because of the reasons mentioned above.

Recommendations emanating from the study, which form the basis for the resulting Action Plan included emissions reduction interventions on four key focus areas (refer to Appendix 3) of activity as follows:

- Public and Industry Information and Awareness of Vehicle Awareness;
- Encouragement for Change through availability of specific voluntary measures and targeted incentives;
- Introduction of minimum standards; and
- Consideration of vehicle emissions at institutional level.

At the time of compiling this report, there has been no further progress on the implementation of Fiji's Vehicle Emissions Action Plan due to lack of funds. Apparently, it is imperative upon Government to secure the necessary funding perhaps from donors like the GEF considering the importance of vehicle emission issue in the context of energy conservation in the land transport sector.

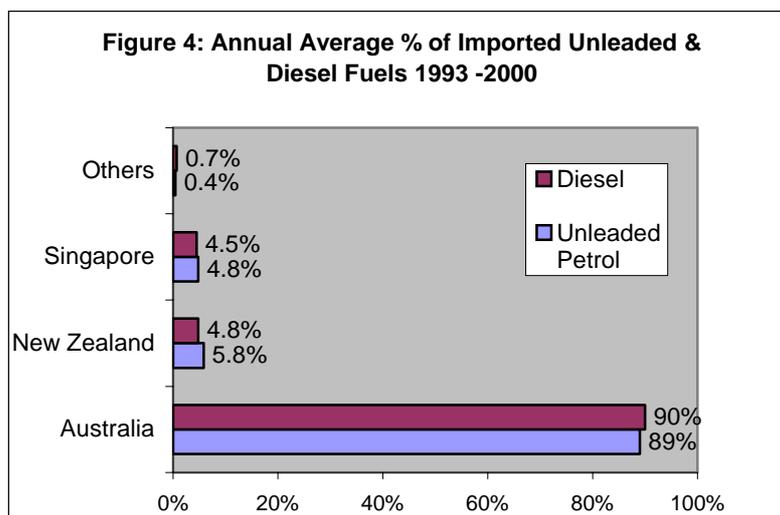
10.0 LAND TRANSPORT AND ENERGY

The administration and management of Fiji's energy sector comes under the purview of responsibility of the Department of Energy within the Ministry of Works and Energy (MWE). Similar to the transport sector, the energy sector provides the catalyst the economy needs for economic development. Without energy it would be impossible to provide the transportation and communication links that the country needs for economic development. The following section presents a review of the energy situation in Fiji with particular emphasis to the energy use (diesel and gasoline fuels) in the land transport sector.

10.1 Energy Source

Fiji's land transport sector is entirely dependent on imported petroleum fuels⁸ as its main energy source. The country's petroleum fuels are imported from other countries namely Australia, New Zealand, Singapore and others with Australia being Fiji's major import source for over a decade. Fiji also serves as a hub in the fuel supply/distribution network in the South Pacific region by re-exporting imported fuels from the above countries to other neighbouring island countries⁹ within the region. Fiji retained around 60-70% of total imported fuels for local consumption with the rest being re-exported. The main petroleum product operator in Fiji is the Pacific Navigator, a dedicated petroleum product carrier, owned and operated by Dorman Tankers (Dilman Navigation) of Australia under charter to the oil companies.

The most common petroleum products that are re-exported to these countries are ADO, aviation fuel spirit and motor spirits. Figure 4 shows the annual average percentage of gasoline/unleaded and diesel (ADO) imports sourced from overseas for the period between 1993 and 2000. Apparently, Fiji imports more than two-thirds of its unleaded petrol and diesel petroleum products from Australia alone.



⁸ Refined petroleum products that are used predominantly as main fuel source for the land transport sector are motor spirit (unleaded petrol), and ADO (diesoline).

⁹ Mainly to Cook Islands, Kiribati, Vanuatu, Tonga, Samoa, and many others.

On average, Fiji imports about 98 million litres of unleaded petrol a year for the period 1995 to 2000 with an average cost of around F\$35 million up to 2004 (Table 19). As for diesel, Fiji receives an average of around 175 million litres per year costing around F\$50 million.

10.2 Fuel Supply

Three fuel companies (British Petroleum (BP), Mobil and Shell) supplying Fiji's diesel and unleaded petrol and are also responsible for their respective local distribution network, including their own brand stations with various local agents operating as refuelling service stations mainly in the two main islands of Viti Levu and Vanua Levu. Table 19 shows the total quantity and corresponding value of total imports of motor spirits (petrol) and diesel supplied to Fiji for the period 1995-2004. It should be noted that the total value of petroleum fuel imports per year does not reflect the duty since value is calculated as the sum of insurance and freight cost.

Table 19: Annual Supply and Value of Land Transport Fuels 1995-2004

Quantity Supplied (million)

Fuel	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Unleaded	92.2	n.a.	94.0	108.6	96.2	132.6	69.1	n.a.	n.a.	n.a.
Diesel	186.7	n.a.	220.0	183.6	206.0	171.7	91.0	n.a.	n.a.	n.a.

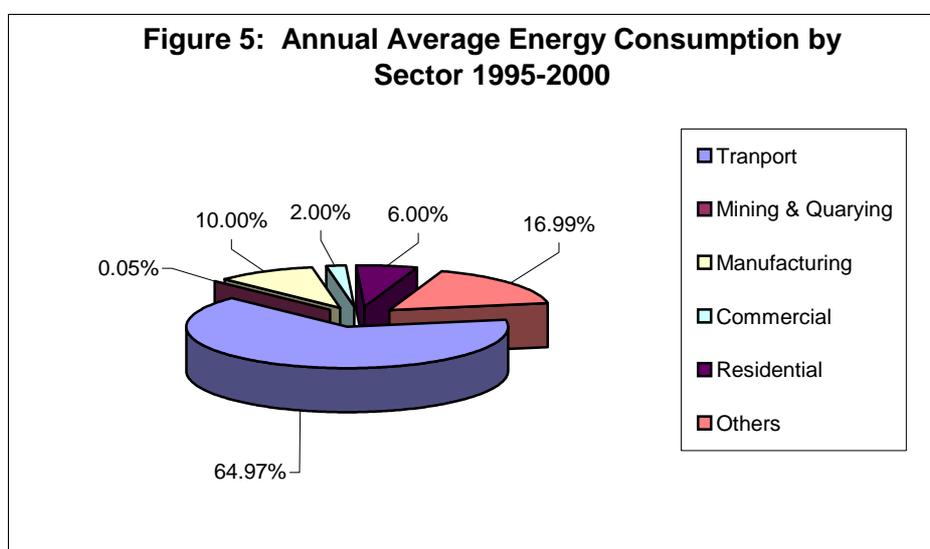
Value (\$ Million)

Fuel	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Unleaded	21.0	22.1	28.2	24.3	35.6	37.8	50.0	45.3	46.3	43.0
Diesel	41.2	60.4	48.2	40.7	40.8	73.1	58.6	61.8	46.8	46.0

Source: SDP Review, FIBS and Energy Statistics Year Book 1993-2000

10.3 Fuel Consumption

Road transport is the dominant mode in terms of energy consumption in the transport sector. According to the Energy Statistic Year Book 1993-2000, the transport sector is the most significant user of energy (Figure 5), accounting for an average of 65% of total energy supply for the period 1995 to 2000 with land transport being the major consuming sub-sector. On annual average, land transport sector alone accounts for more than 90% of total diesel and petrol consumption within the transport sector for the same period (Table 20).



The energy requirements for Fiji's land transport sector is totally dependent on imported ADO (or diesel) and motor spirits (or unleaded petrol) fuels, which can be best presented in terms of their consumption level or trends as against total annual imports. Table 20 provides annual total import distribution of diesel and unleaded petrol fuels for the period 1995-2000 and also showing re-exports and retained imports for domestic consumption in the land transport sector.

Table 20 Total Energy Supply 1995-2000
Re-Exports and Retained Imports (million litres)

Year	1995	1996	1997	1998	1999	2000
Total Fuel	278.9	314	292.2	302.2	304.3	160.1
Re –Exports Import	92.9	118.2	115.4	81	62.2	68.5
Retained Imports (Net/Final Domestic)	186.1	196.1	176.9	221.2	242.1	92.2
Land Transport Sector Consumption	171.7	181.0	163.2	207.9	228.4	82.2

10.4 Fuel Import Duty

The Fiji Islands Revenue & Customs Authority (FIRCA), established in 1999 under the FIRCA Act 1998, is the legal authority responsible for administering and collecting import duty levied on all imported petroleum products including diesel and unleaded petrol. Fuel excise duties in Fiji are applied on per litre basis and vary according to fuel types. Table 21 shows the current level (November 2005) of import duty on diesel and unleaded petrol as well as the value added tax (VAT) component as prescribed under the Customs Tariff (Budget Amendment) Act 2004. Funds collected from fuel import duty are directly channelled to the central government consolidated revenue.

Table 21 Current Fuel Import Duty

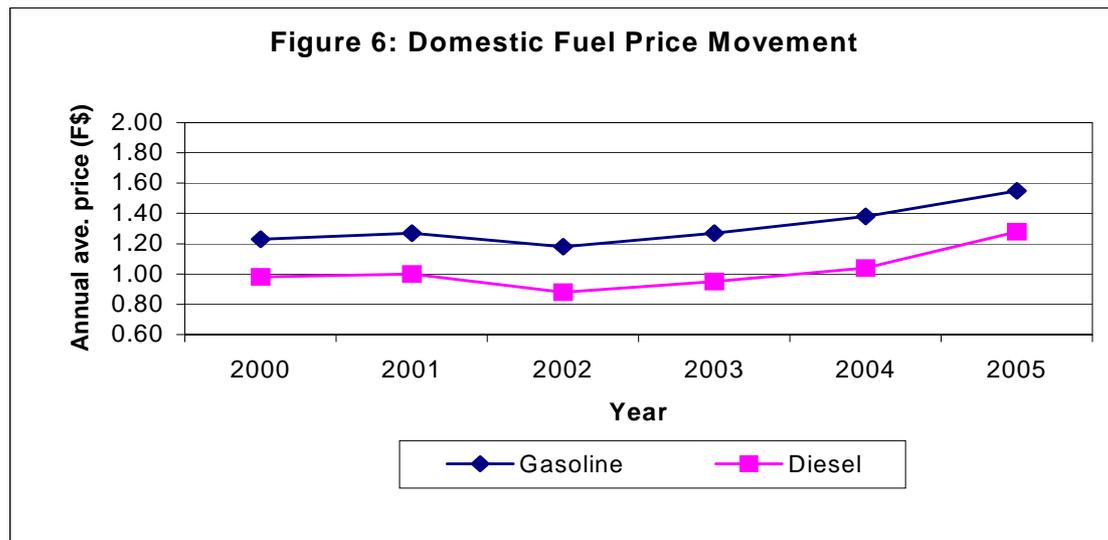
Fuel	Import Duty		Wholesale Price	Retail Pump Price
	Fiscal (per litre)	VAT (%)	Per litre	Per litre
Unleaded	44¢	12.5	\$140.75	\$1.63
Diesel	18¢	12.5	\$121.47	\$1.40

10.5 Fuel Pricing

The pricing control of diesel and unleaded petrol is vested with the Price Incomes Board (PIB), which comes under the ambit of responsibility of Ministry of Finance and National Planning (MFNP). The PIB¹⁰, under the Counter-Inflation Act, set the maximum wholesale and retail pump prices of diesel and petrol fuels. As part of its monitoring role of diesel and unleaded prices, PIB conducts a bi-monthly review of prices using a template that takes into account all inherent factors associated with refined products price movements both locally and internationally. Like in other countries, movements in domestic diesel and unleaded prices (Figure 6) are cyclical with movements in the international refined prices and are largely driven by the fluctuation in supply and demand situation in unrefined global crude oil price.

¹⁰ PIB is responsible for the price control of five refined petroleum products: motor spirit (unleaded petrol), ADO (diesel), white benzine, kerosene, and premixed outboard fuel.

In its review of fuel price, PIB usually takes into account key factors like the international refined prices of refined diesel and unleaded prices, the Fiji dollar/US dollar exchange rate movements, supplier's shipment costs, and the associated time lag, local distribution costs and related operating environment and the overall local economic conditions. As part of the formal fuel price review, PIB is also mandated to undertake annual assessment of fuel companies (Shell, Mobil, and British Petroleum) on-shore operating costs and returns. The oil companies in turn are required, as part of the PIB annual review process, to provide PIB with their respective audited accounts with details on cost and revenue allocations between the five refined fuel products that are under price control of PIB.



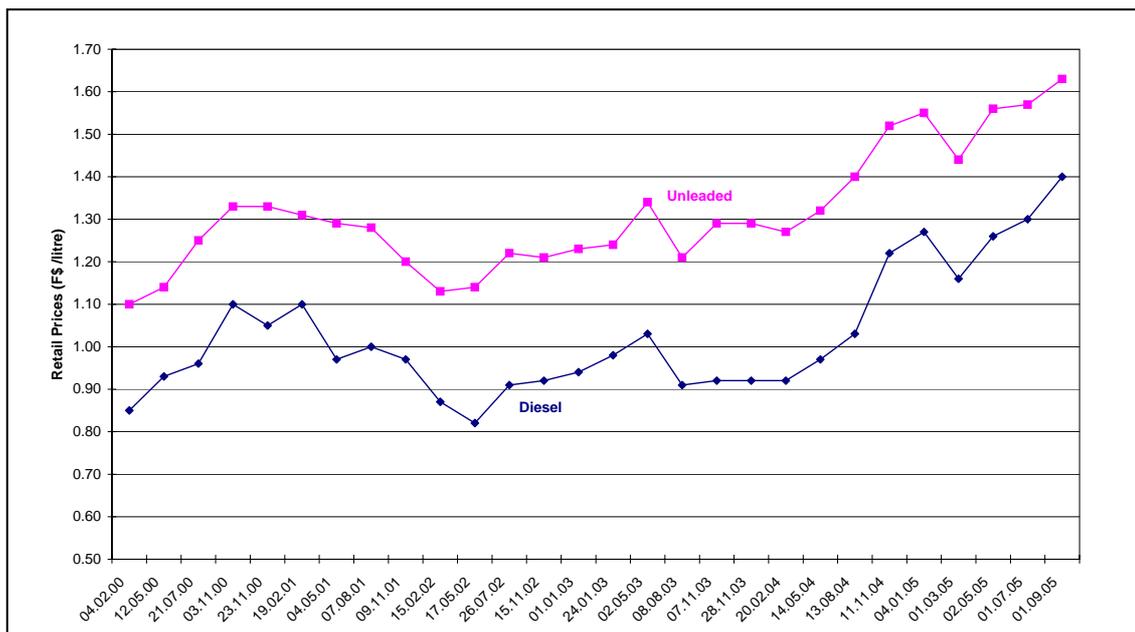
Fuel prices are of great concern to Fiji, having increased four times within a period of eight months in the current year 2005. At the time of compiling this report, retail pump prices for unleaded petrol have just increased from \$1.57 to \$1.63 per litre and diesel from \$1.30 to \$1.40 per litre. As shown in Figure 6, there is a sustained upward trend in retail price of both diesel and gasoline from 2003.

Although the current fuel price level might be considered relatively high to Fiji's economic standards, but it is not high enough to reduce fuel consumption in road transport sector. Table 22 and Figure 7 shows the fluctuations in prices of unleaded and diesel for the period 2000 to 2005.

Table 22 Fuel price change for the period 2000 to 2005

Year	Date	Unleaded		Diesel	
		W/Sale	Retail	W/Sale	Retail
2000	04.02.00	95.87	1.10	73.71	0.85
	12.05.00	99.57	1.14	81.07	0.93
	21.07.00	108.93	1.25	83.77	0.96
	03.11.00	116.43	1.33	96.68	1.10
	23.11.00	116.43	1.33	91.68	1.05
2001	19.02.01	114.43	1.31	96.50	1.10
	04.05.01	112.33	1.29	84.39	0.97
	07.08.01	111.86	1.28	87.49	1.00
	09.11.01	104.68	1.20	84.12	0.97
2002	15.02.02	98.75	1.13	75.15	0.87
	17.05.02	99.51	1.14	70.72	0.82
	26.07.02	106.49	1.22	78.74	0.91
	15.11.02	105.16	1.21	79.71	0.92
2003	01.01.03	105.13	1.23	79.71	0.94
	24.01.03	106.09	1.24	83.39	0.98
	02.05.03	115.29	1.34	88.31	1.03
	08.08.03	103.59	1.21	77.71	0.91
	07.11.03	110.30	1.29	78.43	0.92
	28.11.03	110.30	1.29	78.43	0.92
2004	20.02.04	108.47	1.27	78.38	0.92
	14.05.04	113.48	1.32	82.73	0.97
	13.08.04	119.96	1.40	87.88	1.03
	11.11.04	130.65	1.52	105.30	1.22
2005	04.01.05	133.26	1.55	109.31	1.27
	01.03.05	123.68	1.44	100.06	1.16
	02.05.05	134.69	1.56	108.30	1.26
	01.07.05	135.49	1.57	112.68	1.30
	01.09.05	140.75	1.63	121.47	1.40

Figure 7: Retail Prices for Unleaded and Diesel for the Period 2000 – 2005



10.6 Fuel Quality: Fuel Standards and Regulations

The Fair Trade Department within the Ministry responsible for Commerce through its *Trade Standards and Quality Control Decree 1992* assumes responsibility for setting the national standards and quality control of all imported goods including petroleum fuels. At present, there is no fuel-specific national regulation to control fuel standards and related specification and usage in Fiji. With the non-existence of a national legislative framework, Fiji is currently adopting the Australian fuel standards through a memorandum of understanding between the two countries. Fiji is required, under the said MOU, to meet Australian regulation-based standards AS 1876:1990 and AS 3570:1998 for unleaded petrol and diesel respectively.

Based on the Australian standards, the Government-specified minimum specifications for sulphur content in diesel is up to 5000ppm. However, there is no testing laboratory facility to verify fuel specification in Fiji. It is understood that fuel companies operating in Fiji are prepared to import lower sulphur diesel content but this would obviously have an implication to the end user in terms of extra cost. Further, the three fuel suppliers adopt their own quality assurance measures since there are no Government-approved industry codes for the fuel handling in Fiji. Again this points to the need for Government to strengthen its oversight role in the fuel industry.

There has been formal discussion on the need for Fiji to develop its own national fuel quality standards but to date no substantive action has been taken. Given the complexity of the issues involved in setting fuel quality standards and related specification requirement for the petroleum industry, it appears that Fiji need to be provided with technical assistance to kick-start the preparatory and/or establishment of an appropriate legal framework for a national fuel standard. The case for provision of technical assistance is warranted mainly because there is already formal recognition within Government of the need for such fuel quality standards. On the same token, it is important that the need for national fuel quality standards should be taken on board as part of the underlying need to achieve the overall goal of improving energy efficiency measures in the land transport sector.

Consistent with the above, it might be worth noting that the report of a recent 2004 study on Fiji vehicle emission contains some well-thought piecemeal recommendations on certain fuel measures that are geared towards reducing emissions. The following emission reduction initiatives are reflective of the current fuel landscape in Fiji:

- Tax Regime to Promote Earlier Take-Up of Lower Sulphur Diesel Fuels;
- Industry Codes for Fuel Handling;
- Immediate Introduction of Minimum Fuel Standards at the Point of sale;
- More Stringent Fuel Specifications

At the time of compiling this report, the MTCA had been attempting unsuccessfully to secure funding from within Government to implement the Vehicle Emission Action Plan arising out of this recent project.

In addition, the Weight and Measures Division of the Commerce Ministry also play a role in the fuel sector by carrying out the mandatory requirement for calibration and verification of quantity (volume) of diesel and unleaded petrol that are imported into Fiji. The calibration activity is particularly important for the application of import excise duty on petroleum fuels.

10.7 Road-Use Fuel Tax

At present, the only form of taxation imposed by Government is the fiscal import duty (Table 21) which is levied evenly per litre of diesel/unleaded fuel according to volume regardless of usage, impact on the road and time of use with no price or tax pressure to limit use. There is no specific fuel tax in Fiji. The notion of imposing road fuel tax has already been discussed within Government circle as a simple method of enhancing its financial capacity to meet the maintenance requirements of the public road network. In other words, road fuel tax is part of the road-based user-pay principle designed to recover the cost of constructing, upgrading and maintaining public roads. It would seem that road-user fuel tax is not a feasible idea given the current unprecedented increase in fuel price level, which is already causing economic and social hardships to most public service vehicle operators.

10.8 Energy Policy-Legal Framework

Apart from the rather unknown Petroleum Act (Cap 102), the Department of Energy, as part of the Pacific Islands Energy Policy and Strategic Action Planning (PIEPSAP) project executed by SOPAC, had recently formulated a draft National Energy Policy (NEP). The draft NEP provides a guiding framework for the sustainable development and management of the energy sector. It essentially addresses the renewable energy, affordability and environmentally sustainable issues.

Of worth highlighting from the draft NEP is the component on the transport sector, which articulates the following measures Government would embark on as part of its overall goal to integrate energy and transport sector issues:

- coordinate and integrate transport, energy, land use, economic development, environment and other policies;
- review import duties and licensing fees for vehicles with a view to introduce incentives for energy-efficient vehicles;
- continue through LTA and with support from the DOE to monitor vehicle performance and smoke emissions;
- educate the public in transport efficiency matters such as vehicle choice, driving habits, vehicle operation and maintenance and use of alternative public transport.

10.9 Institutional Arrangement for Transport – Energy

The petroleum sector is somewhat loosely regulated by different agencies of Government. Current administration and management of the petroleum sector is divided among several agencies each dealing with different elements of fuels-pricing, quality standards, etc. The economic aspect (fuel price control of four refined products only) is looked after by the Ministry of Finance's Price and Incomes Board, while trade standards of fuel are the responsibility of Ministry of Commerce. In functional terms, there seem to be lack of national requirement to encourage import of high quality fuel.

Also, the DOE appears to have no control over the commercial or technical affairs of the refined petroleum products in Fiji, let alone the seemingly defunct Petroleum Act supposedly administered by the Ministry responsible for Works and Energy. There may be a case to merge or bundle all policy and regulatory responsibilities of Government for the petroleum sector under one umbrella for obvious reasons that it could strengthen the capability of Government in harnessing the potential for improved fuel economy (via energy efficiency improvement measures). Given the present situation however, it might be appropriate to strengthen the coordination activity between the concerned agencies within Government in its pursuit of promoting energy savings.

11.0 KEY CONTEMPORARY LAND TRANSPORT SECTOR ISSUES

Despite the appeal of having an efficient land transportation system, roads, vehicles and energy usage cause negative externalities or outcomes in the health and environmental areas. In social and economic terms, motor vehicle accidents cause social suffering and economic hardship, while pollutants, noise and of course greenhouse gases emitted by motor vehicles are a major cause of environmental degradation.

11.1 Contemporary Issues on Land Transport

Notwithstanding the obvious economic contribution of land transport activities, Fiji like other developing countries is not immune to common contemporary transport problems such as increased vehicle ownership and use, traffic congestion (especially in the greater Suva urban area), road accidents, and vehicular air pollution. These are the ill effects of increased vehicle ownership and use culture particularly in urban areas.

In a broad sense, transport-related environment problems typically concerns increased energy (diesel and petrol) use of vehicles, which causes emissions to the surroundings or local air pollution in the form of carbon dioxide, nitrogen oxides and particulate matter. As indicated earlier, transport-related environmental problems in Fiji are relatively minimal in terms of air pollution or grey smog commonly found in western metropolitan cities.

There are many other complex land transport issues in Fiji that need to be addressed in the overall context of sustainability not only in terms of economic and financial but more importantly on environmental sustainability. The main social, economic, and environmental issues that reinforce the nature of sustainable land transport system in Fiji are:

11.1.1 Impacts of Increasing Vehicle Number and Use

- There is a notable increasing trend in vehicle number and use and the consequent increase in road traffic volumes and thus road congestion in the high-density or populated areas of Fiji. New vehicle ownership in Fiji reached an unprecedented growth rate of 20-55% per year in recent years (2001-2003). This has largely been caused by economic growth and also influx of affordable second-hand vehicles; and substantial increases in vehicle numbers is among the main cause of traffic congestion in Fiji's urban areas and its adverse side effects on economic, social and environment, and the society as a whole cannot be overemphasised. In social terms, sprawling land-consuming road expansion and associated heavy traffic condition in Fiji's urban areas are obviously making trip to work and school time consuming and costly. In environmental terms, increased vehicle numbers means more traffic and perhaps combined with ill-maintained stock of vehicles, thus more emissions of health-threatening air pollutants (carbon monoxide, etc). In economic terms, traffic delays means business efficiency can be adversely affected.

11.1.2 *Impacts of ill-maintained Vehicles*

- There is a general poor maintenance practice of aging fleet as well as public service and goods vehicles, which is compounded by lack of national industry code for vehicle maintenance. Smokey vehicles are quite widespread in Fiji, which is largely caused by the lack of best maintenance practice.

11.1.3 *Lack of Policy Orientation to Support Public Transport*

- There has been inadequate attention on the need to promote public transport as a countermeasure to increased private motorisation. This is of considerable importance given the growing number of private vehicle ownership (25-68% growth rates in recent years), and hence there is growing reliance in private transport. In some rural-urban areas there has been a decline in public transport patronage especially buses resulting in uneconomical returns.

11.1.4 *Inadequate Vehicle Emission Regulation & Legislation*

- Current vehicle emission standards and regulations are inadequate, which may be due in part to lack of local institutional capacity to develop performance measurement target for emissions from diesel and gasoline powered vehicles.

11.1.5 *Fragmented institutions for Transport Fuel*

- There is no single agency in Fiji with comprehensive authority to deal with the large range of automotive or transport-fuels problems particularly over the economics and quality standards of fuels. Current fragmented responsibilities of Government agencies dealing with the transport fuels is perhaps a minor issue. However, it should be noted that in Fiji, many new alternative sources of transport fuel are on the horizon such as the biomass industry, coconut oil and also liquefied petroleum gas (LPG). This in itself may suggest the need for a stronger regulatory agency that can be charged to address the economic issues as well as the quality and standards of transport fuels in Fiji.

12.0 ENVIRONMENTALLY SUSTAINABLE LAND TRANSPORTATION IN FIJI

This section is an attempt to provide some commentary advice and ideas geared towards the need for the adoption of energy-integrated sustainable transport policies that are consistent with the goal and objectives of the transport component of the PIEP 2004 and the impending PESTRAN project.

12.1 Essence of Environmentally Sustainable Land Transportation System

Achieving a sustainable transport system is all about better, cleaner and safer use of energy, vehicle and road. In a nutshell, there is an inevitable need to integrate the environmental consideration in the operation, management, and development of Fiji's land transport sector. To this end, included within the stated goal of Fiji's transport sector is environmentally sustainable factor. The key to promoting an environmentally sustainable land transport sector is premised on the negative impacts of land-based transport services and related infrastructure on the environment. At local level, the emissions of vehicular-related local air pollution naturally gives rise to potential risk to human health and quality of life, thus imposing a significant threat and burden on people and to all sectors of the community at large.

On a global scale, the atmospheric concentration of GHG such as carbon dioxide is universally recognised to be the main cause of climate change and its natural consequences for global warming. Carbon dioxide is the major greenhouse gas emission in the land transport sector. The challenge for Fiji is to devise ways and measures that can contribute towards achieving the common goal to reduce GHG emissions within the land transport sector. The strategy or perhaps catchphrase is the promotion of environmentally sustainable land transport systems.

At the centre of the need to promote such strategy is the overarching goal of reducing GHG emissions. This can be realised in a variety of ways such as promoting energy efficiency measures, vehicle fleet management, and road use (mobility) management, all of which contribute one or another in minimising environmental impacts of land transport especially in the reductions of GHG.

12.2 Energy Efficiency Improvements

Apart from the adoption of alternative renewable energy sources /applications, energy efficiency of existing vehicles and related conservation measures are largely the most effective means to reduce GHG. In general terms, Fiji should embrace objectives and opportunities that could significantly improve land transport energy efficiency.

Energy efficiency, in the context of environmentally sustainable land transportation, is all about making better use, if not economise, of fuel. In other words, efficient use of energy or improving fuel economy in land transport could bring economic, social, and environmental benefits to the community in terms of reduced cost (benefits the user), health, and emission of air pollutants, thus reducing greenhouse gas emissions.

The potential to improve the energy efficiency of vehicles can be achieved from improved vehicle technologies (or energy efficient technologies) as well as vehicle design factors, which could yield substantial energy savings. Some efficiency features of improved vehicle technology retrofitters commonly known are turbochargers, electronic ignition, improved fuel injection system and many others, can improve energy efficiency of vehicles. There are other related technical measures that are oriented towards better vehicle energy efficiency. A point worth noting is that many new vehicle technologies depend on high quality fuels (to maximise its energy efficiency), and are incompatible with the current standard of fuels being imported to Fiji. New vehicle technologies also require special maintenance skills and perhaps training that may not readily available in Fiji.

Government should consider introducing tax incentives that can encourage vehicle importers to import vehicles that are fuel-efficient. The structure of import duties can therefore be used to encourage the import of vehicles that are conducive to energy efficiency.

Adopting improved vehicle technologies alone may have a limited impact in improving the fuel economy or energy efficiency of vehicles. Having better, smoother, and un-congested roads, let alone good driving habits, could increase the energy efficiency of vehicle by allowing higher sustained speeds especially for heavy goods trucks and buses. In essence, improved roads can contribute immensely to fuel economy of vehicles, but this may also increase road traffic as visibly evident along the Suva-Nausori corridor during peak hours. Despite the obvious side effect of improved road would create in terms of increased fuel consumption and vehicle emissions, this additional traffic indicates that there is economic development and growth in the country.

Further, operational improvements in terms of vehicle load factors could also have the potential to improve efficiency in energy use. Improved communication, route planning and scheduling, better rationalisation of road services, especially for large commercial fleets like haulage services and bus passenger services, are some simple management measures that can improve energy efficiency i.e., by ensuring full loads within the legal limit and reducing waste. In the main, heavy truck fleets for haulage services are generally older and less technologically sophisticated (example cane and logging trucks) and therefore are less energy efficient.

12.3 Vehicle Emissions Management

Consistent with the underlying need to conserve energy is the environmentally soundness and quality of vehicle used in terms of lower vehicle emissions. The emerging trend in engines should be compatible with the environmental objectives of the land transport sector. Changes in vehicle engine technology can achieve energy efficiency improvements and thus reducing emissions. Fiji may consider adopting policy measures that are targeted at promoting lower emission or environmentally-friendly vehicle engine technologies.

Limiting the growth in vehicle use is neither feasible nor desirable, considering the economic and social benefits of increased mobility. The challenge, then, is to effectively manage the growth of vehicles so as to maximise its economic benefits while minimising its adverse impacts on the environment and on society. Current and emerging changes in emission control technologies in vehicles have been proven in other developed countries to achieve very large reductions in vehicle emissions. The

most effective way in incorporating such changes, as adopted in various countries, has been through the establishment of sound vehicle emission standards and regulations. This can include, for instance, setting performance target for unleaded and diesel powered vehicles and also introducing stricter and differentiated emissions standards for the different composition of fleets (light-duty, heavy-duty goods or diesel vehicles, public service vehicles).

From a theoretical standpoint, a vehicle emission tax would be an ideal economic incentive for controlling emission, however this may pose implementation problems considering that there is no guarantee that vehicle owners would maintain their car properly when in-use phase of vehicle. But in principle, a properly implemented emission tax could to a certain degree encourage vehicle importers as well as local buyers to purchase cleaner vehicles.

12.4 Road Use Management

As part of the overall goal to promote environmentally sustainable land transport, there is a need to improve mobility management through technical and economic measures. It should be noted that traffic congestion could impede the full potential for improved energy efficiency of vehicles. In other terms, improving energy efficiency cannot be fully realised without corresponding improvements in road carrying capacity. One of the key areas to addressing road capacity problems or traffic congestion is through improved mobility management. A common tool used is the traffic management system (TMS) for reducing traffic congestion. Other related technology-based devices such as information telecommunication (ITC), should complement traffic management.

Consistent with the need to reduce traffic congestion and vehicle emissions is the use of advanced technology to improve the efficiency of traffic flow in Fiji's urban centres. There are several approaches that Fiji can adopt to improve mobility through traffic system management (TSM) and traffic flow to relieve congestion, thus reducing vehicle emission. First, reducing car use can be realised by promoting public transport utilisation and discouraging drive-alone, thus reducing automobile dependence. There are also alternative modes to vehicle or non-vehicle mode (such as bicycling with dedicated bike lanes and paths).

The promotion of non-automotive transport such as bicycles as an alternative to private car or public transport can serve as a signal to the road users and the community in large to be cautious of the environment of motor vehicles around them. Other transport demand management (TDM) and control measures to achieve vehicle reduction use can involve encouraging the business community to implement telecommuting programmes, flexible work schedules, and teleconferencing programmes. The use of 'high' parking pricing strategies in central business district and/or high employment centres like in Suva capital can also be introduced by municipal councils to reduce vehicle use.

Second, by improving the management and operation of road capacity network (highway /streets /arterial roads) through improved traffic system management or supply side management. For example, the DNR can introduce dedicated lanes for high vehicle occupancy (HOV) like buses to increase bus service to high-demand routes or priority corridors especially along Suva-Nausori corridor. Other capital improvement project measures that concern road-based transportation system management (TSM) may include: i) capitalising on and/or widening of existing road infrastructure.

Third, as discussed earlier through information technologies to improve traffic flow (or transportation demand management) such as traffic demand management (TDM), intelligent transport system (ITS), and information and communication techniques (ICT). Other policy instruments/interventions of land use and a range of mechanisms can be used to enforce land-use planning in any land-transport related capital developments. In essence, planning of the transportation system should be drawn up by DNR in concert with land-use planning carried by the Town & Country Planning. In pursuing the mobility, efficiency, and accessibility considerations of transportation, it is important to take into account the land use factor.

12.5 Vehicle Maintenance

In-use vehicle maintenance programme can also provide a cost-effective means of improving fuel economy of vehicles and reducing vehicle emissions. Proper and periodic maintenance of in-use vehicles can also provide a cost-effective means of improving fuel economy and reducing vehicle emissions. Vehicle maintenance is an essential complement to energy efficiency improvement of vehicles.

Although not strictly enforced under current LTA legislation, an effective and industry-driven maintenance awareness programme can significantly improve fuel economy in Fiji's land transport sector. It is vital for Fiji to have a national standard for vehicle maintenance to ensure that the newer fleet or energy efficient vehicles with better emission control technologies are not lost through poor maintenance. Example of best practice for vehicle maintenance commonly practised in other developed countries are measurement or quantification of emissions concentrations like hydrocarbon, nitrogen oxides, sulphur, and carbon monoxide to name a few in the exhaust system of gasoline and diesel vehicles. At the moment, the current on-road vehicle smoke emission checks does not in any way address the source of the problem, which is poor maintenance.

In order to ensure an acceptable, if not high, level of maintenance (considering the increased number of second-hand vehicle imports), Government should seriously consider incorporating a legal basis for periodic maintenance programme (similar to the annual vehicle inspection) particularly for public service vehicles and commercial heavy goods vehicles for haulage transport.

12.6 Improve public transport use

As an essential complement to transport demand management, public transport use must be encouraged i.e., to be made faster, safer, more comfortable, and more convenient. Fiji's public transport system is relatively well equipped in terms of innovative ways for maximising and enhancing public service operations such as the increasing use and popularity of minibus service and bus express service between towns around Viti Levu. At the same time economic regulation of public transport should move toward raising standards and quality aspects rather than the strict control on quantity. These measures will improve the efficiency and competitiveness of public transport.

Building roads is not the only solution to the problems of congestion and pollution caused by an ever-increasing volume of traffic. One of the alternative policies often suggested is to attract people away from their cars by improving public transport provision. Policies that have been advocated to encourage modal switch from private to public transport include investment in bus services, park and ride schemes, guided bus ways and others.

12.7 Private Sector Involvement

The private sector also recognises the importance of environmental dimension of land transport sector. This is typically manifested through the promotion of certain commercial products designed to improve engine performance and reduce vehicle emissions. For instance, Clean Air Fiji Limited, a private company had recently launched the choronco product aimed at saving fuel consumption of vehicles. Another recent start-up is Chemplex Fiji, an Australian-based company, specialised in chemicals (dynotab) for cleaning engines to reduce fuel consumption, improve engine performance, and reduce vehicle emissions.

12.8 National Regulation, Policy and Related Initiatives Towards Environmental Sustainability

Fiji is at the forefront among other Pacific Island Countries in embracing a conducive policy environment that recognises the environmental significance of transportation and its energy use. To this end, Fiji has developed strategies and related interventions through promulgation of its national policy and legal instruments including programmes to address one way or another various interdependent aspects of the need to promote environmentally sustainable transportation systems. In general, these includes:

1. Strategic Development Plan: 2003-2005, November 2002 and its subsequent Review of the same in November 2004
2. Fiji National Transport Sector Plan 1993 and its subsequent Review and Policy Update 2004
3. Transport Energy Conservation Study 1984
4. Fiji's National State of Environment Report and the subsequent formulation of the Fiji National Environment Strategy 1993
5. A Country Study Programme on Climate Change and an Assessment of Fiji Vulnerability to Climate Changes; and the subsequent production of Fiji's Greenhouse Gas Inventory.
6. The Establishment of a Climate Change Unit with the Department of Environment.
7. The National Communication to the United Nations Framework Convention on Climate Change 2004.
8. Environment Management Act 2005.
9. Land Transport Act 1998 and its subsidiary Land Transport (Traffic) Regulations 2000.
10. Draft National Energy Policy 2004.
11. Vehicle Emission Study and the Fiji vehicle Emission Action Plan 2004.
12. Policy Strategic Framework for developing Fiji's Biofuel Industry, 2005.

13.0 SUMMARY AND RECOMMENDATION

The purpose of this report is to compile/collate information about the current state of Fiji's land transport sector Fiji by focussing on three key components of the sector namely vehicle, road infrastructure and road transport services. In addition, the report also focuses on the environmental aspect with particular emphasis on the sector's energy consumption.

The report, following discussions with stakeholders, also re-visits few study reports covering issues and concerns that is subject of attention of the current report. In that regard, it is not the intention of this report to duplicate matters, but rather support and compliment current undertakings of Government in key areas of energy conservation and vehicle emissions as complimentary factors towards environmentally sustainable land transport sector.

13.1 Findings

There are many and diverse measures available that Fiji needed to undertake to address the problems highlighted in the foregoing. The last two decades have seen significant changes in Fiji's land transport scene largely in response to Government's commitment towards public sector reform including microeconomic reforms of service delivery functions of land transport regulation and associated public transport market industry. However, there seems to be lack of emphasis on issues relating to the need to improve energy efficiency, vehicle emission control standards, and road-use issues such as urban traffic congestion, public transportation and many others.

The essence of the contemporary issues and/or perhaps challenges confronting Fiji's land transport sector is that as the economy grows there is an inevitable tendency for more demand for travel, and so obviously the number and use of vehicles (motorisation) are on the rise, which in turn stimulate public demand for more road space or capacity (roads) and also increased energy use (fuel consumption) from increased road activity. Given the diverse nature of the issues involved, establishing the appropriate policy environment would be critical for Fiji.

This would require leadership on the part of Government in charting the way forward in strategic areas like getting the economic environment of vehicle and fuel right (mainly on improving pricing and supply mechanisms); to getting the institutions in order (in terms of better coordination within Government on exchange of information and ideas, and to getting measures or priorities for action (including health and life threatening environmental impacts).

13.2 The Proposed Way Forward

As already indicated, ideally developing an environmentally sustainable land transport system is all about better, cleaner and safer use of energy (fuel), vehicles and roads. As such, the policy challenge would be for Fiji to put in place a management strategy that will require policy, technical, economic/fiscal and institutional measures to reduce their environmental impacts. It is the external costs of land transport that would warrant an energy-integrated transport- environmental strategy, the main components of which should reflect the key strategic areas mentioned above.

The following package of measures can be employed as part of a transport-energy integrated strategy that can bring about the desired environmentally sustainable transport system:

1. Regulations and standards requiring cleaner and high quality fuels;
2. Regulations and standards requiring the import of environmental sound vehicles with low emission build standards;
3. Introducing high standards for vehicle maintenance;
4. Encouraging public transport usage; and
5. Technical measures for road-use or mobility management through transport demand management (TDM), transport system management (TSM) and use of intelligent transport systems (ITS), and information and communication techniques (ICT) and public transport improvement.

Despite the continuing increases in national vehicle fleet and the corresponding increases in demand for fuel (energy usage), the ongoing challenge are for policy makers and regulators to reduce their impacts on the environment. Needless to say, the importance of putting in place a sound policy framework and supporting institutional structure entailing the above technical, economic and technological measures is essentially the recipe to environmentally sustainable transport system. That is to say, Fiji has to develop the right policy and physical interventions that are feasible and compatible with local environmental conditions. However, this environmental goal cannot be achieved overnight given the competing, if not conflicting interests, involved especially from the commercial viewpoint of fuel and vehicle suppliers. First and foremost, Fiji needs to go through the initial developmental stage in raising public awareness and educational programmes, workshops and seminars as means of advancing the concept of promoting environmentally sustainable land transportation systems nationwide.

REFERENCED DOCUMENTS

The following list of documents was reviewed in compiling this Report.

- Strategic Development Plan: 2003-2005
- Mid-Term Review Strategic Development Plan, 2004
- Fiji National Transport Sector Plan (FNTSP), 1993
- Fiji National Transport Sector Plan (FNTSP) Review and Policy Update, 2003
- Fiji Transport Monitor, 2000
- Draft National Energy Policy
- Fiji Road Safety Reform and Safety Improvement: Vehicle Emission Action Plan 2004
- Greater Suva Transportation Study 2000
- Land Transport Authority, Annual Report 1999,2000,2001,2002,2003,2004
- Land Transport Act 1998 and its subsidiary Regulations of 2000
- Roads Act

CONSULTATIONS

The following were consulted during the consultation phase:

- Transport Planning Unit
- Department of Energy
- Department of Environment
- Weight and Measures Division (Ministry of Commerce)
- Price and Incomes Board (PIB)
- Shell Fiji Limited
- Fiji Bureau of Statistics
- South Pacific Applied Geoscience Commission (SOPAC)

APPENDIX 1

Current Import Duty on Used or Reconditioned Vehicles

VEHICLE PURPOSE /TYPE/ENGINE SIZE	IMPORT DUTY
Tractors	15%
Motor Vehicle of gross laden weight under 2 tonnes and the transport of 10 or more Persons but not exceeding 15 person.	
New Vehicle under 2000 cc	27%
Used/Re –Conditioned vehicle under 2000cc	27% or \$10,150pe
New Vehicles over 2000cc	27% unit whichever
Used /Reconditioned vehicle over 2000cc	27% or \$12,150 per unit
Motor Vehicle of a gross-laden weight under 2 tonnes and whichever is greater for the transport of 16 persons or more	
New Vehicle under 2000cc	27%
New Vehicle over 2000cc	27%
Used/Reconditioned Vehicles under 2000cc	27%or \$10,650 per unit or more
Used /Reconditioned Vehicles over 2000cc	27% or \$12,650 per unit whichever is greater
Motor vehicle of a gross un-laden weight over 2 tonnes and whichever is greater for the transport of 16 person or more but not exceeding 22 person.	
Non Vehicles or 2000 cc	27%
Used /reconditioned vehicle over 2000c	27% or \$25,500 pr unit whichever is greater
Motor Vehicle of a gross unladen weight over 2tonnes and for the transport of 23 person or more	
New Vehicle over 2000 cc	27%
Used/Reconditioned vehicles over 2000cc	27% or \$35,500 per unit whichever is greater

4 Motor Cars principals for the transport of person	
Main Cars under 1000cc	27%
Used/reconditioned cars under1000cc	27% or \$5,550 per whichever is greater
New Cars over 1000ccand under 1200cc	27%
Used /reconditioned cars over 1000cc and under 12000cc	27% or \$6900 per unit whichever is greater
New Cars over 1200cc and under 1500cc	27%
Used/reconditioned cars over 1200cc and under 1500cc	27% or \$7,800per unit whichever is the greater
New Cars over 1500cc and under 1800cc	27%
Used/reconditioned Cars over 1500cc and under 1800cc	27% or \$9,150 per whichever is the greater
New cars over 1800cc and under 2000cc	27%
Used /reconditioned cars over 1800cc and under 2000cc	27% or \$10,150 per unit whichever is greater
New cars over 2000 and under 2500cc	27%
Used /reconditioned cars over 2000 and under 2500cc	27% or\$12,150 per unit whichever is greater
New cars over 2500cc and under 3000 cc	27%
Used/reconditioned cars over 2500cc and under 3000 cc	27% or \$13,150 pr unit whichever is greater

New cars over 3000cc	27%
Used/reconditioned cars over 3000cc whichever is greater	27% or \$14,150 per unit

5 Dual Purpose Goods Vehicles over 3 tonnes and under 5 tonnes GVW

Used and reconditioned vehicle under 1000cc	27% or \$6,000 per unit
Used and reconditioned vehicle over 1000cc and under 1200cc	27% or \$7,350 per unit
Used and reconditioned vehicle over 1200cc and under 1500cc	27% or \$8,250 per unit
Used and reconditioned vehicle over 1500cc and under 1800cc	27% or \$9,600 per unit
Used and reconditioned vehicle over 1800cc and under 2000cc	27% or \$10,650 per unit
Used and reconditioned vehicle over 2000cc and under 2500cc	27% or \$12,650 per unit
Used and reconditioned vehicle over 2500cc and under 3000cc	27% or \$13,650 per unit
Used and reconditioned vehicle over 3000cc	27% or \$14,650 per unit
Other Goods vehicle under 3 tonnes G.V.W	
Used or reconditioned vehicle under 1000cc	27% or \$5,100 per unit
Used or reconditioned vehicle under 1000cc	27% or \$6,000 per unit
Other Goods vehicles over 3 tonnes and under 5 tonnes G.V.W	
Used or reconditioned vehicles.	27% or \$6,450 per unit
Vehicles over 5 tonnes as above below 20 tonnes G.V.W and classic fitted engine and cabs. Chosen/Dumpers/loading express 15%	

APPENDIX 2

Distribution of vehicles registered in Fiji

Period	Private Car	Taxis	Rental And Hire Cars	Goods* Vehicles	Buses	Tractors	Motors Cycles	All** Other Vehicles	Total
Yearly									
1965	6,206	1,073	23	3,388	497	1,416	423	615	13,641
1966	6,495	970	118	3,434	512	1,263	466	704	13,962
1967	6,746	1,040	225	3,361	476	1,506	534	875	14,763
1968	6,970	978	231	3,704	447	1,339	610	689	14,968
1969	7,932	952	291	3,445	544	1,462	736	639	16,001
1970	9,476	1,183	373	4,123	611	1,654	972	781	19,173
1971	11,184	1,428	451	4,915	661	1,921	1,136	1,001	22,697
1972	14,234	1,261	779	5,571	776	1,925	1,000	1,097	26,643
1973	14,545	957	588	6,091	736	2,034	999	923	26,873
1974	14,655	1,110	521	6,965	770	2,156	1,115	966	28,258
1975	14,815	1,129	552	7,840	804	2,278	1,231	1,008	29,657
1976	15,713	1,198	888	8,785	777	2,690	1,242	1,243	32,536
1977	17,008	1,264	1,057	10,212	841	2,942	1,522	1,491	36,337
1978	17,908	1,388	1,120	11,387	907	3,167	1,750	1,667	39,294
1979	19,086	1,493	1,293	12,782	988	3,388	2,091	1,905	43,026
1980	20,246	1,665	1,454	14,471	1,058	3,710	2,546	2,140	47,290
1981	22,066	1,842	1,674	16,332	1,123	3,965	3,069	2,350	52,421
1982	23,500	1,990	1,868	17,600	1,158	4,075	3,254	2,516	55,961
1983	25,152	2,060	2,092	18,995	1,216	4,180	3,467	2,620	59,782
1984	26,555	2,144	2,339	20,222	1,245	4,298	3,656	2,743	63,202
1985	27,699	2,195	2,559	21,539	1,260	4,366	3,826	2,843	66,287
1986	28,646	2,218	2,736	22,443	1,280	4,450	3,924	2,957	68,654
1987	29,262	2,236	2,882	23,029	1,289	4,499	3,984	3,025	70,206
1988	29,713	2,238	2,944	23,523	1,294	4,540	4,040	3,116	71,408
1989	31,924	2,285	3,280	24,548	1,302	4,685	4,090	3,226	75,340
1990	34,415	2,372	3,466	26,259	1,330	4,826	4,107	3,364	80,139
1991	35,955	2,441	3,616	27,858	1,367	5,045	4,124	3,475	83,881
1992	37,665	2,499	3,815	29,487	1,412	5,136	4,169	3,627	87,810
1993	38,711	2,598	4,000	30,228	1,483	5,217	4,240	3,649	90,126
1994	40,803	2,734	4,210	31,417	1,572	5,263	4,302	3,835	94,136
1995	42,572	2,807	4,336	32,273	1,654	5,299	4,334	3,927	97,202
1996	44,391	2,889	4,462	33,000	1,744	5,333	4,374	4,061	100,254
1997	45,829	2,934	4,607	33,743	1,797	5,360	4,395	4,172	102,837
1998	47,053	2,956	4,714	34,182	1,801	5,404	4,409	4,241	104,760
1999	50,005	3,091	4,911	35,038	1,854	5,477	4,488	4,412	109,276
2000	52,344	3,207	5,015	35,706	1,910	5,543	4,541	4,607	112,873
2001	57,702	3,340	5,095	36,365	1,936	5,572	4,587	4,757	119,354
2002	64,410	3,462	5,330	37,111	1,972	5,598	1,636	5,083	124,602
2003	66,028	3,729	5,511	38,025	2,019	5,619	4,670	5,277	130,878

Notes: *Light and heavy goods vehicles including vans, trucks, pick-ups, ambulances, and fire vehicles

** Includes trailers, cranes, loaders, forklifts, etc

Source: Land Transport Authority

APPENDIX 3

Summary of Fiji Vehicle Emission Action Plan

Public and Industry Information and Awareness

- Healthy Vehicle Program
- Window Cards

Fiscal/Economic Measures

- Tax Regime Recognising Lower Emission Vehicles Tax and Pricing Regime to Lower Cost of Service Consumables
- Tax Regime to Promote Earlier Take-Up of Lower Sulphur Diesel Fuels
- Lower Wheel Tax for Diesel Vehicles Successful in Passing a Smoke Check

Technical Measures (Minimum Standards)

- 10-Second Rule Exhaust Smoke Check
- Industry Codes for Fuel Handling
- Immediate Introduction of Minimum Fuel Standards at the Point of Sale
- More Stringent Fuel Inspections
- Minimum Vehicle Emissions Build Standards
- More Frequent COF/COR Inspections
- Angle Down on Final Section of Exhaust for Heavy Vehicles with Horizontal Exhaust Systems
- Maximum Vehicle Loads

Institutional Level

- Government Leadership

Mobility Management/Sundry

- Advocacy on Emissions Recommendations Measures during the Development of Demand Management, Traffic Management and Road Infrastructure Projects
- Vehicle Fleet-Related Monitoring Including Air Quality Monitoring