Japan International Cooperation Agency (JICA)
Department of Transportation and Communications (DOTC)

The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines

MMUTIS Update and Enhancement Project
(MUCEP)

Manual vol. 3

Urban Transportation Planning

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PREFACE

The acceleration of economic activities and population concentration in Metro Manila and other cities in the Philippines has caused severe social problems such as traffic congestion, traffic accidents, and deterioration of the living environment. The development of the public transportation network is crucial in tackling these problems. In addition, investment in infrastructure development is essential to realize a sustainable economic growth. Metro Manila, in particular, requires a transportation policy to facilitate a modal shift from private cars to public transportation by developing and integrating transportation networks and strengthening linkages between transportation modes.

It is within this context that the Government of Japan has provided technical assistance to the Philippines' Department of Transportation and Communications (DOTC) and other related agencies through the Japan International Cooperation Agency (JICA) in conducting a capacity development project entitled "The Project for Capacity Development on Transportation Planning and Database Management in the Republic of the Philippines." MUCEP, as the project is known (short for MMUTIS Update and Capacity Enhancement Project), has been carried out for more than four years, starting on 27 September 2011 and completing on 30 November 2015.

The overall project goal of MUCEP is to enable the DOTC to prepare a public transportation plan for Metro Manila for strategic corridors by strengthening their capacity in transportation database management and public transportation network planning.

This document, Manual on Urban Transportation Planning, is a compilation of manuals on Transport Planning, Public Transportation Planning, and Project Evaluation. The Transport Planning Manual serves as a guide on the preparation of a transport plan with the use of analytical tools. The Public Transportation Planning Manual explores the current public transportation system in the area of study and its planning process. Lastly, the Project Evaluation Manual focuses mainly on the financial and economic component of evaluation.

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Part 1

URBAN TRANSPORTATION PLANNING

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ABBREVIATIONS

ADB	Asian Development Bank
BLGF	Bureau of Local Government Finance
CDP	comprehensive development plan
CDS	city development strategy
CLUP	Comprehensive Land Use Plan
CME	coco-methyl ester
CNG	comprehensive natural gas
CO_2	carbon dioxide
DCUTCLUS	Davao City Urban Transport Cum Land Use Study
DILG	Department of Interior and Local Government
DIDP	Davao Integrated Development Program
DOE	Department of Energy
DOTC	Department of Transportation and communications
DPWH	Department of Public Works and Highways
EMB	Environmental Management Bureau
EST	environmentally sustainable transport
GHG	greenhouse gas
HIS	household interview survey
HLURB	Housing and Land Use Regulatory Board
HUC	higher urban concentration
IES	integrated environmental strategies
InfraCom	Infrastructure Committee
JICA	Japan International Cooperation Agency
JMC	joint memorandum circular
LDF	local development fund

LEDAC	Legislative Executive Development Advisory Committee
LRT	Light Rail Transit
LRTA	Light Rail Transit Authority
LTFRB	Land Transportation Franchising and Regulatory Board
LTO	Land Transportation Office
MCDP	Metro Cebu Development Project
MCLUTS	Metro Cebu Land Use and Transport Study
MCX	manila commuter express
MRT	Metro Rail Transit
MMARAS	Metro Manila Accident Reporting and Analysis System
MMDA	Metro Manila Development Authority
MMUTIS	Metro Manila Urban Transportation Integration Study
MRSU	Metropolitan Road Safety Unit
MTPIP	medium-term public investment plan
MUCEP	MMUTIS Update and Capacity Enhancement Project
MVIS	motor vehicle inspection system
MVUC	motor vehicle user's charge
NCR	National Capital Region
NEDA	National Economic Development Authority
NLTPF	National Land Transport Policy Framework
NMTs	non-motorized transport
NSO	National Statistics Office
NTP	National Transport Plan
NTPP	National Transport Policy and Planning
OD	origin-destination
OTC	Office of Transport Cooperative
OTS	Office of Transport Security
PCU	passenger car unit
PEGR	Partnership For Economic Governance Reforms
PNP	Philippine National Police
PNR	Philippine National Railway
PPP	public-private-partnership
PUB	public utility bus
PUJ	public utility jeepneys
RA	reform agenda
RPS	rationalized local planning system
SLRF	special local road fund
SRSF	special road safety fund
TARAS	traffic accident reporting and analysis system
TDM	travel demand management
TOC	Traffic Operation Center
TRB	Toll Regulatory Board
TSP	total suspended particulate
TTPI	Transport and Traffic Planners Incorporated
UP-NCTS	University of the Philippines - National Center for Transportation Studies
UTP	urban transport planning

1 INTRODUCTION

1.1 Background

Transportation planning takes on a multi-disciplinary approach giving consideration to socio-economic conditions, environmentalism, and policies on sustainability. Similar to other plans and projects, the following roles in transportation planning are recognized:

(i) Realization of favorable circumstance for urban activities
(ii) Organization of integrated transport development
(iii) Coordination among relevant agents and departments

Demographic patterns are constantly changing with mobility increasing. This is more evident in urban places with diverse social and economic features. As such, it is necessary to formulate a transportation plan in such a way that it can effectively support the urban development process in line with the vision proposed.

1.2 Objectives

The Transport Planning Manual aims to provide an easy-to-understand and logical guide on how a transport plan is prepared as a critical component in the process of urban development.

Generally, transport planning is complex with variable approaches depending on the type of transport plan. As such, it is suggested that approaches presented in this manual should be carefully reviewed for its applicability in terms of the goals of the plan and conditions for implementation (i.e., coverage, time frame, finance, etc.).

1.3 Structure of the Manual

This manual is composed of 4 parts, namely:

(i) Introduction: To introduce the structure of the manual
(ii) Overview on urban transportation planning:
- Discussion on transportation in the context of developing cities; and
- Generalization of the scope and process of transportation planning.

(iii) Urban transport development framework
- Review of past studies;
- Compilation of existing urban transport policy framework; and
- Issues and challenges in urban transport

(iv) Simplified urban transport analysis
- Set of analysis tools for rapid assessment of urban transport development needs; and
- Sketch planning methodology

(v) Main steps in preparing an urban transport plan:
- Explanation on the step-by-step process of Transportation Planning

1.4 How to Use This Manual

This manual provides the users with a logical guide and a step-by-step approach for undertaking transport planning analysis based on application of analytical tools to achieve the required planning results. Each step sets out the objective of the activity, tasks to comply with, and the resultant outputs

.

2 OVERVIEW OF TRANSPORT PLANNING

2.1 Context of Urban Transport in Developing Cities

The rapid urbanization in the East Asia and Pacific region requires addressing urban transport challenges to sustain economic and social advantage of the region's cities. Though current programs mainly address urban challenges in the capital cities, there is a growing need to address these issues in other large as well as medium size cities, especially, as most of these cities often do not have well-developed urban transport plans or transport services. This study is part of an Urban Development Program of middle income countries Indonesia, Philippines, and Thailand that are all dealing with new urban transport challenges caused by rapid urbanization.

The Philippines has one of the highest urbanization rates in the region. Based on UN data, 63% of the country's total population lives in urban areas in 2005. The rural population continues to decline as the current trend towards urbanization grows with nearly 70% of the population expected to live in urban areas by 2015. There are presently 33 highly urbanized cities in the Philippines and these cities are experiencing worsening urban transport problems.

Transportation problems vary from country to country depending on their social, economic, and political situation. The current and anticipated problems vary on the historical process of urbanization and its present stage of socio-economic development, the extent of motorization, and the level of transport technology. There is no such theory of transport planning that can be effectively applied to any transport problem, but there is an outline of comprehensive urban transport planning based on state-of-the-art practices. Its relevance to the problem of urban transport in developing countries should be studied based on the situation of a city in question.

Increasing transport demand in developing countries due to a drastic increase in the number of automobiles (motorization) like motorcycles in some cases, rapid urbanization and economic development, and delayed investment in transport facilities particularly for mass transport, are causing serious road congestion problems. Further, in many cases mixed traffic of various means of transportation ranging from non-motorized transport or NMTs (e.g., carts, walking, bicycles) to cars, inadequate traffic rules, and poor traffic management have made very inefficient use of the limited road space, sharing the precious road space with non-transport urban activities.

2.2 Urban Transport Challenges

1) Rapid Urbanization

The Philippines is one of the most rapidly growing and urbanizing countries in Asia. The rapid increase in population puts pressure on existing urban transport infrastructure and services especially in urban areas. In 1980, the total population of the country was 48.098 million. Twenty years later, in 2000, the total population of the Philippines became 76.504 million.

Table 2.1 presents the population growth rate of the Philippines and Metro Manila. Explosive population growth rate occurred during the period from 1960 to 1970 with a rate of 3.08%. During the same period, Metro Manila experienced unprecedented growth rate

at 4.89%. Although the population growth rate of Metro Manila has been decreasing, the national overall rate for the period of 2000 to 2007 is still very high at 2.04%.

Table 2.1: Population of the Philippines and Metro Manila

Census Year	Philippine Population (000)	Growth Rate (%)	Metro Manila Population (000)	Growth Rate (%)	Percent of National Population
1960	27,088	-	2,462	-	9.09%
1970	36,684	3.08	3,967	4.89	10.81%
1980	48,098	2.75	5,926	4.10	12.32%
1990	60,703	2.35	7,928	2.95	13.06%
2000	76,504	2.34	9,932	2.28	12.98%
2007	88,575	2.04	11,553	2.11	13.04%

Source: NSO

In 2007, the country posted an even higher population growth rate than Indonesia and Thailand albeit at a decreasing trend over the past decades. Table 2.2 presents the population growth rates of selected countries.

Table 2.2: Population Growth Rate (%) of Selected Countries

Country	1990	1995	2000	2005	2007
Indonesia	2.0	1.7	0.9	1.3	1.3
Thailand	1.13	1.17	0.70	0.88	0.79
Malaysia	2.5	2.8	2.5	2.2	2.0
Philippines	2.3	2.3	2.1	2.0	1.8

Source: ADB, Key Indicators for Asia and the Pacific
http://www.adb.org/Documents/Books/Key_Indicators/2008/Country.asp

The Philippines has one of the highest urbanization rates in the Region. The urbanization rate of the Philippines was around 60% in 2000. This is expected to reach around 77% in 2030 higher than that of Japan, Indonesia and Thailand. A rapid increase in the proportion of population living in urban areas will require high level of investments in urban transport infrastructure and services. Such investments will also have to compete with demands for other urban services such as housing, health, and education. If urban growth is not managed properly, the quantity and quality of urban services will deteriorate and contribute to a decrease in the overall quality of life. Table 2.3 presents the urbanization rate of selected countries in the region.

Table 2.3: Urbanization Rate of Selected Countries

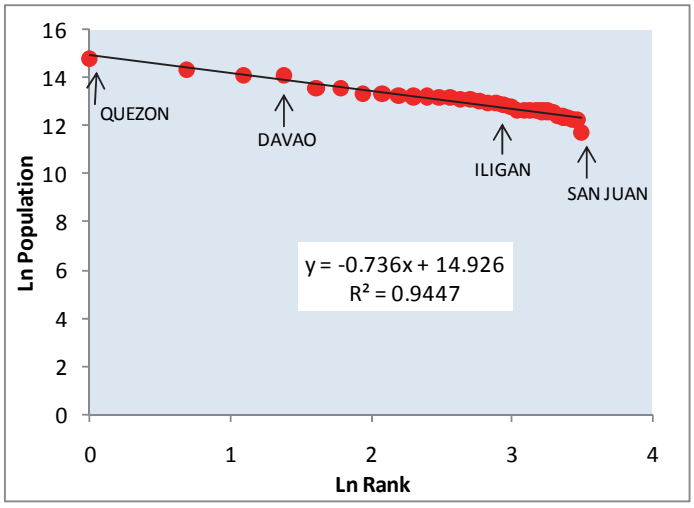
Country	Percentage Urban	
	2000	2030
Philippines	58.5	76.7
Indonesia	42.0	68.9
Malaysia	62.0	82.2
Thailand	31.1	45.8
Vietnam	24.3	41.8
China	35.8	60.3
Cambodia	16.9	37.0
Korea	79.6	86.3
Japan	65.2	73.0

Source: UN World Urbanization Prospects
http://esa.un.org/unup/

The Philippines currently has 33 highly urbanized cities with high population growth. The 16 cities in Metro Manila are included while the remaining 17 cities are located in other regions of the country. For the period of 2000 to 2007, the average population growth rate in Metro Manila cities is 1.92%. Cities outside Metro Manila are growing more rapidly with an average population growth rate of 2.55%.

Also known as Zipf's Law, the rank-size[1] rule states that in well-defined objects like cities or incomes, the size of any object is inversely proportion to its rank. Zipf's Law also states that not only does the size distribution of cities follow a Pareto distribution, but also the distribution has a shape parameter α (henceforth the Pareto exponent) equal to 1.

Figure 2.1: Rank-Size Distribution of Cities



Source: JICA Project Team

The rank-size distribution of cities in the Philippines does not indicate a Pareto distribution. With a parameter of α=0.74, this indicates that the distribution of cities in the country is highly uneven. Recent work by Kwok Tong Soo (2006)[2] suggests that Pareto exponent of more than 1 corresponds to an equal distribution of cities. On the other hand, a Pareto exponent of less than 1 indicates an uneven distribution with 2 or 3 large cities dominating the urban system.

2) Urban Density

An analysis on urban density of cities is very useful since it is considered an important factor in understanding how cities function. Urban density is a term used in urban planning and urban design to refer to the number of people inhabiting a given urbanized area. As such, it is to be distinguished from other measures of population density. Studies like Newman and Kenworthy (1989)[3] and Kentworthy and Laube (1999)[4] has strongly

[1] The rank-size distribution is constructed by taking the natural logarithm of the rank of the cities and plotting it against the natural logarithm of the population.
[2] Kwok Tong Soo (2006) Zipf's Law for Cities: A Cross Country Investigation, The Centre for Economic Performance at the London School of Economics, http://cep.lse.ac.uk/pubs/download/dp0641.pdf
[3] Newman, P. and Kenworthy, J. (1989) Gasoline consumption and cities: a comparison of U.S. cities with a global survey. Journal of American Planning Association, 55, 24-37.
[4] Kenworthy, J.R. and Laube, F.B. (1999) Patterns of automobile dependence in cities: an international overview of key physical and economic dimensions with some implications for urban policy. Transportation Research A, Vol. 33, 691-723.

influenced urban policy that advocates reduction in automobile use by generating higher population density.

The urban densities of highly urbanized cities in the Philippines vary greatly in magnitude. Table 2.4 presents the urban density of cities in Metro Manila. The basis for the calculation of the urban density values is the built-up area of cities as reported in their respective Comprehensive Land Use Plan (CLUP). For cities in Metro Manila, the highest urban density is in Manila City at 66,429 persons per square kilometer. The City of Muntinlupa has the lowest urban density at 11,380 persons per square kilometer. The cities of Mandaluyong, Pasay, Navotas, Makati, and Malabon also exhibit compact configurations.

Table 2.4: Urban Density of Cities in Metro Manila

City	Urban Density	Rank
City of Manila	66,429	1
Kalookan City	34,657	2
City of Mandaluyong	32,858	3
Pasay City	28,790	4
City of Navotas	27,567	5
City of Makati	23,629	6
City of Malabon	23,164	7
City of San Juan	21,101	8
City of Marikina	19,749	9
City of Las Piñas	16,279	10
Quezon City	15,605	11
Taguig City	13,570	12
City of Pasig	12,728	13
City of Valenzuela	12,105	14
City of Parañaque	11,860	15
City of Muntinlupa	11,380	16

Source: JICA Project Team

Table 2.5 presents the urban density of cities outside of Metro Manila. General Santos City has the highest urban density followed by Cebu City, both of which have densities over 13,000 persons per square kilometer. Baguio City, notably, has a relatively high urban density along with Mandaue, Zamboanga, and Davao. Puerto Princesa City has the lowest urban density at barely 300 persons per square kilometer.

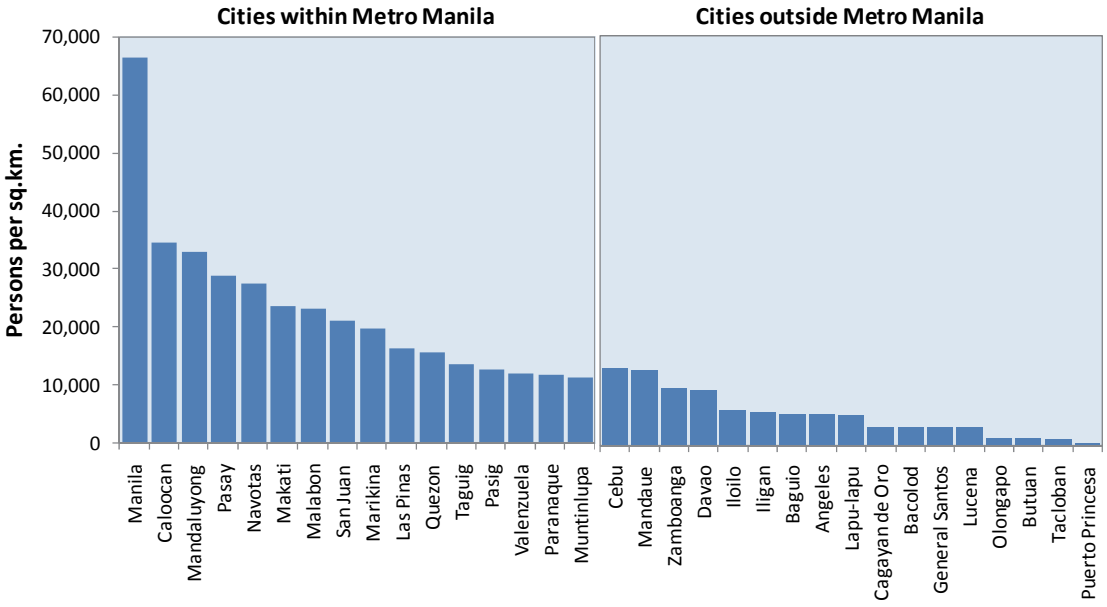
Urban density provides a general measure of the overall demand for urban transport infrastructure and services. A city with a higher urban core density would have greater urban transport development needs including pedestrian facilities and mass transport systems compared to another city with lower urban density but keeping all other factors equal. Figure 2.2 shows the urban densities of HUCs in the Philippines. It is noted that while cities in Metro Manila generally exhibit higher urban concentration, several cities outside of Metro Manila are already reaching comparable densities. This fact raises serious urban transport and development issues and concerns.

Table 2.5: Urban Density of Cities outside Metro Manila

City	Urban Density	Rank
General Santos City	13,774	1
Cebu City	13,194	2
Mandaue City	12,642	3
Zamboanga City	11,900	4
Baguio City	10,502	5
Davao City	10,332	6
Olongapo City	9,988	7
Butuan City	9,135	8
Cagayan de Oro City	7,333	9
Iloilo City	6,031	10
Iligan City	5,826	11
Angeles City	5,215	12
Lapu-Lapu City	4,939	13
Bacolod City	3,070	14
Lucena City	2,948	15
Tacloban City	1,077	16
Puerto Princesa City	292	17

Source: JICA Project Team

Figure 2.2: Urban Densities of HUCs



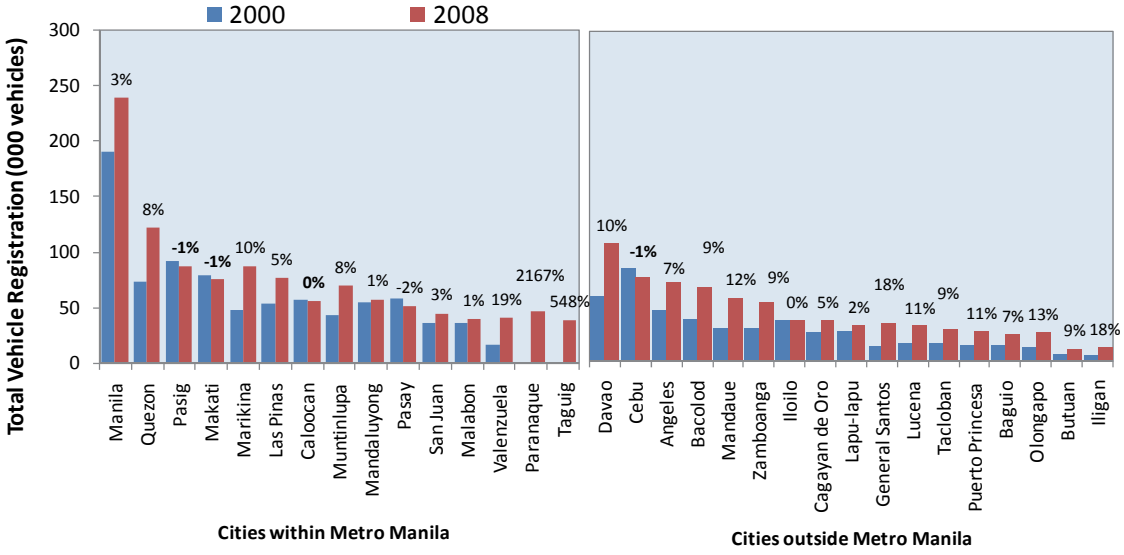
Source: JICA Project Team

2.3 Motorization

Vehicle registration statistics indicate a nationwide average vehicle registration growth rate of 7.5% annually for the period 2000 to 2008**.** Vehicle registration in Metro Manila continues to grow at 3.86% annually. Cities like Makati, Pasay, Caloocan, and Pasig have posted negative growth rates while cities that are located at the fringes of Metro Manila have very high vehicle registration growth including Taguig, Valenzuela, and Parañaque.

The annual vehicle registration growth rates in cities outside of Metro Manila are higher. Cities like Iligan and General Santos have doubled their number of registered vehicles in less than 10 years. Among the cities outside Metro Manila, only Cebu City has experienced negative growth in annual private vehicle registration.

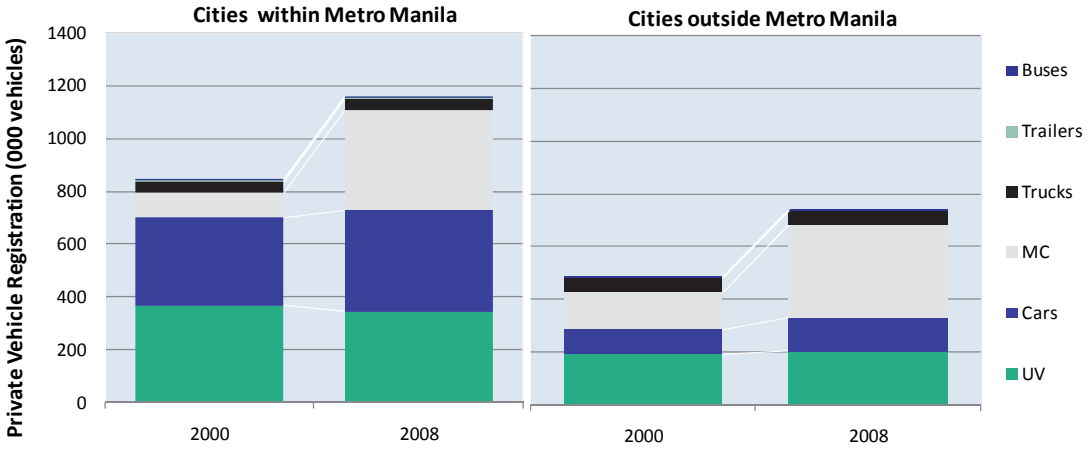
Figure 2.3: Vehicles Registration of HUCs



Source: JICA Project Team

The largest increase in private vehicle registration in the period 2000 to 2008 is attributed to the drastic rise in the number of motorcycles. The number of motorcycle registration in Metro Manila increased at an alarming rate of 27.6% annually while all other cities recorded an average of 13.8%. The overall growth rate in the number of motorcycles nationwide is 20.3% annually.

Figure 2.4: Private Vehicle Registration, 2000 and 2008



Source: JICA Project Team

Table 2.6: Private Vehicle Registration, 2000

City	Vehicle Classification							Total
	Cars	UV	SUV	Trucks	Buses	MC	Trailers	
NATIONAL CAPITAL REGION								
Quezon City	25,151	30,644		2,981	-	14,824	742	74,342
City of Manila	75,900	86,910	-	7,876	5	17,022	2,799	190,512
Kalookan City	13,481	30,364		5,713	16	7,295	651	57,520
City of Pasig	42,077	38,591		3,690	-	6,987	838	92,183
Taguig City	326	383		27	-	135	2	873
City of Valenzuela	3,889	9,881		1,038	-	1,666	59	16,533
City of Parañaque	137	89		13	1	32	1	273
City of Las Piñas	23,606	24,275		1,530	4	4,393	155	53,963
City of Makati	43,784	27,823		2,474	446	4,481	221	79,229
City of Muntinlupa	20,253	17,471		1,523	52	3,946	123	43,368
City of Marikina	18,244	22,436		2,325	28	5,520	175	48,728
Pasay City	21,507	24,767		4,771	52	7,650	387	59,134
City of Malabon	6,562	21,848		3,823	22	4,356	640	37,251
City of Mandaluyong	20,529	20,202		3,405	-	9,954	818	54,908
City of Navotas								
City of San Juan	17,346	12,067		865	4	5,841	128	36,251
CORDILLERA ADMINISTRATIVE REGION								
Baguio City	6,248	7,639		1,079	16	591	11	15,584
REGION III - CENTRAL LUZON								
Angeles City	10,990	21,349		4,493	28	9,837	200	46,897
Olongapo City	2,690	6,428		1,028	90	2,517	68	12,821
REGION IVA - CALABARZON								
Lucena City	2,794	8,364		2,259	37	3,176	145	16,775
REGION IVB - MIMAROPA								
Puerto Princesa City	515	3,374		806	31	10,216	7	14,949
REGION VI - WESTERN VISAYAS								
Iloilo City	7,884	17,313		4,313	34	7,479	159	37,182
Bacolod City	9,674	13,741		7,709	28	7,400	423	38,975
REGION VII - CENTRAL VISAYAS								
Cebu City	18,758	36,278		11,438	16	17,511	1,499	85,500
Mandaue City	5,271	9,138		2,608	14	12,395	303	29,729
Lapu-Lapu City	2,907	10,912		3,570	4	10,543	180	28,116
REGION VIII - EASTERN VISAYAS								
Tacloban City	1,668	6,050		2,082	17	6,562	52	16,431
REGION IX - ZAMBOANGA PENINSULA								
Zamboanga City	3,151	9,007		2,156	41	16,316	134	30,805
REGION X - NORTHERN MINDANAO								
Cagayan de Oro City	5,315	9,734		3,247	111	8,021	156	26,584
Iligan City	1,372	2,173		237	2	1,482	15	5,281
REGION XI - DAVAO REGION								
Davao City	11,653	24,411		7,119	59	15,754	477	59,473
REGION XII - SOCCSKSARGEN								
General Santos City	1,352	3,540		1,221	2	8,169	59	14,343
CARAGA								
Butuan City	1,030	2,519		892	21	2,368	19	6,849

Source: LTO

Table 2.7: Private Vehicle Registration, 2008

City	Vehicle Classification							Total
	Cars	UV	SUV	Trucks	Buses	MC	Trailers	
NATIONAL CAPITAL REGION								
Quezon City	20,833	20,716	8,810	2,835	51	67,908	935	122,088
City of Manila	50,609	71,018	21,379	9,322	67	83,717	3,080	239,192
Kalookan City	8,633	21,780	3,405	5,284	40	16,626	560	56,328
City of Pasig	33,883	28,854	5,317	1,913	-	17,751	138	87,856
Taguig City	8,928	11,907	2,465	747	336	14,723	12	39,118
City of Valenzuela	7,203	15,316	2,757	2,926	1	12,958	192	41,353
City of Parañaque	15,016	12,818	3,596	730	1	15,378	53	47,592
City of Las Piñas	24,512	24,438	5,051	1,361	15	21,695	200	77,272
City of Makati	32,202	21,905	6,959	1,173	-	13,037	297	75,573
City of Muntinlupa	24,686	21,125	5,586	1,885	32	16,325	133	69,772
City of Marikina	23,947	29,153	4,818	2,112	27	28,067	161	88,285
Pasay City	13,532	13,787	2,624	4,473	17	17,018	520	51,971
City of Malabon	4,982	17,790	1,441	2,524	10	11,909	1,517	40,173
City of Mandaluyong	16,479	14,607	4,510	2,621	-	18,911	988	58,116
City of Navotas								
City of San Juan	12,119	14,087	3,895	557	261	14,364	67	45,350
CORDILLERA ADMINISTRATIVE REGION								
BAGUIO CITY	6,648	11,522	1,683	1,635	8	2,942	23	24,461
REGION III - CENTRAL LUZON								
Angeles City	11,539	21,034	2,275	3,017	32	34,628	211	72,736
Olongapo City	3,256	6,890	749	779	20	14,480	28	26,202
REGION IVA - CALABARZON								
Lucena City	3,909	10,960	823	2,394	48	13,873	114	32,121
REGION IVB - MIMAROPA								
Puerto Princesa City	625	4,622	511	1,367	1,066	19,348	20	27,559
REGION VI - WESTERN VISAYAS								
Iloilo City	6,457	15,060	1,434	3,429	43	10,565	94	37,082
Bacolod City	9,920	20,706	2,588	7,870	72	26,568	287	68,011
REGION VII - CENTRAL VISAYAS								
Cebu City	13,993	23,318	4,876	7,234	204	27,064	635	77,324
Mandaue City	8,043	17,031	2,567	3,574	14	25,981	478	57,688
Lapu-Lapu City	2,573	6,129	709	902	211	21,700	153	32,377
REGION VIII - EASTERN VISAYAS								
Tacloban City	1,845	7,758	719	2,773	-	15,394	57	28,546
REGION IX - ZAMBOANGA PENINSULA								
Zamboanga City	3,085	10,517	1,287	2,491	16	36,347	186	53,929
REGION X - NORTHERN MINDANAO								
Cagayan de Oro City	4,351	9,895	1,464	2,587	46	18,578	147	37,068
Iligan City	1,762	4,534	633	680	3	5,181	39	12,832
REGION XI - DAVAO REGION								
Davao City	12,656	26,294	8,805	7,990	58	50,733	572	107,108
REGION XII - SOCCSKSARGEN								
General Santos City	2,035	5,238	815	2,070	1	24,266	134	34,559
CARAGA								
Butuan City	728	2,395	355	437	28	7,760	16	11,719

Source: LTO

2.4 Public Transport Demand

The total number of motorized trips generated in Metro Manila grew from 10.6 million per day in 1980 to 17.5 million per day in 1996. This phenomenal growth is attributed not only to very high population growth rate but also to the rapid increase in car ownership. The number of car-owning households increased from 10% in 1980 to 20% in 1996.

There was an overall decrease in the share of public modes in the total number of trips from 74.4% in 1980 to 72.5% in 1996. On the other hand, there has been an increasing trend of private car use. The share of private transport increased significantly from 15.9% in 1980 to 18.8% in 1996.

In the case of Metro Manila, there has been an encouraging increase in the use of the rail system from 0.1% to 2.3% of the daily travel demand. However, simultaneously, there has been a significant increase in the use of tricycles or three-wheelers, from 4% to 13% of the daily travel demand. This has resulted to the drastic decrease in the overall use of jeepney at 54.5% in 1980 to barely 40% in 1996.

Table 2.8: Metro Manila Travel Demand, 1980 and 1996

Mode	JUMSUT (1980)			MMUTIS (1996)		
	No. of Trips (000)	% to Mode	% to Total	No. of Trips (000)	% to Mode	% to Total
Public Mode	7,910	100	74.4	12,281	100	72.5
Train	10	0.1	0.1	385	3.1	2.3
Bus	1,674	21.2	15.7	2,937	23.9	17.3
Jeepney	5,796	73.3	54.5	6,758	55	39.9
Tricycle	430	5.4	4	2,201	17.9	13
Private Mode	2,723	100	25.6	4,669	100	27.5
Car	1,694	62.2	15.9	3,189	68.3	18.8
Taxi	168	6.2	1.6	1,046	22.4	6.2
Trucks/Others	861	31.6	8.1	434	9.3	2.6
Total	**10,633**		**100**	**16,950**		**100**

Source: MMUTIS (1999)

For Metro Cebu, the share of trips using the private modes increased from 9.7% in 1979 to 20.6% in 1992 while the share of trips using public transport drastically decreased from 90.3% in 1979 to 79.4% in 1992. It is also anticipated that the Metro Cebu will experience an overall increasing rate of person-trips due to rapid population growth and urbanization.

Table 2.9: Metro Cebu Travel Demand, 1979-2020

Mode	1979		1992		2012		2020	
	No. of Trips (000)	% to Total	No. of Trips (000)	% to Total	No. of Trips (000)	% to Total	No. of Trips (000)	% to Total
Private	110.50	9.7%	305.7	20.6%	515.4	17.1%	989.9	23.5%
Public	1,028.90	90.3%	1,180.4	79.4%	2,492.1	82.9%	3,229.7	76.5%
Total	1,139.40	100.0%	1,486.1	100.0%	3,007.5	100.0%	4,219.6	100.0%
Trip Rate	1.1		1.26		1.54		1.61	

Source: MCLUTS (1981)

Travel demand forecasts for key urban areas outside of Metro Manila indicate increasing dependence on car use and overall decrease in the patronage of public transport**.** Master planning efforts for the Metros Iloilo, Bacolod, and Cagayan de Oro in 2003 has revealed drastic increase in vehicle trips by car at the expense of decreasing usage of public

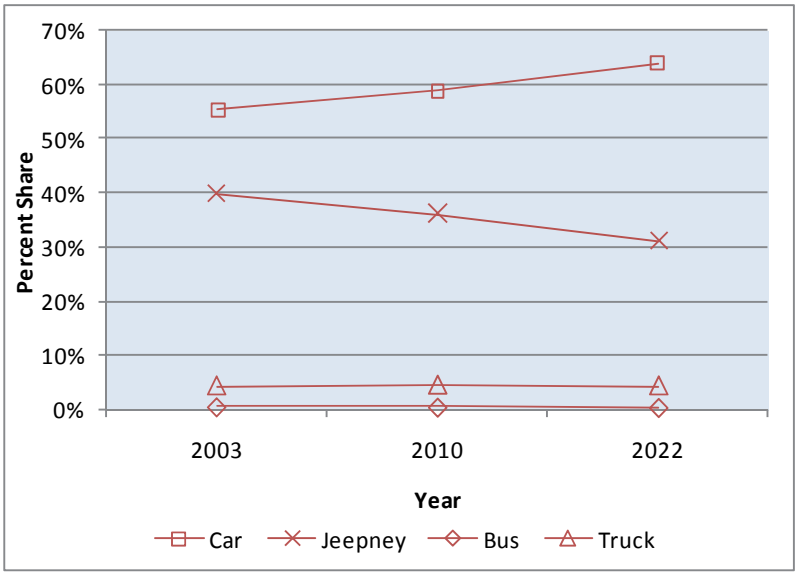
transport. This trend will pose serious implications on the overall sustainability of growing regional centers outside of Metro Manila. The same challenges will be faced by other cities in the country especially since there are no strong and pro-active polices that promote the development of high-quality public transport systems.

Table 2.10: Traffic Demand for Metro Iloilo, 2003-2022

Vehicle Type	Vehicle Trips Per Day			Average Traffic Growth Rate	
	2003	2010	2022	2003-2010	2010-2022
Car	123,704	179,800	303,558	5.5	4.5
Jeepney	88,910	110,234	147,878	3.1	2.5
Bus	1,175	1,430	1,937	2.8	2.5
Truck	9,717	13,686	20,606	5.0	3.5
Total	223,506	305,150	473,979	4.5	3.7

Source: JICA Project on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines (2004)

Figure 2.5: Modal Share for Metro Iloilo, 2003-2022



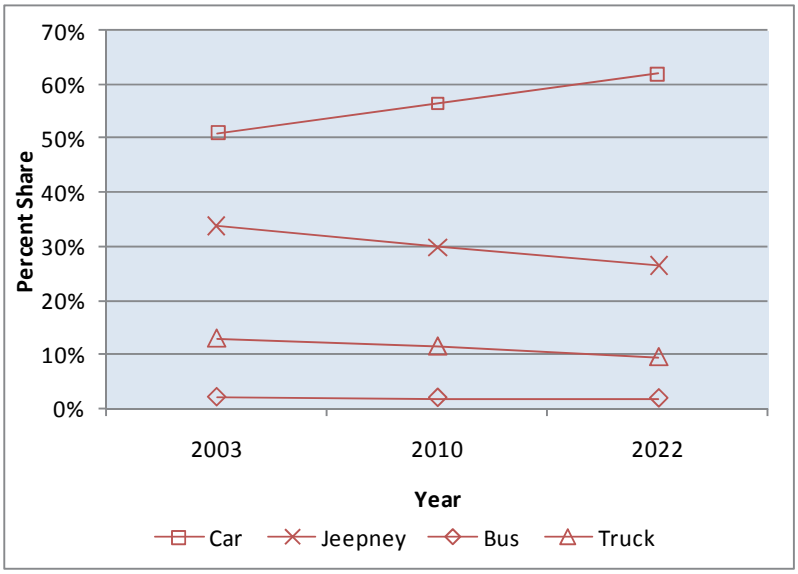
Source: JICA Project on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines (2004)

Table 2.11: Traffic Demand for Metro Bacolod, 2003-2022

Vehicle Type	Vehicle Trips/Day			Average Traffic Growth Rate	
	2003	2010	2022	2003-2010	2010-2022
Car	88,985	136,328	232,094	6.3	4.5
Jeepney	59,237	72,276	99,393	2.9	2.7
Bus	3,580	4,675	6,879	3.9	3.3
Truck	22,729	27,780	35,597	2.9	2.1
Total	174,531	241,059	373,963	4.7	3.7

Source: JICA Project on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines (2004)

Figure 2.6: Modal Share for Metro Bacolod, 2003-2022



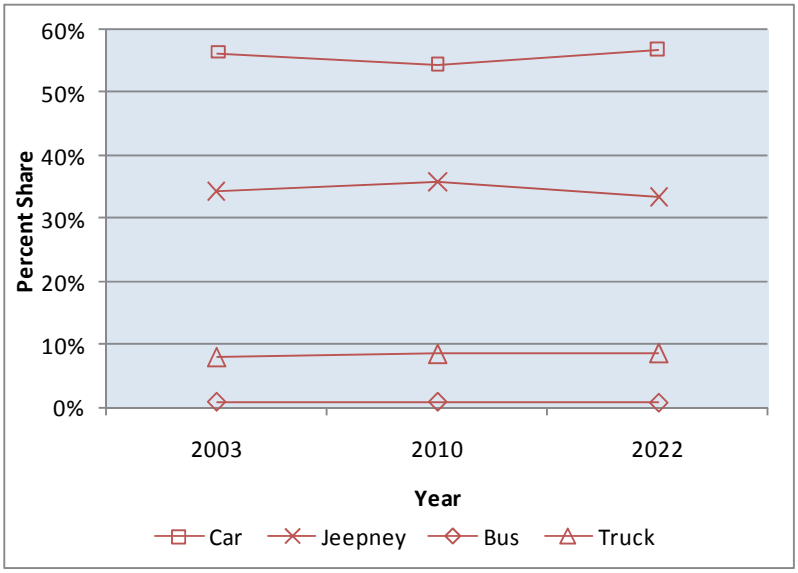
Source: JICA Project on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines (2004)

Table 2.12: Traffic Demand for Metro Cagayan de Oro, 2003-2022

Vehicle Type	Vehicle Trips/Day			Average Traffic Growth Rate	
	2003	2010	2022	2003-2010	2010-2022
Car	177,720	236,350	429,290	4.2	5.1
Jeepney	108,400	155,960	252,720	5.3	4.1
Bus	3,050	4,200	6,170	4.7	3.3
Truck	25,270	36,910	65,080	5.6	4.8
Total	314,440	433,420	753,260	4.7	4.7

Source: JICA Project on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines (2004)

Figure 2.7: Modal Share for Metro Cagayan de Oro



Source: JICA Project Team

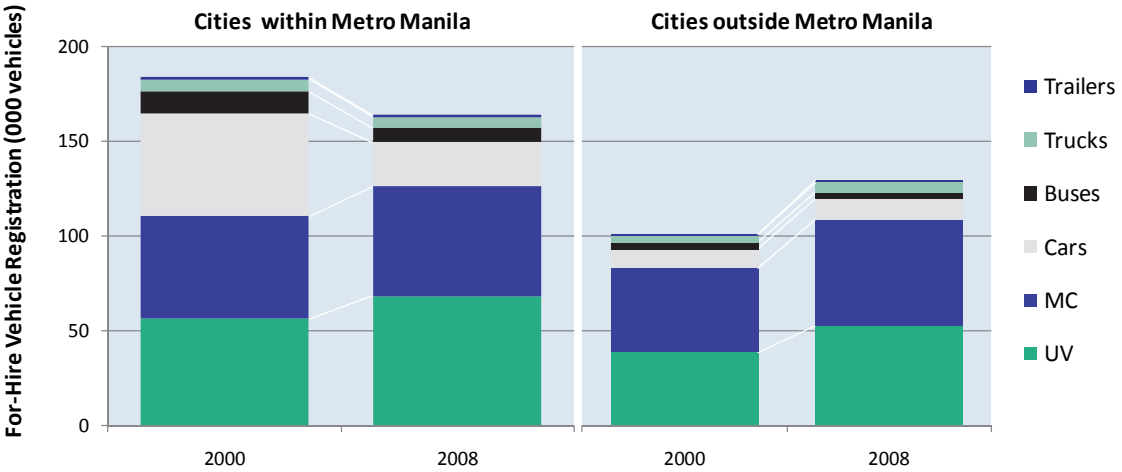
2.5 Public Transport Supply

The public transport system in Philippine cities is road-based except in Metro Manila where there is a network of 3 light rail transit lines and intra-city public transport services are mainly provided by public utility jeepneys (PUJ) and tricycles. Based on the LTFRB record of franchises in 2007, there are about 61,800 public utility vehicles operating in Metro Manila. For buses, the average fleet size per operator is about 13.6 while majority of jeepney operators owned only one unit. There are about 73 intra-city bus routes serving Metro Manila with 33 bus routes serving EDSA and the rest on non-EDSA including 17 routes linking Metro Manila to Bulacan, Rizal, Cavite, and Laguna. There are more than 640 intra-city jeepney routes serving the metropolis and about 130 AUV routes serving mainly commercial districts and intermodal transfer points within Metro Manila.

Public transport supply data for cities outside of Metro Manila are not readily available because the LTFRB regional offices do not regularly produce this. Local governments also do not produce tricycle statistics. Existing statistics for for-hire vehicle registration, on the other hand, provide useful information. Figure 2.8 shows the for-hire vehicle registration for 2000 and 2008. Statistics show there has been a decrease in the total number of registration in Metro Manila while it is the opposite for cities outside Metro Manila. The decrease in Metro Manila is attributed to the decrease in for-hire car registration that indicates a decrease in the overall taxi fleet.

The registration of utility vehicles and motorcycle units accounts for the majority of increases in the for-hire vehicle registration. This is a clear indication of the commanding shares of public utility jeepney (and, to some extent, mega taxi or garage-to-terminal services) and tricycle units in the public transport fleet of cities.

Figure 2.8: For-Hire Vehicle Registration, 2000 and 2008



Source: JICA Project Team

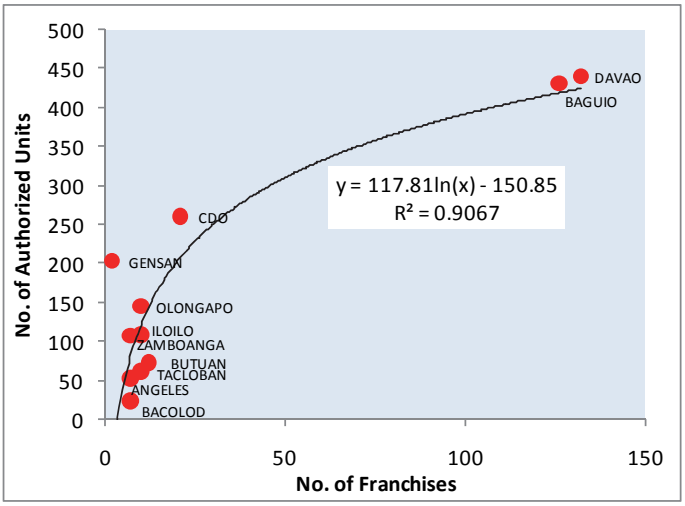
Existing data point to an exponential increase in authorized units with respect to the number of approved franchises. Table 2.13 presents the number of franchises and authorized PUJ units for cities outside of Metro Manila. Figure 2.9 presents a regression fit between the number of authorized units and the number of franchises.

Table 2.13: Public Transport Franchises per City

City	No. of Franchises	Authorized PUJ Units
Angeles City	7	53
Bacolod City	7	24
Baguio City	126	432
Butuan City	12	73
Cagayan de Oro City	21	261
Davao City	132	440
General Santos City	2	2
Iloilo City	10	109
Olongapo City	9	145
Tacloban City	10	62
Zamboanga City	7	107

Source: LTFRB

Figure 2.9: Franchise Characteristics



Source: JICA Project Team

Based on the review of the Medium-Term Land Transport Action Plan 2005-2010 of the Department of Transportation and Communications (DOTC), a number of concerns and problems beset the public transport industry in the Philippines most notably in Metro Manila. These include 1) public transport efficiency; 2) poor enforcement of traffic rules; 3) lack of road safety enhancement measures, 4) increasing levels of air pollution; 5) inadequate intermodal connections among road-based and rail-based public transport services; 6) inadequate standards and procedures on driver and vehicle safety; and, 7) poor coordination among land transport agencies.

A practical approach to analyzing the current state of public transport supply in cities is to infer from vehicle registration statistics for for-hire vehicles. For-hire car registration provides a proxy for the number of taxi units. For-hire utility vehicles can be considered a proxy for PUJ while for-hire buses are for public utility bus (PUB). Lastly, the number of registered for-hire motorcycles is an indication of the number of tricycle units operating in the city. While the place of registration may not necessarily mean where the vehicle will be used, it can be contested that this inconsistency may be more widespread with private vehicles. Tables 2.14 and 2.15 show the vehicle registration data of for-hire vehicles for 2000 and 2008, respectively.

Table 2.14: For-Hire Vehicle Registration, 2000

City	Vehicle Classification							Total
	Cars	UV	SUV	Trucks	Buses	MC	Trailers	
NATIONAL CAPITAL REGION								
Pilot DO	36,149	39,788		5,052	7,710	4,685	834	94,218
Pilot Ext	17,905	16,696		1,605	3,577	-	307	40,090
Quezon City	-	-		-	-	2,581	-	
CORDILLERA ADMINISTRATIVE REGION								
Baguio City	1,452	3,596		53	96	-	2	5,199
REGION III - CENTRAL LUZON								
Angeles City	501	4,283		175	65	5,877	24	10,925
Olongapo City	2	1,397		48	844	5,167	9	7,467
REGION IVA - CALABARZON								
Lucena City	-	1,830		153	283	5,525	23	7,814
REGION IVB - MIMAROPA								
Puerto Princesa City	73	624		44	110	5,144	-	5,995
REGION VI - WESTERN VISAYAS								
Iloilo City	981	4,205		475	244	2,591	20	8,516
Bacolod City	906	4,304		455	273	1,738	13	7,689
REGION VII - CENTRAL VISAYAS								
Cebu City	3,093	5,869		1,142	432	630	165	11,331
Mandaue City	981	930		167	4	2,816	3	4,901
Lapu-Lapu City	406	1,322		173	92	2,071	13	4,077
REGION VIII - EASTERN VISAYAS								
Tacloban City	30	1,525		290	186	1,321	49	3,401
REGION IX - ZAMBOANGA PENINSULA								
Zamboanga City	32	2,390		211	146	5,982	4	8,765
REGION X - NORTHERN MINDANAO								
Cagayan de Oro City	698	2,944		546	484	1,354	66	6,092
Iligan City	114	1,593		39	15	-	3	1,764
REGION XI - DAVAO REGION								
Davao City								
REGION XII - SOCCSKSARGEN								
General Santos City	551	1,084		228	13	3,022	11	4,909
CARAGA								
Butuan City	-	782		61	38	1,284	21	2,186

Source: LTO

Table 2.15: For-Hire Vehicle Registration, 2008

City	Vehicle Classification							Total
	Cars	UV	SUV	Trucks	Buses	MC	Trailers	
NATIONAL CAPITAL REGION								
Pilot DO	16,599	46,929	-	3,892	3,778	6,751	616	78,565
Pilot Ext	5,201	19,122	-	1,866	3,529	1,166	386	31,270
Quezon City	17	25	-	-	-	343	1	
CORDILLERA ADMINISTRATIVE REGION								
Baguio City	509	5,815	-	10	105	-	-	6,439
REGION III - CENTRAL LUZON								
Angeles City	-	5,931	-	144	50	10,373	64	16,562
Olongapo City	2	1,509	-	31	753	5,890	7	8,192
REGION IVA - CALABARZON								
Lucena City	-	2,153	-	200	259	7,872	22	10,506
REGION IVB - MIMAROPA								
Puerto Princesa City	100	406	-	7	76	6,178	-	6,767
REGION VI - WESTERN VISAYAS								
Iloilo City	756	4,497	-	145	161	3,554	14	9,127
Bacolod City	718	4,416		838	393	5,136	13	11,514
REGION VII - CENTRAL VISAYAS								
Cebu City	2,890	5,721	-	1,082	341	1,921	82	12,037
Mandaue City	2,372	3,841	-	708	374	1,402	19	8,716
Lapu-Lapu City	134	432	-	49	-	2,016	223	2,854
REGION VIII - EASTERN VISAYAS								
Tacloban City	269	1,874	2	355	176	2,244	28	4,948
REGION IX - ZAMBOANGA PENINSULA								
Zamboanga City	4	2,350	1	267	134	3,510	16	6,282
REGION X - NORTHERN MINDANAO								
Cagayan de Oro City	563	2,919	-	317	308	1,059	58	5,224
Iligan City	66	1,702	-	71	10	-	12	1,861
REGION XI - DAVAO REGION								
Davao City	2,439	6,905	-	763	222	1,113	222	11,664
REGION XII - SOCCSKSARGEN								
General Santos City	35	1,427	-	162	-	3,433	28	5,085
CARAGA								
Butuan City	18	706	6	45	59	653	3	1,490

Source: LTO

For Metro Manila, the total number of public transport units has decreased in the period of 2000 to 2008. There has been an increase in the number of PUJ and tricycle units, but there was a big drop in the number of PUB and taxi units. It is also worth noting that the increase in the number of tricycle units is much higher. Table 2.16 presents the annual trend in the number of available public transport modes by city.

Several cities outside of Metro Manila are experiencing relatively high growth rates in the number of public transport units, including Angeles, Lucena, Bacolod, Mandaue, and Tacloban. These increases are generally brought about by the very high increase in the number of tricycle units. It can be said that the change in the composition of public transport units in cities is marked by the proliferation of tricycle units.

It is also interesting to note that the number of PUB units is consistently decreasing in all cities. The demand, therefore, for public transport mode is mainly catered by lower occupancy modes, particularly PUJ and tricycles. This points to the need to more effective regulation and management of the tricycle sector in medium and large-size cities in the Philippines, including enforcing the optimal number and route designations for tricycle operations.

Table 2.16: Annual Growth Rates of Public Transport Modes, 2000-2008

	Annual Growth Rate in 2000-2008 (%)				
	All Vehicles	PUJ	PUB	Tricycle	Taxi
NATIONAL CAPITAL REGION	-2.67	1.98	-5.29	1.62	-10.72
Pilot DO	-2.25	2.08	-8.53	4.67	-9.27
Pilot Ext	-3.06	1.71	-0.17	-	3.77
CORDILLERA ADMINISTRATIVE REGION					
Baguio City	2.71	6.19	1.13	-	-12.28
REGION III - CENTRAL LUZON					
Angeles City	5.34	4.15	-3.23	7.36	-100.00
Olongapo City	1.17	0.97	-1.42	1.65	0.00
REGION IVA – CALABARZON					
Lucena City	3.77	2.05	-1.10	4.52	-
REGION IVB – MIMAROPA					
Puerto Princesa City	1.53	-5.23	-4.52	2.32	4.01
REGION VI - WESTERN VISAYAS					
Iloilo City	0.87	0.84	-5.06	4.03	-3.20
Bacolod City	5.18	0.32	4.66	14.50	-2.87
REGION VII - CENTRAL VISAYAS					
Cebu City	0.76	-0.32	-2.91	14.95	-0.84
Mandaue City	7.46	19.40	76.34	-8.35	11.67
Lapu-Lapu City	-4.36	-13.05	-100.00	-0.34	-12.94
REGION VIII - EASTERN VISAYAS					
Tacloban City	4.80	2.61	-0.69	6.85	31.55
REGION IX - ZAMBOANGA PENINSULA					
Zamboanga City	-4.08	-0.21	-1.07	-6.45	-22.89
REGION X - NORTHERN MINDANAO					
Cagayan de Oro City	-1.90	-0.11	-5.49	-3.03	-2.65
Iligan City	0.67	0.83	-4.94	0.0	-6.60
REGION XI - DAVAO REGION					
Davao City	-	-	-	-	-
REGION XII – SOCCSKSARGEN					
General Santos City	0.44	3.50	-100.00	1.61	-29.15
CARAGA					
Butuan City	-4.68	-1.27	5.65	-8.10	-

Source: JICA Project Team

2.6 Road Development

Almost all cities have road densities higher than the 1km per square kilometer threshold that corresponds to sufficiency of roads. Cities in Metro Manila have generally higher road densities compared to other cities. This also indicates that Metro Manila cities have a comprehensive road network system. Table 2.17 presents data on road length and road density. The cities of Manila, San Juan, and Makati in Metro Manila have the highest road densities with values of 19.64, 14.14 and 10.56 kilometer per square kilometer, respectively. Outside Metro Manila, General Santos City has the highest road density at 15.14 kilometer per square kilometer.

2.7 Traffic Accidents

The Philippines lack comprehensive accident studies, but it is generally known that cities in the country face serious challenges in road safety. Metro Manila accounts for one-third of the country's recorded number of fatalities from road accidents in 2002. Pedestrians, especially those below 15 years old, were found to be the most vulnerable group. This is

bound to worsen with the implementation of traffic management schemes that favor high speed and weaving maneuvers and poor protection of pedestrians crossing the streets[5].

The state of road safety of the cities can be evaluated based on road traffic accidents. In Metro Manila, the Metro Manila Development Authority (MMDA) maintains the Metro Manila Accident Reporting and Analysis System (MMARAS). Table 2.18 shows the recorded number of fatal and non-fatal traffic accidents in Metro Manila in 2005.

Parañaque and Quezon Cities has the highest fatal accident rates per 100,000 people. The cities of Makati, San Juan, and Mandaluyong registered non-fatal accident rates of over 1,000 occurrences per 100,000 people, the highest in Metro Manila. Table 2.19 presents the accident rates per 100,000 people in Metro Manila.

Table 2.17: Road Length and Road Density, 2005, 2006 and 2008

City	Road Length (km)			Built-up Area	Road Density (km/km^2)		
	2005	2006	2008	(km^2)	2005	2006	2008
NATIONAL CAPITAL REGION							
Quezon City	1,369.26	1,369.26	1,191.00	171.7	7.97	7.97	6.94
City of Manila	373.08	373.08	491.00	25	14.92	14.92	19.64
Kalookan City	228.42	228.42	227.00	39.8	5.74	5.74	5.71
City of Pasig	223.39	223.39	371.00	48.5	4.61	4.61	7.65
Taguig City	42.00	165.78	166.00	45.2	0.93	3.67	3.67
City of Valenzuela	69.55	69.55	54.00	47.0	1.48	1.48	1.15
City of Parañaque	66.67	66.67	174.00	46.6	1.43	1.43	3.73
City of Las Piñas	43.13	70.95	71.00	32.7	1.32	2.17	2.17
City of Makati	215.36	215.36	228.00	21.6	9.97	9.97	10.56
City of Muntinlupa	7.27	7.27	64.00	39.8	0.18	0.18	1.61
City of Marikina	316.95	316.95	39.00	21.5	14.74	14.74	1.81
Pasay City	229.98	229.98	59.00	14	16.43	16.43	4.21
City of Malabon	88.77	78.72	79.00	15.7	5.65	5.01	5.03
City of Mandaluyong	80.41	80.41	81.00	9.3	8.65	8.65	8.71
City of Navotas			49.00	8.9	-	-	5.51
City of San Juan			84.00	5.94	-	-	14.14
CORDILLERA ADMINISTRATIVE REGION							
Baguio City	149.91	142.70	143.00	28.75	5.21	4.96	4.97
REGION III - CENTRAL LUZON							
Angeles City	102.20	218.19	218.00	60.30	1.69	3.62	3.62
Olongapo City	24.60	4.60	148.00	22.76	1.08	1.08	6.50
REGION IVA - CALABARZON							
Lucena City	19.81	19.81	30.00	80.20	0.25	0.25	0.37
REGION IVB - MIMAROPA							
Puerto Princesa City	207.06	207.06	210.00	720.00	0.29	0.29	0.29
REGION VI - WESTERN VISAYAS							
Iloilo City	688.68	688.68	127.00	69.43	9.92	9.92	1.83
Bacolod City	296.20	296.20	296.20	162.70	1.82	1.82	1.82
REGION VII - CENTRAL VISAYAS							
Cebu City	34.94	34.94	87.00	60.54	0.58	.58	1.44
Mandaue City	68.89	125.61	126.00	25.20	2.73	4.98	5.00
Lapu-Lapu City	4.07	4.07	4.00	59.23	0.07	0.07	0.07
REGION VIII - EASTERN VISAYAS							
Tacloban City	71.55	71.55	71.55	201.72	0.35	0.35	0.35

[5] Meeting Infrastructure Needs Study: Transportation Sector Review (Philippines), Supplemental Report on the Urban Transport Sector, World Bank, 2004.

City	Road Length (km)			Built-up Area	Road Density (km/km^2)		
	2005	2006	2008	(km^2)	2005	2006	2008
REGION IX - ZAMBOANGA PENINSULA							
Zamboanga City	17.00	17.00	153.00	65.08	0.26	0.26	2.35
REGION X – NORTHERN MINDANAO							
Cagayan de Oro City	402.00	402.00	245.00	75.54	5.32	5.32	3.24
Iligan City	66.84	66.84	67.00	52.87	1.26	1.26	1.27
REGION XI - DAVAO REGION							
Davao City	170.44	170.44	163.00	131.95	1.29	1.29	1.24
REGION XII - SOCCSKSARGEN							
General Santos City	35.29	434.19	582.00	38.45	0.92	11.29	15.14
CARAGA							
Butuan City	89.22	89.22	179.00	32.66	2.73	2.73	5.48

Source: DILG

Table 2.18: Traffic Accidents in Metro Manila, 2005

City	Fatal	Non-fatal		Total
		Injury	Damage	
Quezon City	109	3,525	17,369	21,003
City of Manila	50	586	3,962	4,598
Kalookan City	23	732	2,309	3,064
City of Pasig	19	820	4,411	5,250
Taguig City	21	561	1,312	1,894
City of Valenzuela	15	332	815	1,162
City of Parañaque	27	500	2,385	2,912
City of Las Piñas	6	574	2,818	3,398
City of Makati	12	927	6,760	7,699
City of Muntinlupa	8	403	2,294	2,705
City of Marikina	14	806	2,003	2,823
Pasay City	7	258	2,386	2,651
City of Malabon	5	188	414	607
City of Mandaluyong	3	423	2,944	3,370
City of Navotas	3	73	261	337
City of San Juan	1	98	1,347	1,446

Source: MMDA

Table 2.19: Accident Rates per 100,000 People in Metro Manila, 2005

City	Population	Accident Rate		
		Fatal	Non-fatal	Total
Quezon City	2,510,294	4.34	832.33	836.67
City of Manila	1,635,575	3.06	278.07	281.12
Kalookan City	1,312,967	1.75	231.61	233.36
City of Pasig	579,838	3.28	902.15	905.42
Taguig City	563,729	3.73	332.25	335.98
City of Valenzuela	541,497	2.77	211.82	214.59
City of Parañaque	518,424	5.21	556.49	561.70
City of Las Piñas	513,093	1.17	661.09	662.26
City of Makati	489,006	2.45	1,571.96	1,574.42
City of Muntinlupa	428,736	1.87	629.06	630.92
City of Marikina	413,981	3.38	678.53	681.92
Pasay City	387,449	1.81	682.41	684.22
City of Malabon	355,788	1.41	169.20	170.61
City of Mandaluyong	296,905	1.01	1,134.03	1,135.04
City of Navotas	240,601	1.25	138.82	140.07
City of San Juan	122,889	0.81	1,175.86	1,176.67

Source: Author

The average accident rate in Metro Manila is around 640 per 100,000 people. This value is actually much higher than reported in the past. For example, a previous ADB study[6] citing 1999 statistics computes that the accident rate for NCR is around 101 accidents per 100,000 people. This is a clear indication of worsening traffic accident situation in Metro Manila.

Parañaque, Taguig, and Quezon Cities have the highest fatal and non-fatal accident rates per 10,000 vehicles. Existing statistics indicate an average accident rate of around 934 accidents per 10,000 vehicles. Again, this figure is much higher than accident rates reported in the past. The previous ADB study has reported an accident rate of 83.34 accidents per 10,000 vehicles. Table 2.21 lists the accident rates per 10,000 vehicles.

Table 2.20: Accident Rates per 10,000 Vehicles in Metro Manila, 2005

City	Vehicle Registration	Accident Rate		
		Fatal	Non-fatal	Total
Quezon City	101,364	10.75	2,061.29	2,072.04
City of Manila	219,628	2.28	207.08	209.35
Kalookan City	56,772	4.05	535.65	539.70
City of Pasig	89,454	2.12	584.77	586.89
Taguig City	9,400	22.34	1,992.61	2,014.95
City of Valenzuela	29,322	5.12	391.17	396.28
City of Parañaque	6,871	39.30	4,198.81	4,238.10
City of Las Piñas	67,538	0.89	502.23	503.12
City of Makati	76,924	1.56	999.30	1,000.86
City of Muntinlupa	58,377	1.37	462.00	463.37
City of Marikina	70,647	1.98	397.61	399.59
Pasay City	54,549	1.28	484.70	485.98
City of Malabon	39,051	1.28	154.16	155.44
City of Mandaluyong	56,892	0.53	591.83	592.35
City of Navotas	-	-	-	-
City of San Juan	41,697	0.24	346.55	346.79

Source: Author

The occurrence of traffic-related deaths and injuries in Metro Manila continue to worsen over the years. Tables 2.21 and 2.22 present the number and growth rates of traffic-related deaths and injuries in Metro Manila from 2002 to 2006. In 2006, Quezon City had the highest number of death and injuries totaling more than 3,300. Large increases in the number of traffic-related deaths and injuries occurred from 2003 to 2005. Taguig City had the largest recorded increase where figures went 20 times up for the period of 2004 to 2005. The City of Parañaque also had an increase of almost 10 times in 2003 to 2004. On the other hand, several cities including Las Piñas, Makati, Malabon, Muntinlupa, and Quezon City have experienced improvement in road safety conditions in 2006.

The current system of recording traffic accidents along the national road does not provide a complete picture of the road safety conditions in key cities outside Metro Manila. The Department of Public Works and Highways (DPWH) maintains the Traffic Accident Reporting and Analysis System (TARAS), which is composed of computer software and associated procedures for recording and analyzing road accidents in the Philippines. Since TARAS only records traffic accident data along the national roads, the existing

[6] ADB, Country Report 7: Road Safety in the Philippines, ASEAN Regional Road Safety Strategy and Action Plan (2005-2010).

information is not adequate to assess the road safety situation in key medium and large-size cities outside Metro Manila.

Table 2.21: Traffic Related Deaths and Injury in Metro Manila, 2002-2006

City	Yearly Number of Fatalities and Injuries				
	2002	2003	2004	2005	2006
Quezon City	359	576	1,824	3,634	3,332
City of Manila	83	56	154	636	702
Kalookan City	96	262	366	755	762
City of Pasig	227	367	709	839	1,043
Taguig City	6	8	28	582	641
City of Valenzuela	28	26	126	347	335
City of Parañaque	28	22	223	527	567
City of Las Piñas	26	142	215	580	502
City of Makati	291	249	335	939	864
City of Muntinlupa	16	138	141	411	386
City of Marikina	36	261	692	820	1,068
Pasay City	227	367	709	839	1,043
City of Malabon	11	6	48	193	174
City of Mandaluyong	45	76	190	426	506
City of Navotas	3	7	25	76	90
City of San Juan	-	20	32	99	213

Source: MMDA

Table 2.22: Annual Increase in Number of Fatalities and Injuries

City	Annual Growth Rate of Fatalities and Injuries			
	2002-2003	2003-2004	2004-2005	2005-2006
Quezon City	60%	217%	99%	-8%
City of Manila	-33%	175%	313%	10%
Kalookan City	173%	40%	106%	1%
City of Pasig	62%	93%	18%	24%
Taguig City	33%	250%	1979%	10%
City of Valenzuela	-7%	385%	175%	-3%
City of Parañaque	-21%	914%	136%	8%
City of Las Piñas	446%	51%	170%	-13%
City of Makati	-14%	35%	180%	-8%
City of Muntinlupa	763%	2%	191%	-6%
City of Marikina	625%	165%	18%	30%
Pasay City	62%	93%	18%	24%
City of Malabon	-45%	700%	302%	-10%
City of Mandaluyong	69%	150%	124%	19%
City of Navotas	133%	257%	204%	18%
City of San Juan	-	60%	209%	115%

Source: Author

Nevertheless, some insights and patterns can still be derived from the existing data of traffic accident along national roads. Table 2.23 presents the frequency of traffic accidents per region by severity. The regions of CALABARZON, Northern Mindanao, and Davao experience relatively high traffic accident frequencies compared to other regions.

Table 2.23: Road Traffic Accidents by Region According to Severity, 2008

District Engineering Office	Frequency of Accidents	Number of Accidents by Severity				Total
		Fatal	Serious Injury	Minor Injury	Property Damage	
NATIONAL CAPITAL REGION	230	17	21	38	154	460
CORDILLERA ADMINISTRATIVE REGION	276	19	13	44	200	552
Baguio City District Engineering Office	90	2	-	1	87	180
REGION III - CENTRAL LUZON	485	105	63	136	181	970
Pampanga Sub	27	1	7	16	3	54
Zambales 2nd	17	5	2	5	5	34
REGION IVA - CALABARZON	935	56	96	294	489	1,870
Quezon 2nd	160	9	42	41	68	320
REGION IVB - MIMAROPA	245	17	21	138	69	490
Palawan 3rd	24	3	1	15	5	48
REGION VI - WESTERN VISAYAS	-	-	-	-	-	-
Iloilo City	-	-	-	-	-	-
Bacolod City	-	-	-	-	-	-
REGION VII - CENTRAL VISAYAS	103	9	13	63	18	206
Cebu City	-	-	-	-	-	-
REGION VIII - EASTERN VISAYAS	-	-	-	-	-	-
Tacloban City Sub	-	-	-	-	-	-
REGION IX - ZAMBOANGA PENINSULA	359	20	57	135	147	718
Zamboanga City	159	4	6	44	105	318
REGION X - NORTHERN MINDANAO	1,040	118	130	326	466	2,080
Cagayan de Oro City	354	11	19	67	257	708
Lanao Del Norte 1st	4	3	1	-	-	8
Lanao Del Norte 2nd	105	5	-	55	45	210
Misamis Oriental 2nd	96	6	26	28	36	192
REGION XI - DAVAO REGION	1,307	114	175	311	707	2,614
Davao City Sub-District Engineering Office	665	8	29	141	487	1,330
Davao City	126	3	15	55	53	252
REGION XII - SOCCSKSARGEN	100	9	42	20	29	200
South Cotabato Sub	17	-	4	3	10	34
CARAGA	121	27	19	36	39	242
Butuan City	64	7	6	20	31	128

Source: DPWH

It is clear that the type of accident that occurs in regions outside NCR are severe as revealed by the large proportion of traffic-related casualties. They are either killed or seriously injured. In some regions, the number of fatalities and seriously injured account for more than a third of the total number of recorded casualties. An example is the number of fatalities and seriously injured in Northern Mindanao and Davao Region that is around 38%. Table 2.24 presents the number of casualties per region.

Existing statistics indicate that human error accounts for majority of the traffic accidents, followed by vehicular defects or mechanical errors. While this generally points to deficiencies in the overall quality of drivers and vehicle fleet in the country, one cannot discount the poor quality of road network and traffic systems as contributing factors to poor road safety. Although driver error is singled out as the main cause of traffic accidents in terms of recorded accident statistics, existing data are not able to differentiate the real causes from circumstantial ones. Table 2.25 presents the cause of accidents.

Table 2.24: Road Traffic Accidents by Region According to Number of Casualties, 2008

District Engineering Office	Number of Casualties			Total
	Killed	Serious Injury	Minor Injury	
NATIONAL CAPITAL REGION	19	32	89	140
CORDILLERA ADMINISTRATIVE REGION	22	36	169	227
Baguio City District Engineering Office	2	-	2	4
REGION III - CENTRAL LUZON	143	104	296	543
Pampanga Sub	1	8	34	43
Zambales 2nd	5	3	16	24
REGION IVA - CALABARZON	63	169	487	719
Quezon 2nd	11	59	75	145
REGION IVB - MIMAROPA	21	45	251	317
Palawan 3rd	3	9	39	51
REGION VI - WESTERN VISAYAS	-	-	-	-
Iloilo City	-	-	-	-
Bacolod City	-	-	-	-
REGION VII - CENTRAL VISAYAS	9	17	108	134
Cebu City	-	-	-	-
REGION VIII - EASTERN VISAYAS	-	-	-	-
Tacloban City Sub	-	-	-	-
REGION IX - ZAMBOANGA PENINSULA	23	93	292	408
Zamboanga City	6	8	86	100
REGION X - NORTHERN MINDANAO	161	226	643	1,030
Cagayan de Oro City	11	27	129	167
Lanao Del Norte 1st	4	5	1	10
Lanao Del Norte 2nd	6	-	88	94
Misamis Oriental 2nd	8	44	59	111
REGION XI - DAVAO REGION	143	300	709	1,152
Davao City Sub-District Engineering Office	11	37	248	296
Davao City	3	22	132	157
REGION XII - SOCCSKSARGEN	11	53	69	133
South Cotabato Sub	-	5	5	10
CARAGA	29	39	80	148
Butuan City	7	11	44	62

Source: DPWH

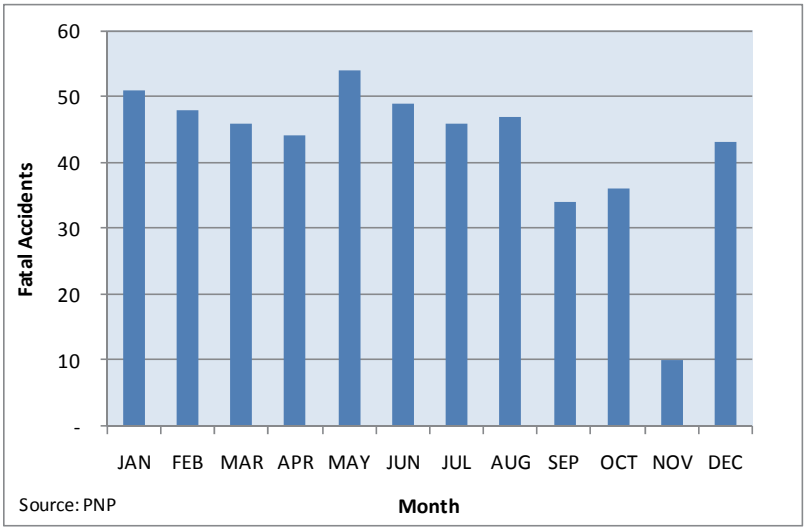
Accident statistics from the Philippine National Police (PNP) indicate that the frequency of fatal accidents is highest in May and lowest in November. The frequency of non-fatal accidents is highest in March, but lowest in November. This may be due to that school does not start until June and, therefore, traffic speeds may still be high particularly along city and provincial roads.

Table 2.25: Road Traffic Accidents by Region according to Cause, 2008

District Engineering Office	Main Cause of Accident			
	Human Error	Vehicular Defect	Road Defect	Alcohol/ Drug
NATIONAL CAPITAL REGION	211	16	3	1
CORDILLERA ADMINISTRATIVE REGION	229	32	8	40
Baguio City District Engineering Office	83	7	-	4
REGION III - CENTRAL LUZON	409	56	12	60
Pampanga Sub	7	15	1	5
Zambales 2nd	16	-	1	4
REGION IVA - CALABARZON	863	63	8	47
Quezon 2nd	149	10	1	7
REGION IVB - MIMAROPA	216	24	5	9
Palawan 3rd	21	2	1	-
REGION VI - WESTERN VISAYAS	-	-	-	-
Iloilo City	-	-	-	-
Bacolod City	-	-	-	
REGION VII - CENTRAL VISAYAS	90	9	2	7
Cebu City	-	-	-	-
REGION VIII - EASTERN VISAYAS	-	-	-	-
Tacloban City Sub	-	-	-	-
REGION IX - ZAMBOANGA PENINSULA	300	44	12	40
Zamboanga City	144	13	2	15
REGION X - NORTHERN MINDANAO	879	92	26	77
Cagayan de Oro City	314	26	4	8
Lanao Del Norte 1st	4	-	-	-
Lanao Del Norte 2nd	90	10	4	5
Misamis Oriental 2nd	86	7	2	4
REGION XI - DAVAO REGION	1,200	56	9	17
Davao City Sub-District Engineering Office	644	12	1	7
Davao City	111	4	2	1
REGION XII - SOCCSKSARGEN	96	3	-	1
South Cotabato Sub	15	1	-	-
CARAGA	101	10	3	14
Butuan City	52	5	1	3

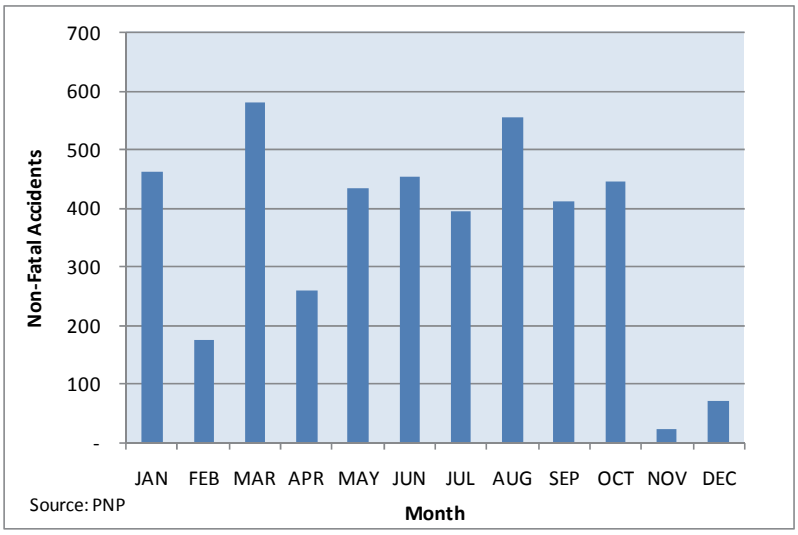
Source: DPWH

Figure 2.10: Frequency of Fatal Accidents by Month, 2008



Source: JICA Project Team

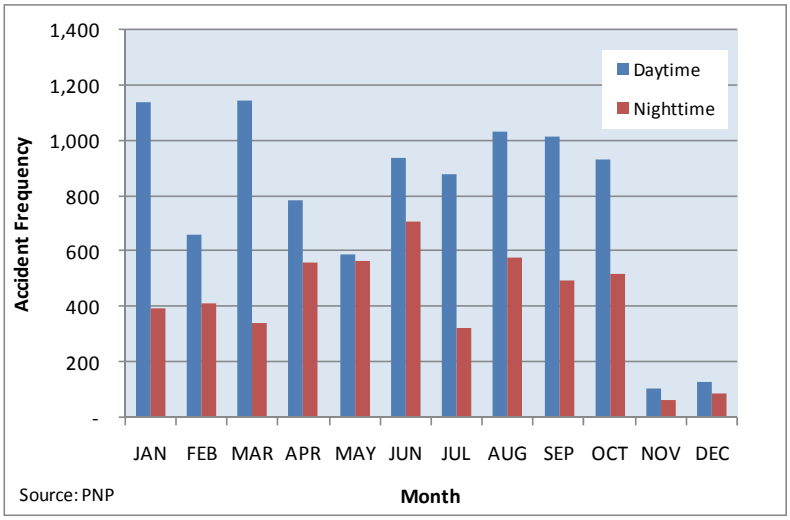
Figure 2.11: Frequency of Non-Fatal Accidents by Month, 2008



Source: JICA Project Team

There is a relatively high occurrence of traffic accidents during daytime period. A finer disaggregation of traffic accidents according to severity and time of day is not readily available from existing police records. Still, it can be surmised that the number of occurrence is high during daytime because of the large number of vehicles and pedestrians on the road.

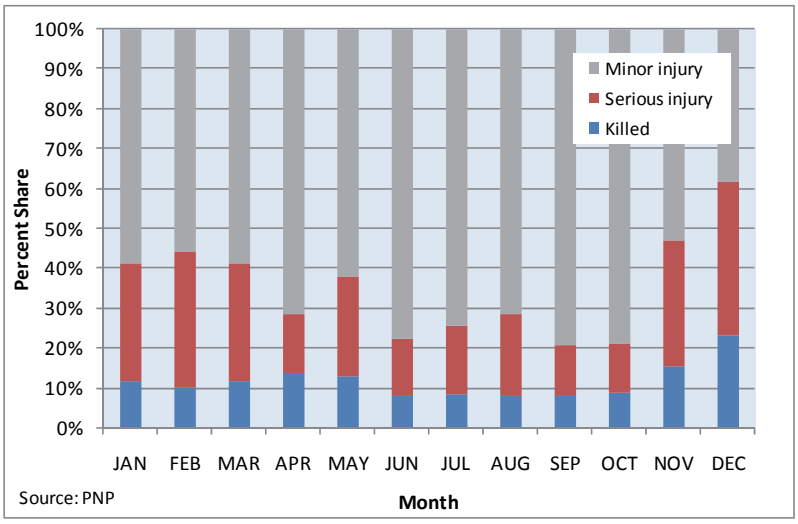
Figure 2.12: Occurrence of Accidents by Time of Day, 2008



Source: JICA Project Team

During the month of December, the proportion of people killed is alarmingly high and the number of persons killed and seriously injured is highest. The share of persons killed is more than 20% and the seriously injured is more than 30% of the total number of fatalities and injuries during this month. This is probably because December is a wet season and many people travel in the holiday season. The number of fatalities is low in the school months of June to October. Figure 2.13 shows the composition of fatalities and injuries by month in the year 2008.

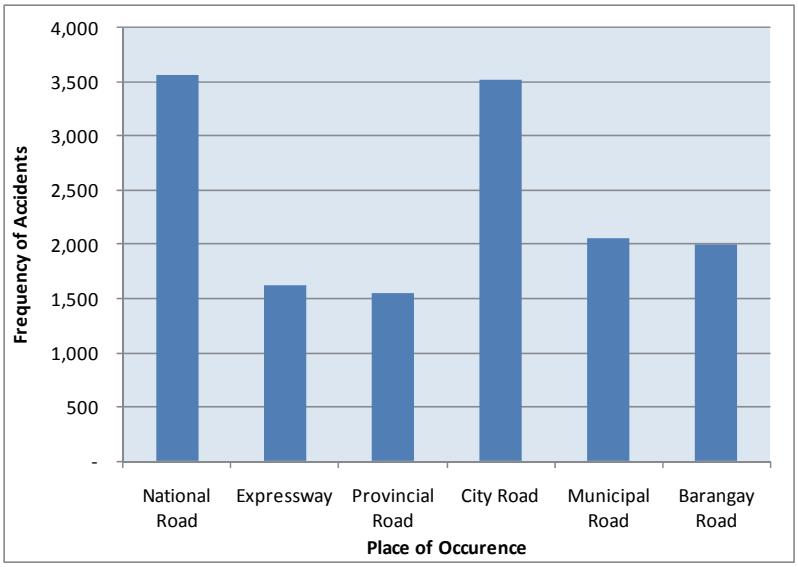
Figure 2.13: Composition of Fatalities and Injuries by Month, 2008



Source: JICA Project Team

The statistics showed that a large portion of traffic accidents occurs on national and city roads since they have higher traffic volumes and levels of service. These infrastructures are able to provide vehicle travel at high speeds. Figure 2.14 shows the occurrence of traffic accidents by road type.

Figure 2.14: Occurrence of Accidents by Type of Road, 2008



Source: JICA Project Team

It is worth noting that occurrences of traffic accidents at the city level are not reported by the PNP. Existing police records are at best incomplete, but there is reason to believe that accident rates in key medium and large-size cities are relatively high. In Iligan City, for example, the reported the number of traffic accident fatalities and injuries totaled to 977 in 2007[7]. With a population of 308,046 in 2007 and 12,832 registered vehicles in 2008, this

[7] Presentation by Senior Inspector Andreo Emeterio Gomez during Seminar-Workshop on Environmentally Sustainable Transport (EST) for Iligan City, 19 September 2007.

translates to an accident rate of 3,172 per 100,000 people and 761 per 10,000 vehicles. The city also reported an increasing trend in traffic accident occurrence.

A traffic accident reporting system for key cities outside of Metro Manila is severely lacking. Such system is needed in assessing the state of road safety in medium and large-size cities.

2.8 Air Pollution

The ambient air quality statistics from the Environmental Management Bureau (EMB) shows a general decrease in TSP concentration in Metro Manila from 1998 to 2006. However, the TSP readings in 2006 are still above the guideline value of 90 ug/ Ncm for one-year average exposure. Table 2.26 presents the annual average concentration of Total Suspended Particulates (TSP) for cities in the National Capital Region (NCR).

Table 2.26: Average Concentration of TSP in NCR, 1998-2006

City	Monitoring Station	1998	1999	2000	2001	2002	2003	2004	2005	2006
Valenzuela	Municipal Hall	266	258	214	222	206	256	220	169	180
Manila	DOH, Rizal Ave.				171	143	188	148	150	118
	EDSA - Taft							243	342	329
Makati City	Guadalupe Viejo	218	188	129	157	157	209			
	Ayala - Gil Puyat						211	222	190	158
	EDSA-MMDA							231	222	
Quezon City	PAGASA Compound	128	152	89						
	DPWH Compound	212	205	215	133	134				
	East Avenue	190	220	169	205	178	186	188	136	109
	Quezon Avenue	248	239							
	Araneta Avenue	187	344							
	Ateneo	148	65	86	94	93	89	106	99	78
	Congressional Avenue			359	227	206	241	282		
	EDSA-NPO			360	133	149	164	169	169	144
Las Pinas	City Hall	113	93	91	73	81				
Pasig City	City Hall		151	129	110	90	107	116	109	95
Pasay City	City Hall				136	166	196	143	143	166
Mandaluyong	City Hall			147	132	145	143	141	130	

Source: DENR-EMB
Note: Values in microgram per normal cubic meter

The graph of historical TSP readings for cities in Metro Manila is shown in Figure 2.15.

Historical ambient air quality data for cities outside of Metro Manila generally point to decreasing trend in TSP concentration for selected cities. Several cities have TSP readings above the guideline value; however, the cities of Mandaue, Iloilo, General Santos and Butuan already exhibit TSP levels that are below the guideline value of 90 micrograms per normal cubic meter. Table 2.27 presents the average concentration of TSP of selected cities outside NCR. The graph of historical TSP readings for cities outside of Metro Manila is shown in Figure 2.12.

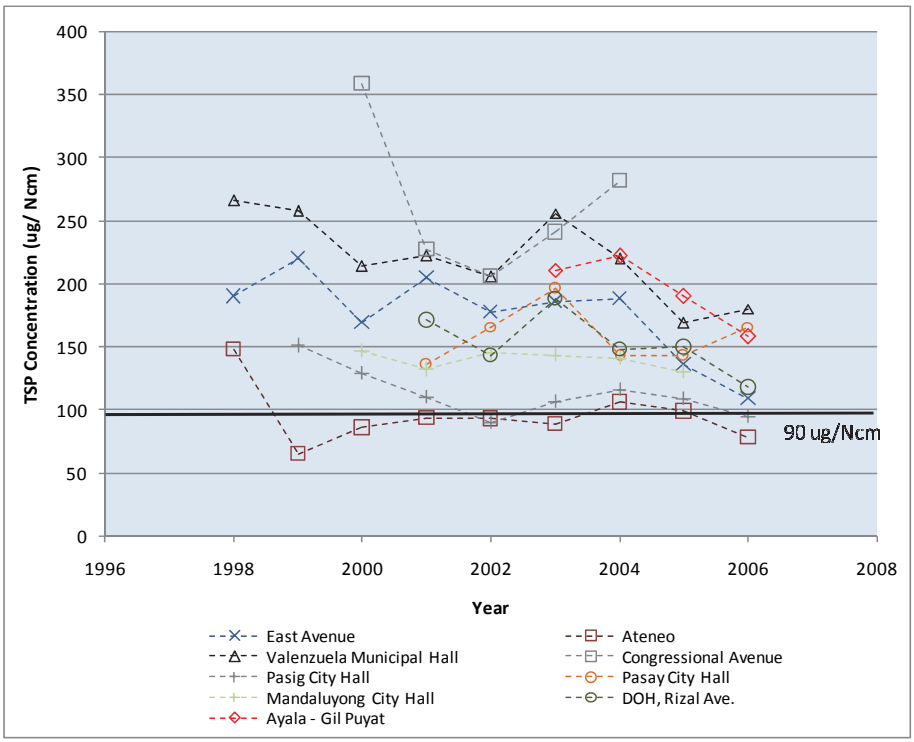
Table 2.27: Average Concentration of TSP in Cities Outside NCR, 1998-2005

City	Monitoring Station	1998	1999	2000	2001	2002	2003	2004	2005
Baguio City	Plaza Garden	216	307	287	222	326	204	229	170
Iloilo City	La Paz Plaza	184	179	146	184	129	92	104	81
	Jaro	227	211	257	218	208	177	182	141
Mandaue City	Banilad	109	139	101	66	89			
Tacloban City	P&M Bldg, Torres cor. Avenida					91	97		
Zamboanga City	ZCMC, Dr. Evangelista Ave. cor. Gov. Lim				432	3774	237	220	154
Cagayan de Oro	Lapasan Shell Station	259	272	206	220	191			
Davao City	Quirino Ave. cor. Pichon St.						249		
	Agdao						335		
General Santos								135	81
Butuan	Urios College Campus			172	184	100			
	Old Caltex Depot, New Asia						96	83	81

Source: DENR-EMB, http://www.emb.gov.ph/air/Air%20Quality/AQ%20Graph.jpg.htm
Note: Values in microgram per normal cubic meter

Studies[8] suggest that cost of pollution as a percentage of income ranges from 2.5% to 6.1%. Surveys in key cities in the country indicate that about 2,000 people die each year as a result of exposure to PM_{10}. The model estimates an economic loss of about USD140 million. About 9,000 people suffer from chronic bronchitis resulting to an estimated economic loss of USD120 million. The number of people suffering from PM_{10}-related respiratory symptoms is quite high with an economic loss of about USD170 million. The total economic cost of PM_{10} exposure is estimated to be at USD430 million.

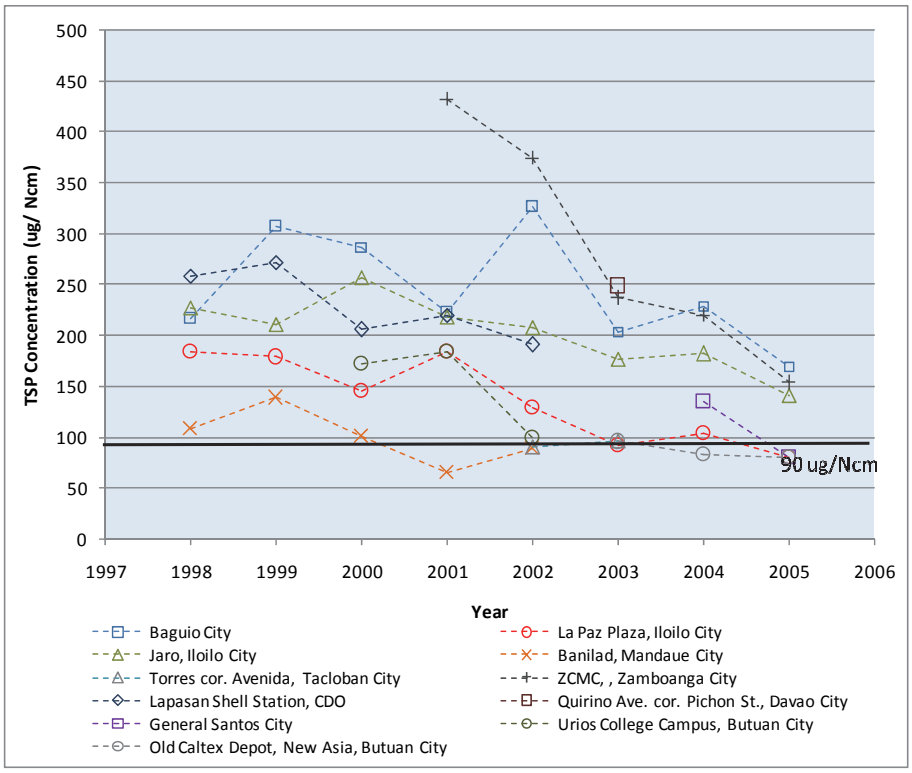
Figure 2.15: TSP Concentration in in NCR



Source: JICA Project Team

[8] Modeling by the World Bank on the effects of PM_{10} in Metro Manila, Davao, Cebu and Baguio. http://www.adb.org/Vehicle-Emissions/phi/health.asp

Figure 2.16: TSP Concentration in Cities Outside NCR



Source: JICA Project Team

2.9 Energy Consumption and Climate Change

Increase in motorization as well as reliance on fossil fuels and inefficient vehicle technologies in the transport sector has led to increased emission of carbon dioxide (CO_2) and other greenhouse gases (GHG). The continuous release of CO_2 and other GHG[9] to the environment beyond the Earth's natural absorptive capacity is accountable for global warming. Global trends suggest that the transport sector is the significant contributor in the overall CO_2 and GHG load.

There is a clear connection between energy use and carbon dioxide emissions[10]. The latest GHG emission inventory for the country points to a 22% share of the transport sector to the annual CO_2 load and 30% share to the total GHG emissions[11]. Severe congestion levels coupled with low fuel efficiency of existing vehicle fleet pose serious GHG emission situations. Recent studies in the country state that the average fuel efficiency is 4.0 km/liter for a PUJ and 3.3 km/liter for a PUB compared with around 12 km/liter for a private car[12].

PUJ and PUB units mostly run on diesel fuel with very high CO_2 emission rates. The average CO_2 emission factors for PUJs and PUBs are 601 g/km and 770 g/km, respectively, compared to 260g/km for a private car. These emission factors fall way

[9] Including Methane, Nitrous oxide, Perfluorocarbons, Hydrofluorocarbons.
[10] Studies show that since the majority of the energy consumed in transport is from liquid fuel, it can be assumed that the proportional rate of CO2 emission is just slightly lower than the percentage share of transport sector in the overall energy consumption.
[11] From the First National Communication to the United Nations Framework Convention on Climate Change.
[12] UNDP GEF Project Development Facility, "Philippines: Development and Promotion of Environmentally Sustainable Transport"

below the 162g/km level in developed countries like in United Kingdom. With the boosting travel demand, there is a growing concern over the increasing energy consumption in the transport sector and worsening GHG emissions. Without any interventions, both at the local and national levels, the future situation is one where there is a persistent use of inefficient vehicles and implementation of ineffective transport management systems and policies.

Climate change and global warming issues should be a major concern of the government and the broader civil society. The dramatic heating of the Earth's oceans is bringing about drastic changes to world's climates and is contributing to the ever-worsening climate change-induced disasters, e.g. floods, typhoons, sea level rise. Governments can stabilize energy consumption and GHG emission of the transport sector through proactive efforts. Local governments must tackle the rising levels of energy consumption in the transport sector, increasing use of inefficient vehicles, and the inefficient and sub-optimal transportation systems and policies.

The only detailed study on the GHG implications in the urban transport sector is the 2005 Integrated Environmental Strategies (IES) Report[13]. The project quantified and assessed the public health benefits of different mitigation measures with special focus on transport issues common to both controlling ambient air pollution and greenhouse gas emissions. It made use of health and economic impacts as parameters in evaluating the benefits of the mitigation measures. The following policies where tested: 1) Transportation Demand Management through license plate scheme (TDM); 2) Construction of Rail-based Mass Transit System; 3) Construction of Bikeways; 4) Implementation of the Motor Vehicle Inspection System (MVIS); 5) Introduction of the Compressed Natural Gas buses (CNG); 6) Introduction of Coco-Diesel for diesel-fueled vehicles particularly jeepneys (CME); 7) Two stroke tricycles switching to four-stroke engines; 8) Improvement of vehicles by the Use of Diesel Traps; 9) Combo 1 – combination of policies: all policies except railways and switching of two stroke to four stroke tricycles; 10) Combo 2 – all policies except railways; and 11) Combo 3 – all policies including railways.

In the IES report, the total emission of Metro Manila in 2005 in the BAU scenario was estimated at 44,069 tons per day or 16,085 kilotons for the whole year. The total CO_2 emission in the BAU scenario for 2010 was estimated at 49,771 tons per day, 13% higher than the figure for the 2005 BAU scenario. The total CO_2 emission for the BAU scenario in 2015 was estimated at 51,345 tons per day, which is an increase of 1,574 tons per day or 3% relative to the 2010 BAU scenario and an increase of 7,276 tons per day or 43% compared to the 2005 BAU scenario.

Based on the assumptions made in the scenario development, three single policies have the advantage of having more health and economic benefits. These are: 1) The implementation of the maintenance of vehicle and inspection system; 2) Switching from four-stroke to two stroke tricycles; and 3) Use of the metro railways. Decision makers, particularly the Department of Transportation and Communication (DOTC) and the Metro Manila Development Authority (MMDA), must seriously consider these three policies.

[13] Integrated Environmental Strategies Philippines Project Report: Metropolitan Manila Focus on the Transport Sector, Prepared by the Manila Observatory, http://www.epa.gov/ies/pdf/philippines/manilafinalreport.pdf

The use of CNG in buses and Coco-Methyl Ester (CME) in jeepneys did not show very important benefits because the assumptions on the targets, which were based on the government plans, were too low for any significant impact. The Department of Energy (DOE) must exert extra effort for CNG buses and CME jeepneys to have more meaningful impact on air pollution.

CO_2 emissions can be reduced with the policies proposed especially the Motor Vehicle Inspection System (MVIS) and TDM. However, the most benefits in terms of reduction of both particular matter and CO_2 can be seen with the MVIS and the railways policy scenarios. The combinations of policies resulted with the most health and economic benefits as well as reduction of CO_2. Hence, if at all possible, the combinations of these policies must be implemented. Several government agencies are responsible to implement the combination of policies, but DOTC must take lead as most of the policies are transport-related.

2.10 Traffic Congestion

A study[14] in 2000 states that time lost due to serious road traffic congestion in Metro Manila amounts to PHP100 Billion each year. Traffic congestion is especially severe during peak periods where in-vehicle time is rather long. In 1996, the recorded average travel speeds were extremely low at 12 km/h for cars and 9 km/h for buses and jeepneys. The average travel times of bus, jeepney and tricycle users are 79 minutes, 43 minutes and 17 minutes, respectively.

In order to improve the meet the future travel demand at an improved level of traffic situation than the 1996 conditions, the MMUTIS formulated a “Do-maximum network”. The ideal network requires roughly PHP 1,200 billion or USD 30 billion, out of which, PHP 800 billion or USD 20 billion are to be borne by the government. Although the entire “Do-maximum” network cannot be realistically achieved, this provides national agencies and local government units with a basis for transportation planning beyond 2015.

Congestion cost studies should be undertaken for medium and large-size cities in the Philippines in order to highlight the negative impacts of poorly managed transport systems to the economy and urban quality of life.

[14] Economic Impact of Traffic Congestion in Metro Manila, A study conducted by University of the Philippines National Center for Transportation Studies (UP-NCTS) for the National Economic Development Authority (NEDA) Legislative Executive Development Advisory Committee (LEDAC).

3 URBAN TRANSPORT DEVELOPMENT FRAMEWORK

3.1 Review of Past Studies

1) City Development Strategies[15]

The City Development Strategy (CDS) is an action plan for equitable growth in cities, developed and sustained through participation, to improve the quality of life for all citizens. The goals of CDS include a collective city vision and action plan aimed at improving urban governance and management, increasing investment to expand employment and services, and systematic and sustained reductions in urban poverty. It is not intended to substitute for integrated master plans, general land use plans, or even investment plans. Rather, it forms the basis for planning of land use, transport and other sectoral needs and for setting policy, resource allocation, and investment priorities.[16]

In 1998, the World Bank and several City Mayors from the Philippines launched the first phase of the CDS Program. After eight years, three CDS phases have been implemented. In addition to the CDS programs, a project preparation grant from the Japanese Government supported a number of cities in preparing city strategies and project feasibility studies. In all, more than 60 cities have participated in the CDS activities. Through the CDS process, the cities have generated more than 500 priority programs and projects; many of these were funded through the cities own funds, government financial intermediaries, official development assistance, central government transfers, and the private sector.

Several cities in the Philippines that have participated in the CDS initiative have expressed the need to address local traffic management and transport issues through the identification of transport-related projects including the conduct of traffic management plans and road construction. However, the CDS has yet to make strides in the realization of these project initiatives. Besides, the role of transport interventions in achieving the CDS vision is yet to be strengthened. Complementation between urban development and transport planning efforts needs to be pursued. Appendix 3 presents the urban transport-related strategies and programs identified by selected CDS cities in the Philippines.

2) National Land Transport Policy Framework

With the rising fuel and food prices and other critical issues confronting the land transport sub-sector in the Philippines, Executive Order 712 was issued on 11 March 2008. This directed the DOTC to formulate the National Land Transport Policy Framework (NLTPF).

The significance of this undertaking is viewed from the recognition that traditional transport system management concentrated on individual transport modes and physical infrastructure results to disconnected efforts. There is the need to move the country to a more holistic, multi-modal approach to transport policy, planning and investment assessment that compares all feasible solutions and takes full account of social,

[15] The Cities Alliance is a global coalition of cities and their development partners committed to scaling up successful LGU approaches to poverty reduction. The Cities Alliance supports cities in two key areas: the preparation of City Development Strategies (CDS) and citywide and nationwide slum upgrading programs.

[16] The International Bank for Reconstruction and Development/ The World Bank, Cities on the Move: A World Bank Urban Transport Strategy Review, 2002.

economic, and environmental factors ('triple bottom line' perspective) as well as to support integrated land transport sub-sector decision-making to stimulate economic activity and act as a driver to poverty alleviation.

A series of consultation workshops was undertaken from March to May 2008 to provide the key inputs to the policy document. However, the draft NLTPF has yet to be fine-tuned, adopted by concerned transport-related agencies, and translated into binding policies.

3) National Transport Policy and Planning

National Transport Policy and Planning (NTPP)[17] is an AusAid-funded initiative under the Philippines–Australia Partnership for Economic Governance Reforms (PEGR). NTPP is a five-year program aimed at supporting the Philippine Government in the formulation and implementation of reforms in various areas of economic governance including reforms in the transport sector. It is expected to provide the foundation and framework for a National Transport Plan and a Medium-Term Public Investment Plan (MTPIP).

NTPP assessed relevant planning options with special regard to the experience gained in earlier transport strategy and planning processes in the Philippines. The proposed framework for National Transport Policy and Planning is based on the Coordinated Incremental Planning process. The framework envisions a setup where the preparation of the transport development plan will be carried out by each transport agency, but the individual transport plans must be guided and coordinated by referring to the Transport Policy Document prepared by the DOTC. The framework also should be made consistent with the Philippine planning system, enable long-term planning, and incorporate a Transport Expenditure Assumption, which is the resource envelop that can realistically be expected to be available to the transport sector.

As of date, the Cabinet-level Infrastructure Committee (InfraCom) has dispensed with the signing of the draft EO since the Committee has endorsed the findings and recommendations of the NTPP Study. The second phase of the Reform Agenda (RA) under NTPP is now in full swing and a Terms of Reference has been issued for the formulation of a National Transport Plan (NTP)[18]. The objectives of the RA is to foster renewed understanding of sound transport planning, policy development, and regulatory measures and to take this into practical formulation of transport policy and planning guidelines in the implementing agencies. An important feature of this is the reference to the Medium Term Expenditure Framework as a fiscal resource envelope that, realistically, can be expected to be available to the transport sector for locally funded projects as well as foreign-funded and Public-Private-Partnership (PPP) projects.

[17] AusAid, Philippines–Australia Partnership for Economic Governance Reforms (PEGR), Activity 4 Report: Implementation Strategies for NTPP Recommendations, RA 008-01: Developing a Methodology and Framework for National Transport Policy and Planning, December 2008.
[18] AusAid, Terms of Reference, Reform Agenda 008-02 Formulating a National Transport Plan

3.2 Review of Urban Transport Master Plans

1) Metro Manila Transportation Integration Study

The Metro Manila Transportation Integration Study (MMUTIS)[19] followed the conventional transport planning process, but also incorporated participatory planning through its planning workshops and consultative activities. MMUTIS formulated and evaluated four scenarios on future **urban development patterns.** They were in the range from continuation of current trends to strong interventions to decentralize and force growth at the regional level. The study selected Scenario III that assumed that a transport network would be developed more strategically to encourage the current land use trend to continue, but with more effective land use control and growth management of the urban areas.

A transport master plan was developed by MMUTIS based on the chosen scenario. The plan was a product of two rounds of plan testing and evaluation. The first round of network development produced a network that would entail an investment of USD30 billion. Unfortunately, the investment requirement would be as much as twice the possible fund for transport infrastructure estimated even under the high growth scenario.

A second round of transportation plan development was undertaken with the total cost pegged at USD15 billion, with USD10 billion coming from the public sector. The network ensured that the North-South corridors would be provided with ample transport infrastructure to guide the planned urbanization. Investments would still cover primary and secondary road network, expressway system and mass transit systems, albeit at a reduced scale. The primary and secondary arterial road network would cover a length of around 600 km. Under this network, the planned radial-circumferential road system would be fully developed. The expressway system would cover all existing, on-going and committed projects totaling 138 km in length plus 78 km of new expressways identified by MMUTIS. The road network development would be complemented by mass transit systems, consisting of the full development of the LRT/MRT network to Line 6, Manila Commuter Express (MCX), Northrail and bus ways.

It must be noted that the MMUTIS Master Plan was never institutionalized by any policy or statutory document or issuance and no formal monitoring and evaluation system was put in place**.** Most of the study's recommendations remain on paper with urban transport institutions locked into a 'business-as-usual' mode. Only about one-fifth of the desired medium-term transport investment program had materialized. As a result, the gap between the demand and supply in Metro Manila has widened. Even until now, no serious efforts have been conducted to evaluate and assess project achievements and/or new project proposals in relation to the Master Plan.

2) Metro Cebu Land Use and Transport Study

The Metro Cebu Land Use and Transport Study (MCLUTS) prepared a structure plan to guide the development of Metro Cebu from 1981 to 2000. A phased program of transportation infrastructure investments had been prepared in the context of the Structure Plan. Included in the short-term plan were transportation system management measures. The strategic planning component of the MCLUTS formulated, tested and

[19] The Metro Manila Urban Transport Integration Study (MMUTIS) was conducted from 1996 to 1999 with technical assistance from the Japan International Cooperation Agency (JICA).

evaluated four basic urban forms, namely: 1) Concentrated without mainland reclamation; 2) Concentrated with mainland reclamation; 3) Linear-dispersed; and 4) Mactan Island expansion.

Decision-makers selected Plan 2 for implementation. The study team evaluated the need for a rail mass transit system and concluded that such would not be needed by year 2000. The medium to long-term plan consisted basically of road network improvements. A second connection between the mainland and Mactan Island was not part of the preferred plan.

Most of the recommendations of the MCLUTS have been implemented. As part of the Structure Plan, the Mandaue and Cebu City reclamation projects have been completed, providing a good road network. Construction of new road links and widening of existing ones helped in the development of a road hierarchical system. A new bridge connecting the mainland and Mactan Island has been built which is a feature of Plan 4 and not of the originally selected Plan 2. This indicated a shift in priority during the course of plan implementation. Notwithstanding substantial progress in implementing the Structure Plan, several recommendations that would have been important for completing a road hierarchical system by year 2000, remain as proposals. Short-to-medium term transportation system management measures, including a modern urban traffic control system, have been implemented.

The study has recommended the creation of a development authority, although this has not yet been implemented. However, a project office, the Metro Cebu Development Project, has been established to manage the implementation of the MCLUTS recommendations. Prior to its creation, the Metro Cebu Transportation and Traffic Engineering Office was setup to develop the medium to long-term transport proposals of MCLUTS and implement its short-term recommendations. More than seven years have passed since the expiration of MCLUTS and still no successor plan is in place. It is about time that a new round of transportation master planning exercise is undertaken to produce a structure plan that would guide the development of Metro Cebu for the next 20 years.

3) Davao City Urban Transport Cum Land Use Study

The Davao City Urban Transport Cum Land Use Study (DCUTCLUS)[20] Project had two purposes, namely 1) the formulation and implementation of an Urgent Implementation Program for the remedy of impending problems from which Davao City was currently suffering, and 2) the laying down of a transportation and land use master plan which would provide the City with a guide for development and transportation/traffic administration up to the year 2000. In addition, the training and education of personnel in charge of transportation planning was also intended through the process of the Study.

The Urgent Implementation Program includes 1) a traffic control plan for Poblacion and the vicinity; 2) a plan for the improvement/ development of streets in downtown Poblacion; and 3) a PUJ rerouting scheme. The Transportation Cum Land Use Master plan consisted of a short-term plan up to 1985, and a medium-term plan up to the year 2000, 1990 was designated as the year for interim review. The master plan has the following components: 1) establishment of a socio-economic framework; 2) formulation of medium and long-term

[20] In 1979, the then Ministry of Public Works and Highways set up a team for a DCUTCLUS and a steering committee consisting of representatives from concerned agencies.

land use plans; 3) designing of a transportation facilities development master plan; 4) designing of a public transportation master plan; 5) formulation of an investment plan; and 6) pre-feasibility studies of major projects.

A person-trip survey, the most important of the data generating efforts, has been conducted covering approximately 85% of the study area, which includes the entire administrative area of the city. The project area, on the other hand, covers the coastal part of the city including the Poblacion with a total land space of about 18,000 hectares. Three urban development patterns were conceived as follows:

(a) Alternative A: Mono-Center Development Pattern – The outward expansion of the existing Poblacion, in an attempt to contain urban space to as compact an area as possible;

(b) Alternative B: Belt Shape Development Pattern – The development of urban space along a major road and/or a secondary road which will traverse the project area in north-south direction, in an attempt to achieve development with an even geographic spread; and

(c) Alternative C: Multi-Center Development Pattern – The designation of a number of strategic development districts as growth centers and the accumulation of social capital in these districts with a priority emphasis, in an attempt to prevent overcrowding of the urban area while preventing the over-dispersion of investment.

Alternative A provides for development which rests on the past trend and. Therefore, is the easiest of all to realize. However, the implementation of Alternative A will inevitably bring about overcrowding and its undesirable consequences such as the aggravation of dwelling environment and traffic congestion. Also, this alternative was found undesirable because it was thought to hinder the segregation of commercial, industrial and housing land uses.

Alternative B was thought to have an advantage of distributing various functions evenly throughout the area and offering a greater degree of freedom in selecting sites for various facilities, but the excessive distribution of investment in the project area, where the accumulation of social capital was still limited, was thought to negate the effects of the investment.

Alternative C was concluded to be the most desirable development pattern for the project area. It was thought at that time that the multi-center development pattern will eventually evolve into a belt shape urban development in the future. Detailed financial analysis revealed that the introduction of rail-transit will still be premature in the target year 2000.

4) Transportation and Traffic Management Plan for Davao City

The study[21] was primarily undertaken to come up with a transportation and traffic management plan that would meet the travel needs of the rapid urban expansion of the city of Davao. In particular, the study intended to: 1) assess the existing traffic condition in Davao City through compilation of primary and secondary data; 2) design an efficient traffic circulation plan to ensure smooth vehicular and pedestrian flow; 3) identify traffic management measures and alternatives appropriate for the city to alleviate congestion; 4)

[21] Final Report, Transportation and Traffic Management Plan for Davao City, University of the Philippines National Center for Transportation Studies Foundation, June 2000.

develop a framework plan for long-term period; and, 5) recommend policy directions to sustain programs for short, medium, and long-term plans.

The Davao City Comprehensive Development Plan (CDP) and the Davao Integrated Development Program (DIDP)[22] have provided the medium-term and long-term plans towards the realization of the city's development vision. The DIDP has looked at the metropolitanization of Davao City and its impacts on the Davao Gulf area. On the other hand, the CDP has focused on the city's urbanization and economic growth. However, one aspect that was not given much attention is the formulation of a vision of the city for development of its transportation system. This vision is essential towards the realization of the city in attaining sustainable transportation system. This is because the development of a comprehensive transportation plan for the city shall be guided by this vision.

The study proposed a transportation vision and policy for Davao City. The transportation policy is anchored towards the development of a sustainable transportation system supportive of the city's development vision. Furthermore, the Study proposed a transportation planning framework that is intended to provide an efficient and sustainable transportation system and network for city. The proposed planning framework consisted of goals, objectives, as well as, short, medium and long-term interventions.

The transportation planning framework proposed for Davao City is basically a reiteration of the need to integrate land use and transportation planning for the future development of the city. Furthermore, the desire to alleviate the existing pressing transportation and traffic problems of the city further justifies the need for the framework. The short-term and medium-term plans draw the necessary soft and hard measures toward this end. On the other hand, the long-term plans are aimed at providing the necessary transportation and land use programs, schemes and measures toward the attainment of sustainable development of the city and to make Davao City more livable and competitive in the region and in the BIMP-EAGA area.

5) Road Network Improvement of Regional Growth Centers

The study[23] on Road Network Improvement for Development of Regional Growth Centers was undertaken in 2004 covering Metro Iloilo, Metro Bacolod, and Metro Cagayan de Oro. The objectives of the study were: 1) formulate a Master Plan for the Urban Road Network Development including short, medium and long term implementation programs; 2) carry out a feasibility study for high priority road projects; and, 3) enhance the capability of the National Government as well as the Local Government Units for urban road network planning and feasibility study. The study entailed the conduct of the following activities: 1) Socio-economic profiling of the metropolitan areas; 2) Review of transport and traffic conditions; 3) Urban transport and land use modeling; 4) Development of urban road master plans; and, 5) Feasibility studies on priority road projects.

An urban road master plan has been formulated for each study area. No policy issues have been addressed. It is not clear, however, if the master plan that was developed for each of the study area was adopted by the concerned Local Government Unit. As with the

[22] Final Report, The Study on the Davao Integrated Development Program Master Planning, JICA, March 1999.
[23] Final Report, The Study on Road Network Improvement for Development of Regional Growth Centers in the Republic of the Philippines, JICA, October 2004.

case of the MMUTIS Master Plan, there is no clear institutionalization, including monitoring and evaluation system in place.

3.3 Land Use and Transport Planning

There is a growing need to address urban transport issues in several other large and medium size cities, especially since most of these cities often do not have well-developed urban transport plans or transport services. Except for Metro Manila[24], Metro Cebu[25], and Davao City[26], very few comprehensive urban transport studies have been undertaken for cities, if at all.

In terms of local development planning, the Local Government Code of 1991 clearly defines urban planning and management and as a primary responsibility of the local government units. More specifically, this responsibility includes land use planning and the application of appropriate local development controls that should consistent with national and provincial plans and policies. The common experience however has been uncontrolled urban development in cities that have resulted to ribbon-type commercial development along major roads, uncontrolled squatting in the coastal areas, and the deterioration of the central business district. High intensity land uses tend to gravitate along national roads and cities oftentimes have failed to developed appropriate development controls in these areas. As such, these corridors become congested thereby necessitating the construction of bypass roads.

The HLURB is the regulatory body responsible for land use and housing. It is mandated to formulate land use planning guidelines and standards. A city or municipality with rural areas within its jurisdiction prepares its Comprehensive Land Use Plan (CLUP) consisting of a General Land Use Plan and an Urban Land Use Plan based on the guidelines of HLURB. The general land use plan covers the whole area of the LGU. The urban land use plan, on the other hand, is for the built-up area (the poblacion and its vicinity).

The weakness of the present urban planning system in the Philippines is its reliance on minimum standards. Furthermore, urban transport planning have not been given due attention in the existing guidelines and standards. While good city-specific plans and policies are crafted by the respective local governments, weak coordination and integration among such plans and policies have not ensured sustainable urban transport development for the cities as a whole.

There has been a realization on the need to provide tighter integration between the CLUP and the CDP and the need for simplified local planning process for local governments**.** A Joint Memorandum Circular (JMC)[27] between the Department of Interior and Local Government and the Housing and Land Use Regulatory Board (HLURB) has been issued. The circular identifies guidelines on the harmonization of steps and processes in the preparation of the CLUP and CDP for local governments.

[24] 1999 Metro Manila Urban Transportation Integration Study (MMUTIS), among others.
[25] 1981 Metro Cebu Land Use and Transport Study (MCLUTS).
[26] 1983 Davao City Urban Transport Cum Land Use Study (DCUTCLUS).
[27] Under this JMC, the DILG shall issue the Rationalized Local Planning System (RPS) Sourcebook and the accompanying Guide to Ecological Profiling and CDP Preparation for local governments, while the HLURB, its set of Guidelines for CLUP Preparation. Both agencies shall ensure that their respective guidebooks shall serve as instruments for strengthening and enhancing LGU capacities on spatial and multi-sectoral planning.

DOTC is the agency responsible for transport planning. Under the Administrative Code of 1987 (Executive Order No. 292), the DOTC "shall be the primary policy, planning, programming, coordinating, implementing, regulating and administrative agency of the Executive Branch of government in the promotion, development and regulation of dependable and coordinated networks of transportation and communications systems as well as in the fast, safe, efficient and reliable postal, transportation and communication services". The DOTC is also tasked to develop policies[28] that should strengthen the linkage between national and local transport planning. As such, the DOTC is the primary agency which, either directly or through its sectoral offices[29] and attached agencies[30], oversees policy, planning, operations, regulations, and investment in all modes except for road infrastructure.

3.4 Funding for Urban Transport

1) Motor Vehicle User's Charge

Republic Act No. 8794 entitled, "An Act Imposing a Motor Vehicle User's Charge (MVUC) on Owners of all types of Motor Vehicles and for other Purposes", otherwise known as the MVUC Law which was ratified in June 2000 stipulates that all monies collected under his law shall be earmarked and used exclusively for road maintenance and improvements of road drainage, installation of adequate and efficient traffic lights and road safety devices, and air pollution control, which shall be deposited to the National Treasury in the following (4) Special Trust Accounts, wherein a Road Board was created to manage the said funds in a prudent and efficient manner:

(i) Special Road Support Fund;

(ii) Special Local Road Fund;

(iii) Special Road Safety Fund; and

(iv) Special Vehicle Pollution Control Fund

The MVUC Law also directs that the Special Road Support Fund, Special Local Road Fund, and Special Road Safety Fund shall be under the DPWH and Special Vehicle Pollution Control Fund shall be under the DOTC. According to the Road Board Operations Manual, the following are the allocations of the monies: 80% for the is dedicated to the Special Road Support Fund, 7.5% is dedicated to the Special Local Road Fund (SLRF), another 7.5% is allocated to the Special Road Safety Fund (SRSF) and the last 5% is dedicated to the Special Vehicle Pollution Control Fund.

Of all the special funds under MVUC, only the SLRF is readily accessible for cities and provinces**.** Presently, road users contribute only about PHP7-8 billion a year under the

[28] The DOTC is mandated to formulate and recommend national policies and guidelines for the preparation and implementation of integrated and comprehensive transportation and communications systems at the national, regional and local levels; to establish and administer comprehensive and integrated programs for transportation and communications; and to administer and enforce all laws, rules and regulations in the field of transportation and communications.

[29] Land Transportation Office (LTO) for safety regulation of motor vehicles and drivers, Land Transportation Franchising and Regulatory Board (LTFRB) for the economic regulation and enforcement of public transport laws, Toll Regulatory Board (TRB) for the regulation of limited access highways (expressways and tollways), Office of Transport Cooperatives (OTC) for the promotion of transport cooperatives, and Office of Transport Security (OTS) for the regulation and enforcement of transport security laws.

[30] Philippine National Railways (PNR) for the development and operation of rail systems and the Light Rail Transit Authority (LRTA) for the development and operation of urban rail systems, particularly in Metro Manila.

MVUC special funds[31]. At this level, some PHP400 million is available to local government units for road maintenance. The SLRF is allocated to 200 cities and provinces nationwide. The allocation per city and province is computed based on 10% from equal share, 20% from vehicle population and 70% from road length.

As previously mentioned, the SLRF spending is limited to maintaining existing road surface of provincial and city roads. This means that maintenance spending do not cover paving of roads with earth and gravel surfaces. In large cities where roads are mostly paved, maintenance of road surface would result in significant economic benefits due to time savings and lesser operation costs among others.

On the other hand, in medium cities where basic road network is not yet complete and many road sections are still unpaved, the benefits of maintaining the road maybe lesser compared to large cities. The monitoring of SLRF allocations have been problematic as there are no specific guidelines specifying treatment of SLRF allocations in local accounting processes. Table 3.1 shows the allocation of the SLRF for 2008.

The SRSF could easily provide the needed funds for enhancing road safety in cities. However, there are still no specific guidelines from the Road Board regarding the allocation of this fund for cities. The fund are being allocated to national agency partners with their specific actions forming part of the 2004 Road Safety Action Plan. However, the utilization rate of the fund has been rather low.

2) Local Funds

One of the major reasons why urban transport-related projects do not figure dominantly in the CDP is the absence of transport data on the local level. Because of poor transport sector data, sectoral analysis is difficult and necessary transport projects cannot be identified. On the other hand, there is a need to work closely with LGUs in terms of distilling workable approaches in funding local transport projects.

With decentralization, LGUs are envisioned to play a major role in altering the relative attractiveness of urban centers to firms and skilled labor by offering different bundles of local services (most especially infrastructure) vis-à-vis varying levels of local taxes and user charges[32]. More specifically, LGUs can help affect the cost of doing business through their expenditure as well as regulatory policies and thus, make their jurisdictions more competitive to new investments relative to other locations.

Under the Local Government Code, LGUs shall appropriate in its annual budget no less than 20% of its IRA for development projects, otherwise known as Local Development Fund (LDF). However, it is not clear as to what extent such fund has been utilized to support local transportation infrastructure projects like barangay and city roads.

[31] AusAid, Philippines–Australia Partnership for Economic Governance Reforms (PEGR), Activity 3 Report: Main Volume Future Planning Concepts and Methodology, RA 008-01: Developing a Methodology and Framework for National Transport Policy and Planning, September 2008.

[32] Manasan, R. (2006), Infrastructure and Decentralization, Paper presented during the Visioning Meeting for the Philippine Transportation Sector held at the Manila Hotel, 25 October 2006.

Table 3.1: Special Local Road Fund (SLRF) Allocation for 2008

REGION	EQUAL SHARE		VEHICLE SHARE		LOCAL ROAD PROVINCIAL./CITY			
	Number of Prov. & City	Equal Share Index	Vehicle Population	Vehicle Population Index	Road Length (km.)	Road Length Index	Distribution Factor	Fund Allocation Prov./City
NATIONAL CAPITAL REGION	16	1	1592036	1	3426.816	1	1	38,880,784
Caloocan City	1	0.063	61567	0.039	226.723	0.066	0.06	2,344,409
Las Pinas City	1	0.063	81205	0.051	70.948	0.021	0.031	1,203,129
Makati City	1	0.063	77777	0.049	227.581	0.066	0.063	2,430,400
Malabon City	1	0.063	44290	0.028	78.716	0.023	0.028	1,084,516
Mandaluyong City	1	0.063	53393	0.034	80.265	0.023	0.029	1,141,281
Manila City	1	0.063	243136	0.153	490.746	0.143	0.137	5,328,197
Marikina City	1	0.063	82393	0.052	39.303	0.011	0.025	957,599
Muntinlupa City	1	0.063	67779	0.043	63.671	0.019	0.028	1,079,755
Navotas City	1	0.063	20569	0.013	48.975	0.014	0.019	732,443
Paranaque City	1	0.063	48322	0.03	174.428	0.051	0.048	1,864,376
Pasay City	1	0.063	82765	0.052	59.26	0.017	0.029	1,117,919
Pasig City	1	0.063	106335	0.067	371.462	0.108	0.095	3,712,624
Quezon City	1	0.063	486224	0.305	1191.1	0.348	0.311	12,077,908
San Juan City	1	0.063	44830	0.028	83.596	0.024	0.029	1,125,911
Taguig City	1	0.063	43323	0.027	165.775	0.048	0.046	1,771,235
Valenzuela City	1	0.063	48128	0.03	54.267	0.016	0.023	909,083
CORDILLERA ADMINISTRATIVE REGION	8	1	98118	1	1878.852	1	1	13,784,899
Baguio City	1	0.125	30946	0.315	142.703	0.076	0.129	1,774,747
REGION III - CENTRAL LUZON	20	1	1259505	1.001	3389.657	1	0.9981	36,220,253
Angeles City	1	0.05	82099	0.065	218.186	0.064	0.063	2,285,296
Olongapo City	1	0.05	32775	0.026	148.247	0.044	0.04	1,478,474
REGION IVA - CALABARZON	17	1	1083564	1	2067.233	1	1	25,982,624
Lucena City	1	0.059	41968	0.039	29.93	0.014	0.024	617,437
REGION IVB - MIMAROPA	7	1	126651	1	2844.797	1	1	19,721,556
Puerto Princesa City	1	0.143	27796	0.219	209.951	0.074	0.11	2,166,231
REGION VI - WESTERN VISAYAS	2	1	580715	1	4179.83	1	1	34,897,877
Iloilo City	1	0.045	89246	0.154	688.68	0.165	0.151	5,256,176
Bacolod City	1	0.045	79759	0.137	296.2	0.071	0.082	2,848,350
REGION VII - CENTRAL VISAYAS	1	0.15	171,261.00	0.20	216.91	0.07	0.10	3,217,720
Cebu City	1	0.05	76052	0.088	87.226	0.026	0.041	1,314,067
Lapu-Lapu City	1	0.05	41388	0.048	4.069	0.001	0.015	496,158
Mandaue City	1	0.05	53821	0.062	125.614	0.038	0.044	1,407,495
REGION VIII - EASTERN VISAYAS	13	1.000	210,210	1.000	2,116.82	1.000	1.00	17,215,564
Tacloban City	1	0.07692308	33,105	0.157	110.101	0.052	0.076	1,301,463
REGION IX - ZAMBOANGA PENINSULA	8	1.000	270,309	1.000	1,651.90	1.000	1.00	14,053,288
Zamboanga City	1	0.125	64,779	0.240	16.785	0.010	0.068	949,191
REGION X - NORTHERN MINDANAO	14	1.000	305,260	1.000	3,355.76	1.000	1.000	25,807,846
Cagayan de Oro City	1	0.071	69,699	0.228	165.184	0.049	0.087	2,252,122
Iligan City	1	0.071	14,186	0.046	66.843	0.020	0.030	784,054
REGION XI - DAVAO REGION	10	1.000	427,706	1.000	4,804.040	1.000	1.00	35,008,446
Davao City	1	0.100	112,296	0.263	1,637.38	0.341	0.301	10,540,834
REGION XII - SOCCSKSARGEN	9	1.000	281,226	1.000	2,900.10	1.000	1.00	21,899,086
General Santos City	1	0.111	34,256	0.122	582.222	0.201	0.176	3,854,342
CARAGA	11	1.000	103,786	1.000	1,681.28	1.000	1.00	13,195,052
Butuan City	1	0.091	9085	0.088	89.224	0.053	0.064	841,137

Source: DILG

Manasan (2006) observes that the mismatch between the revenue and the expenditure assignment under the Code does not provide strong internal incentives for a long-term view in local planning and consequently, local infrastructure spending. Thus, it is important to look at other mechanisms for accountability. A greater upward accountability can be enhanced by clarifying the mandate supporting the link among the CDP, Annual

Investment Plan, and local budget of cities. It would also be helpful if DBM, DILG, and NEDA work together to strengthen the planning-budgeting linkage by mandating that the LDF be used only for projects that are found in the CDP.

Downward accountability can also be promoted by: (i) early engagement of local elected officials in the plan preparation process so as to promote their commitment to the plans that are formulated (thus, the emphasis on the drafting of an Executive Agenda), and (ii) the meaningful participation of a broad-based multi-sectoral group in the exercise so as to give local communities greater voice in the process and to promote greater accountability on the part of local officials. In this context, the multi-sectoral planning group includes representatives not just from the local community (LGU officials, NGOs and the wider population) but also from national government agencies that are operating in the local area in order to re-establish a link between the local plans and the national plans and, more importantly, to generate external funding for local projects.

3) Performance-Based Grants

The experience of DILG in managing the SLRF is notable as it demonstrates the catalytic impacts of fund allocations that can be channeled to LGUs. Fund allocations can be subject to appropriate levels of monitoring and evaluation with a mix of capacity-building strategies. In the case of SLRF, DILG conducts field visits and dialogues with concerned LGUs. The DILG have also collected useful statistics relating to the urban transport system of LGUs. For example, the SLRF office now maintains an inventory of existing city and provincial roads. These strategies can be supportive in the administration of performance-based grants for urban transport.

A closer institutional cooperation setup between the DOTC and DILG will also need to be established. While DOTC is the main policy and planning agency in relation to transport development, the DILG works closely with city governments. While DILG does not have the financial resources to support the urban transport development needs of LGUs, DOTC may be able to provide seed funds to assist LGUs.

3.5 Environmentally Sustainable Transport

The Philippines is committed to identify, promote and undertake Environmentally Sustainable Transport (EST) strategies and initiatives, in support of national progress and development. In fact, the country is a signatory to various conventions and declarations. The Philippines has undertaken various programs and activities towards achieving sustainable development and addressing climate change since its signing to the United Nations Framework Convention on Climate Change (UNFCCC) Agreement in Rio de Janeiro in 1992. These activities eventually led to the formulation, legislation and implementation of Republic Act No. 8749 or the “Philippine Clean Air Act of 1999,” which provides for environmentally sustainable transport through harmonization of national emission standards with the international standards.

The Philippines is also a signatory to the Aichi Statement of 2005 that recognizes, among others, the need for both national and local level governments to develop and adopt integrated policies, strategies, and programs incorporating key elements of environmentally sustainable transport. The Aichi Statement defines these key elements of EST into twelve (12) thematic areas including (not in order of importance):

(i) Public health;

(ii) Strengthening roadside air quality monitoring and management;

(iii) Traffic noise management;

(iv) Vehicle emission control, standards, and inspection and maintenance;

(v) Cleaner fuels;

(vi) Public transport planning and travel demand management;

(vii) Non-motorized transport;

(viii) Environment and people friendly infrastructure development;

(ix) Social equity and gender perspectives;

(x) Road safety and maintenance;

(xi) Knowledge base, awareness, and public participation; and

(xii) Land use planning.

In August 2008, the United Nations Centre engaged the University of the Philippines National Center for Transportation Studies (UP-NCTS) for Regional Development as the National Collaborating Center for the formulation of a National EST strategy document for the Philippines. The overall objective of this endeavor is to develop and mainstream EST strategies that are sensitive to future development scenarios. Strategies should be developed considering future development scenarios such as vehicle growth, level of urbanization, population density, and economic growth. The overall goals of the strategy are:

- Reduction of the annual growth rate of energy consumption and associated GHG emissions from the transport sector in urban areas of the country;
- Enhance sustainable mobility through the development of a viable market for EST goods and services, which involves, among others, the promotion of transportation systems of low carbon intensity and shift towards the use of more sustainable transport modes.

In December 2008, Administrative Order No. 254 mandated DOTC to take the lead in the formulation of a National EST strategy. The formulation of the national strategy is primarily intended for the identification of priority challenges in the context of EST that would need to be addressed through the formulation of strategies. These strategies will have specific targets, incorporate multi-sector commitments, and recommend measures for the promotion of EST in Philippines.

The EST strategy-cum-action plan should establish linkage between and the on-going local and national activities, including initiatives of international agencies, addressing issues of vehicular pollution as well as other elements of EST. In order to avoid duplication in efforts, the national EST strategy-cum-action plan should, as far as possible, build on or complement already existing sectoral plans, strategies, or initiatives, if any, addressing transport related issues. The strategy-cum-action plan should recommend country-specific, realistic, feasible actions, or measures which could stimulate the National Government policy making bodies as well as international donor agencies. The national strategy should take into consideration potential financial resources and recommend financial mechanisms to generate required resources for implementation of the strategy-cum-action plan.

The concept of EST planning paradigm was first brought to the fore by the Organization for Economic Cooperation and Development nations in the early 1960s to decouple economic growth from the negative externalities of transport. Under this policy approach, environmental protection is deemed equally important as other policy goals for the

transport sector. There are 3 key differences between EST and the conventional approaches to transport planning and policy development. Firstly, the goals of EST are consistent with sustainable development, whereas, conventional approaches are more for mobility and accessibility with mitigating measures prescribed to counter-act possible negative externalities of the resulting transport system, in short reactive. Secondly, EST views negative externalities in its entirety, whereas, conventional approaches tend to focus on mitigation of environmental impacts per transport activity unit. And, thirdly, because of its pro-active nature, the recommended policy instruments are aimed at restraining growth in the most environmentally damaging forms of transport activity.

4 SIMPLIFIED URBAN TRANSPORT ANALYSIS

4.1 Background

A simplified set of analysis tools is sought to provide for rapid assessment of urban transport development needs in medium to large-size cities in the Philippines, particularly those outside of Metro Manila. There is need to institutionalize a data collection and management system in order to make access to critical urban transport planning and management data cost-effective and sustainable. Collection of statistics in central offices of concerned transport agencies should be disaggregated at the LGU level to allow for detailed analysis at the city level.

4.2 Sources of Data

Data that are produced by transport and other related agencies can provide basic information that can be used to perform rapid assessment of urban transport needs. Table 4.1 presents the sources of readily available data.

Table 4.1: Sources of Readily-Available Data

Agency	Data Category	Data Attributes
DPWH	Road Network	Inventory of National Roads
	Traffic Counts	AADT along National Roads
DILG	Road Network	Inventory of Provincial and City Roads
	Transport Financing	Allocations from the Special Local Road Fund (SLRF)
NSO	Demographic	Population by Barangay
LTO	Motor Vehicle Registration	Registration for Private and For-Hire Vehicles
LTFRB	Public Transport	Public Transport Franchise
LGU	Road Network	GIS maps and Road Inventory
	Land Use	Urban Land Use
	Public Transport	Tricycle Franchise
BLGF	Transport Financing	Statement of Income and Expenditure

Source: Author

1) Road Network Data

Road network data, which include information on surface type and surface conditions, are available in different offices in charge of road administration. The Department of Public Works and Highways (DPWH) maintains a regular inventory of national roads, while the DILG, in the office of Special Local Road Fund, keeps an updated inventory of provincial and city roads. There is no central repository of barangay road data as these are usually kept at local planning or engineering offices, or the district engineering offices of the DPWH.

2) Traffic Count Data

Traffic counts data are available for some national roads sections at the DPWH Planning Service Division. Traffic counts for city roads, are commonly not performed except for cities that have prepared local transport plans and have conducted local traffic counts.

3) Motor Vehicle Registration Data

Motor vehicle registration data are available at the Management and Information Division of LTO. Data are commonly aggregated according to district offices of LTO and, as such, only give broad indications of the vehicle registration characteristics of cities. Motor

vehicle registrations are classified according to vehicle type, ownership type, engine type, and age among others.

Electronic data on district office level statistics are however not available for older years. Since paper-based district level data at Management Information Department (MID) are commonly lent out to researchers coming to LTO, pages are sometimes mixed up or have missing sections. These contribute to the gradual demise of the quality of older statistics, and inconsistencies with quality with more recent data. Some motor vehicle registration data are kept and recorded in socioeconomic profile or sectoral profile available at the city planning and development office.

4) Public Transport Data

Public transport supply and operations data are critical to the planning of public transport system. Deregulated public transport in the country has contributed to the absence of centralized data collection system for public transport system particularly on the level of passenger ridership. The number of passenger utility vehicle units and buses that are for hire is available from LTO and gives an indication of the supply, while operational data like routes, fare, and operating units are available from LTFRB. Franchising for other public transport modes like tricycles and pedicabs are performed by the LGUs.

5) Traffic Accident Data

Data on road accidents are important for road safety planning. Two of the main sources of traffic accident data in the country are the Traffic Accident Reporting and Analysis System (TARAS) and Metropolitan Manila Accident Reporting and Analysis System (MMARAS). TARAS started in 2004 and is integrated by DPWH. MMARAS started in 2002 and is maintained by MMDA. Both systems make use of a computer software and recording procedure of traffic accidents involving local traffic enforcement units. Details on traffic accidents are recorded in TARAS forms, processed into the database, and are submitted to the DPWH district offices. MMARAS, on the other hand, is operated under the Metropolitan Road Safety Unit (MRSU) of the MMDA Traffic Operation Center (TOC) with the cooperation of the Traffic Enforcement Group of the NCR Police office of the PNP.

For cities outside Metro Manila, which have the function of upgrading and maintaining city roads, data on accidents are often missing or inadequate. While local traffic enforcement groups under the PNP would record accident data including those that are not covered by the TARAS, i.e. those occurring in provincial, city, municipality, and barangay roads, the data management is still not as efficient. For example, the Philippine National Police - Highway Patrol Group regularly collects and integrate accident data from the different regional Highway Patrol offices. However, it is manned by a single employee who singlehandedly performs the encoding and formatting of the data. Because of this, organizational changes often modify the format or discontinue the upkeep of data.

6) Transport Funding

The level of investment and the source of financing urban transport investment are necessary in determining the capacity and efficiency of LGUs for financing urban transport programs and projects. Majority of city transport investment data are only available at the local budget or treasury office. These data can be extracted from detailed Statement of Income and Expenditure accounts that often come in raw form. Data integration is often done according to the minimum requirements and standard format of the Bureau of Local Government Finance (BLGF). The data format is commonly in aggregated form and do

not specifically identify, for instance, details of economic services expenditure which may partially cover transport investments. Some data on road maintenance expenditure are, however, available at the central office level.

Allocations to cities from the SLRF are available at the fund disbursement office at the DILG Central Office. On the other hand, MVUC district engineering office/ regional allocations for national road maintenance are available from the Road Board.

4.3 Urban Transport Indicators

An indicator system is proposed for the rapid assessment of urban transport needs in key medium and large-size cities in the Philippines. The proposed urban transport indicators are: 1) urban density; 2) vehicle density, based on area and length of roads; 3) vehicle ownership per population; 4) road density; 5) public transport density, based on area and length of roads; 6) city income per capita; and, 7) road fund availability.

Urban density, vehicle density and vehicle ownership can be considered as indicators of urban transport demand. On the other hand, road density and public transport density can be considered as indicators of urban transport supply. The last two indicators, namely, city income per capita and road fund availability can be taken as indicators of the resource capacity of cities.

Correlation analysis provides insights into the relationship between and among variables indicating the demand and supply of urban transport. Urban density is positively correlated with vehicle density based on area and road density with a correlation coefficient of 0.608 and 0.418, respectively. Vehicle density based on area has high correlation with public transport density and vehicle ownership. On the other hand, road density based on length of road is strongly correlated with road funding which is quite logical.

Road density is strongly correlated with the urban density indicator. The indicators of public transport density are correlated with vehicle density and vehicle ownership indicative of the fact that public transport services are often provided by small operators who operated their private vehicles as public transport units through conversion. This is particularly true for tricycle and van-for-hire services. The level of road funding is correlated with vehicle density by length of road. City income per capita is not correlated to any other indicator.

Clustering of cities based on the identified urban transport indicators provide a simplified approach in assessing the level of urban transport development and demand for urban transport infrastructure and services. For meaningful analysis, cities outside of Metro Manila should generally be analyzed separately from cities in Metro Manila.

Table 4.2: Proposed Urban Transport Indicators

City	Urban Density Index[1]	Vehicle Density Index 1[2]	Vehicle Density Index 2[3]	Vehicle Ownership Index[4]	Road Density Index[5]	PT Density Index 1[2]	PT Density Index 2[3]	City Income Index[6]	Road Fund Index[7]
Quezon City	15,605	711	103	36	7	636	32	3,170	10,140
City of Manila	66,429	9,568	487	94	20			4,662	10,857
Kalookan City	34,657	1,416	248	21	6			2,549	10,340
City of Pasig	12,728	1,811	237	92	8			6,899	9,995
Taguig City	13,570	865	236	43	4			2,242	10,685
City of Valenzuela	12,105	880	766	40	1			2,634	16,752
City of Parañaque	11,860	1,021	274	62	4			3,703	10,689
City of Las Piñas	16,279	2,363	1,088	96	2			2,338	16,958
City of Makati	23,629	3,499	331	102	11			15,137	10,679
City of Muntinlupa	11,380	1,753	1,090	103	2			3,573	16,958
City of Marikina	19,749	4,106	2,264	134	2			3,259	24,365
Pasay City	28,790	3,712	881	82	4			4,287	18,865
City of Malabon	23,164	2,559	509	50	5			2,154	13,778
City of Mandaluyong	32,858	6,249	717	131	9			6,891	14,219
City of Navotas	27,567	-	-	-	6			-	14,955
City of San Juan	21,101	7,635	540	242	14			-	13,468
Baguio City	10,502	425	171	37	5	112	45	2,826	12,437
Angeles City	5,215	1,206	334	154	4	274	76	2,204	10,474
Olongapo City	9,988	142	177	81	7	44	55	6,562	9,973
Lucena City	2,948	401	1,071	79	0	131	350	1,979	20,629
Puerto Princesa City	292	38	131	97	0	9	32	5,339	10,318
Iloilo City	6,031	528	292	44	2	130	13	2,167	7,632
Bacolod City	3,070	418	230	78	2	71	39	1,526	9,616
Cebu City	13,194	1,277	889	58	1	197	137	2,933	15,065
Mandaue City	12,642	2,289	458	115	5	345	2,137	2,388	11,205
Lapu-Lapu City	4,939	547	8,094	85	0	44	21	2,289	121,936
Tacloban City	1,077	142	399	83	0	24	45	2,592	11,821
Zamboanga City	11,900	681	352	53	2	79	373	1,769	56,550
Cagayan de Oro City	7,333	207	151	44	3	29	31	2,689	13,634
Iligan City	5,826	243	192	25	1	35	28	3,357	11,730
Davao City	10,332	731	657	53	1	78	70	2,137	6,438
General Santos City	13,774	200	59	51	15	29	9	1,682	6,620
Butuan City	9,135	46	65	30	5	6	8	2,527	9,427

Notes: [1] in persons per sq km
[2] in vehicles per sq km
[3] in vehicles per km
[4] in vehicles per 1000 people
[5] in km per sq km
[6] per capita
[7] in PHP per km

Table 4.3: Correlation Analysis of Urban Transport Indicators

		urbden	vehden[1]	vehden[2]	vehown	roadden	ptden[1]	ptden[2]	cityinc	roadfund
urbden	Pearson Correlation	1	.418(*)	-.153	-.301	.608(**)	.292	.321	-.119	-.072
	Sig. (1-tailed)		.048	.278	.120	.005	.128	.104	.324	.392
	N	17	17	17	17	17	17	17	17	17
vehden1	Pearson Correlation	.418(*)	1	.056	.482(*)	-.041	.932(**)	.800(**)	-.276	.024
	Sig. (1-tailed)	.048		.415	.025	.438	.000	.000	.142	.463
	N	17	17	17	17	17	17	17	17	17
vehden2	Pearson Correlation	-.153	.056	1	.155	-.287	-.073	-.057	-.129	.916(**)
	Sig. (1-tailed)	.278	.415		.277	.132	.390	.413	.311	.000
	N	17	17	17	17	17	17	17	17	17
vehown	Pearson Correlation	-.301	.482(1)	.155	1	-.117	.568(2)	.365	.097	.083
	Sig. (1-tailed)	.120	.025	.277		.328	.009	.075	.356	.376
	N	17	17	17	17	17	17	17	17	17
roadden	Pearson Correlation	.608(**)	-.041	-.287	-.117	1	-.023	.068	-.024	-.280
	Sig. (1-tailed)	.005	.438	.132	.328		.465	.397	.463	.138
	N	17	17	17	17	17	17	17	17	17
ptden1	Pearson Correlation	.292	.932(**)	-.073	.568(**)	-.023	1	.702(**)	-.242	-.127
	Sig. (1-tailed)	.128	.000	.390	.009	.465		.001	.175	.314
	N	17	17	17	17	17	17	17	17	17
ptden2	Pearson Correlation	.321	.800(**)	-.057	.365	.068	.702(**)	1	-.120	-.039
	Sig. (1-tailed)	.104	.000	.413	.075	.397	.001		.323	.441
	N	17	17	17	17	17	17	17	17	17
cityinc	Pearson Correlation	-.119	-.276	-.129	.097	-.024	-.242	-.120	1	-.164
	Sig. (1-tailed)	.324	.142	.311	.356	.463	.175	.323		.264
	N	17	17	17	17	17	17	17	17	17
roadfund	Pearson Correlation	-.072	.024	.916(**)	.083	-.280	-.127	-.039	-.164	1
	Sig. (1-tailed)	.392	.463	.000	.376	.138	.314	.441	.264	
	N	17	17	17	17	17	17	17	17	17

[1] Correlation is significant at the 0.05 level (1-tailed); [2] Correlation is significant at the 0.01 level (1-tailed).

1) Demand Indicators

Urban density provides a good measure of urban transport demand. Clustering of cities based on urban density provides a typology of cities according to the level of urban transport demand brought about by intensity of urban activities. 'Low Dense' cities are those with urban densities of less than 4,000 persons per square kilometer. Cities of urban densities between 4,000 persons per square kilometers and 10,000 persons per square kilometer can be referred to as 'Medium Dense' cities. Iligan City can be taken as representative of this cluster. Cities of urban densities with a minimum of 10,000 persons per square kilometer can be referred to as 'High Dense.' Davao City can be taken as representative of this cluster. Table 4.4 shows the clustering of cities based on urban density.

Table 4.4: Clustering Based on Urban Density

Cluster	Range	Cities
Low	Less than 4,000	Puerto Princesa, Tacloban, Lucena, Bacolod
Medium	Between 4,000 and 10,000	Angeles, Iloilo, Lapu-Lapu, Iligan, Cagayan de Oro
High	More than 10,000	Butuan, Olongapo, Davao, Zamboanga, Baguio,General Santos, Cebu, Mandaue

Note: Range values in persons per sq km

Vehicle density based on urban area also denotes demand for urban facilities that are concentrated in the built-up area of the city. Table 4.5 presents clustering of cities based on this indicator. The 'Low Vehicle Density per Area' cluster denotes that transport facilities are required over a wider area; most cities are part of this cluster. The cities of Angeles and Cebu are considered as 'Medium Vehicle Density per Area' and Mandaue City is classified as a 'High Vehicle Density per Area.'

It must be noted that clustering of cities based on vehicle density per length of road does not provide much insight since the computed values under this indicator are limited to a

narrow band of values. The results of the cluster analysis also do not segregate cities into meaningful groupings.

Table 4.5: Clustering Based on Vehicle Density (per Area)

Cluster	Range	Cities
Low	Less than 1,000	Puerto Princesa, Tacloban, Lucena, Bacolod, Iloilo, Lapu-Lapu, Iligan, Cagayan de Oro, Butuan, Olongapo, Davao, Zamboanga, Baguio, General Santos
Medium	Between 1,000 and 2,000	Angeles, Cebu
High	More than 2,000	Mandaue

Note: Range values in vehicles per sq km

Vehicle ownership computed as private vehicle registration per one thousand population provides an indicator of demand for road space. In the absence of regular transport census data for cities, this indicator provides a ready-to-use indicator of urban transport demand from private vehicle use. It also provides a rapid assessment tool to assess the adequacy of public transport services in a city. For example, a city with a higher vehicle ownership indicates the general lack of public transport alternatives. Table 4.6 presents the clustering of cities based on vehicle ownership.

Cities that have relatively higher urban densities tend to have lower vehicle ownership**.** Cities with relatively higher urban densities like Cebu, Davao, Zamboanga and General Santos are classified as having low vehicle ownership levels. This implies the greater role of public transport in larger cities.

Table 4.6: Clustering Based on Vehicle Ownership

Cluster	Range	Cities
Low	Less than 60	Iloilo, Cagayan de Oro, Baguio, Zamboanga, Davao, General Santos, Cebu, Iligan, Butuan
Medium	Between 60 and 150	Lucena, Bacolod, Olongapo, Tacloban, Lapu-Lapu, Puerto Princesa, Mandaue
High	More than 150	Angeles

Note: Range values in vehicles per 1000 people

2) Supply Indicators

Road density computed as length of roads per urban land area denotes the supply of available road space. Consequently, lower values of this indicator imply a need for investment on road construction and expansion. Table 4.7 presents the clustering of cities based on road density. It can be shown that cities with higher urban densities tend to have lower road densities which indicates a general need for road development.

It is widely recognized that road construction is not the long-term solution to meeting the urban transport needs of cities. Besides, it is quite impossible for road construction to keep pace with the scale of urban development that is happening in cities in the Philippines. Cities with higher urban densities tend to have higher values of public transport density per area, confirming the greater role of public transport in such cities. It is also interesting to note that cities that are thought to have great numbers of 3-wheelers like Puerto Princesa, Cagayan de Oro, and Butuan register low values of public transport density.

Table 4.7: Clustering Based on Road Density

Cluster	Range	Cities
Low	Less than 2.5	Iloilo, Bacolod, Iligan, Davao, Cebu, Zamboanga, Lucena, Tacloban, Puerto Princesa, Lapu-Lapu
Medium	Between 2.5 and 10	Angeles, Cagayan de Oro, Baguio, Mandaue, Butuan, Olongapo
High	More than 10	General Santos

Note: Range values in km per sq km

Notwithstanding issues on data quality, this is an indication of non-responsiveness of a fragmented approach to provision of public transport services. The clustering of cities based on public transport density per length of road does not provide much insight. Table 4.8 presents the clustering of cities based on public transport density per area.

Table 4.8 : Clustering Based on Public Transport Density (per Area)

Cluster	Range	Cities
Low	Less than 60	Olongapo, Lapu-Lapu, Cagayan de Oro, General Santos, Tacloban, Iligan, Puerto Princesa, Butuan
Medium	Between 60 and 150	Zamboanga, Davao, Bacolod, Lucena, Iloilo, Baguio
High	More than 150	Angeles, Mandaue, Cebu

Note: Range values in vehicles per sq km

3) Funding Indicators

The city income per capita indicator provides a gauge on the level of financial resource that is available for cities to address its urban transport needs. Consistent with the observation that cities with higher urban densities are generally constrained in terms of level of road infrastructure, the clustering also indicates the fiscal challenges that such cities are facing. Table 4.9 presents the clustering of cities based on this indicator.

Table 4.9: Clustering Based on City Income per Capita

Cluster	Range	Cities
Low	Less than 3,000	Iloilo, Davao, Angeles, Mandaue, Lapu-Lapu, Lucena, Baguio, Cebu, Tacloban, Butuan, Cagayan de Oro, Zamboanga, General Santos, Bacolod
Medium	Between 3,000 and 5,000	Iligan
High	More than 5,000	Olongapo Puerto Princesa

Note: Range values in PHP per capita

Most of the cities have relatively low funding levels as indicated by road funding allocation under the SLRF. Lapu-Lapu City has the highest allocation at around 122,000 PHP/km followed by Zamboanga City with an allocation of 56,550 PHP/km. The rest of the cities has allocation less than 50,000 PHP per km. This highly skewed distribution of this indicator implies the lack of a sophisticated criteria system for the allocation of road funds. Table 39 presents that clustering of cities based on road funding from national government through the Special Local Road Fund (SLRF) allocation.

Table 4.10: Clustering Based on Road Funding

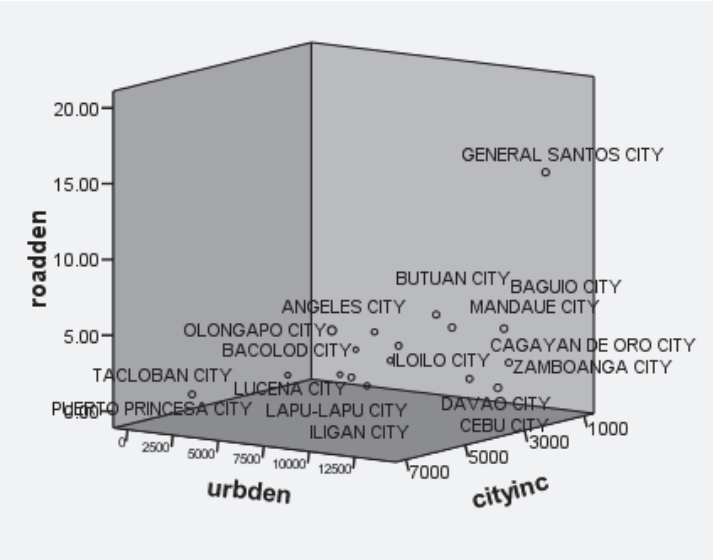
Cluster	Range	Cities
Low	Less than 50,000	Tacloban, Iligan, Mandaue, Baguio, Butuan, Angeles, Puerto Princesa, Olongapo, Cebu, Cagayan de Oro, Davao, General Santos, Iloilo, Lucena
Medium	Between 50,000 and 10,000	Zamboanga
High	More than 100,000	Lapu-Lapu

Note: Range values in PHP per km

4) Plot of Indicators

A 3-D scatter plot using the proposed indicators is able to depict the relative levels of demand and supply for urban transport infrastructure and services. A plot can be constructed showing indicators of transport demand (i.e. urban density) on the x-axis, transport supply (i.e. road density) on the y-axis and transport funding (i.e. city income per capita) of the z-axis.

Figure 4.1: Urban Transport Needs based on Road Density



Source: JICA Project Team

Iligan City represents a case for a medium-size city with high urban density but has relatively low road density that suggests a sparse network of roads. This is also indicative of urban sprawl. While the city has relatively high transport funding potential owing to its high per capita income, it might not be able to sustain development for needed road infrastructure and services due to competing demands from other urban infrastructure. In the case of Iligan City, there is much requirement for investment in drainage systems.

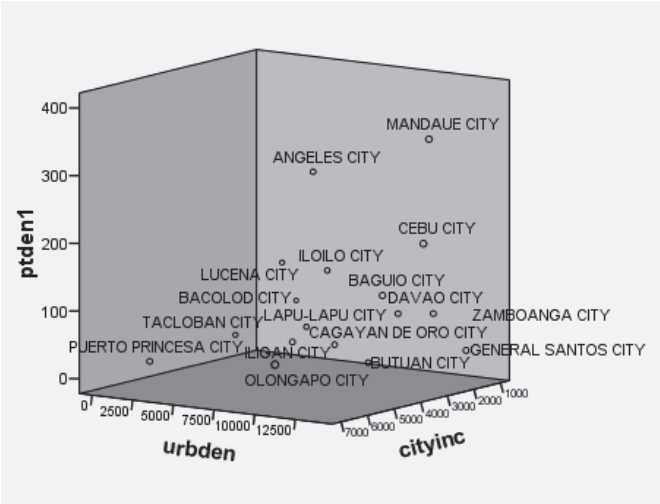
General Santos City, with a relatively high urban density, has achieved a relatively high road density of 15 km per square km. In contrast to Iligan City, the case of General Santos City indicates a more balanced spatial development.

The cases of Davao City and Cebu City represent key urban areas that have large population base as exhibited by very large urban densities. But perhaps due to lack of directed urban expansion or coordination of land use and transport developments, the investments in road infrastructure have not been able to keep pace as indicated by relatively low road density values. In these cities, there is a need to introduce high-quality mass transit system and policy and planning systems to integrate of land use and transport developments should be in place.

A 3-D plot can be constructed using public transport density as the indicator of transport demand. This visualization scheme provides a kind of benchmarking analysis across cities in relation to sufficiency of public transport services. For example, Iligan City and Cagayan de Oro City can be considered as having very low levels of public transport services as compared with Iloilo City and Bacolod City. The plot also reveals the lack of sufficient public transport in the cities of Davao and Zamboanga as other medium-size

cities reflect higher public transport densities. One would expect that cities like Davao and Zamboanga would have a relatively higher number of serving public transport units.

Figure 4.2: Urban Transport Needs based on Public Transport Density



Source: JICA Project Team

4.4 Ranking of Urban Transport Needs

The ranking of cities based on urban transport needs can be constructed using the identified urban transport indicators. This can be achieved through scoring under each indicator. Transport demand indicators will be scored using positive values according to the cluster that the city is in. For example, the high-density cities are given a score of 3 indicating highest level of urban density. Medium-dense cities are given a score of 2 and low-dense cities are given a score of 1 under the urban density indicator. On the other hand, indicators of transport supply and funding will be scored using negative values. The total scores can then be generated for each city.

Under this scoring scheme, the city with the lowest value of total score will be the least priority in terms of urban transport needs.

Table 4.11: Scoring of Urban Transport Indicators

City	Urban Transport Indicator							Total Score
	urbden	vehden1	vehown	roadden	ptden1	cityinc	roadfund	
Mandaue City	3	3	2	-2	-3	-1	-1	1
Angeles City	2	2	3	-2	-3	-1	-1	0
Cebu City	3	2	1	-1	-3	-1	-1	0
Tacloban City	1	1	2	-1	-1	-1	-1	0
Davao City	3	1	1	-1	-2	-1	-1	0
Baguio City	3	1	1	-2	-2	-1	-1	-1
Olongapo City	3	1	2	-2	-1	-3	-1	-1
Lucena City	1	1	2	-1	-2	-1	-1	-1
Iloilo City	2	1	1	-1	-2	-1	-1	-1
Bacolod City	1	1	2	-1	-2	-1	-1	-1
Lapu-Lapu City	2	1	2	-1	-1	-1	-3	-1
Zamboanga City	3	1	1	-1	-2	-1	-2	-1
Cagayan de Oro City	2	1	1	-2	-1	-1	-1	-1
Iligan City	2	1	1	-1	-1	-2	-1	-1
General Santos City	3	1	1	-3	-1	-1	-1	-1
Puerto Princesa City	1	1	2	-1	-1	-3	-1	-2
Butuan City	0	1	1	-2	-1	-1	-1	-3

Source: JICA Project Team

Based on the developed indicators and scoring system adopted, the priority cities under the high dense cluster are Mandaue, Cebu, and Davao. Cities under the medium dense cluster have similar priority assessments. For low-dense cities, the top priority cities according to urban transport needs are Tacloban, Lucena, and Bacolod.

Table 4.12 : Ranking of Cities based on Urban Transport Needs

Cluster	Priority	City
1	1	Tacloban
	2	Lucena, Bacolod
	3	Puerto Princesa, Butuan
2	1	Angeles, Iloilo, Lapu-Lapu, Cagayan de Oro, Iligan
	2	
	3	
3	1	Mandaue, Cebu, Davao
	2	Baguio, Olongapo
	3	Zamboanga, General Santos

Source: JICA Project Team

4.5 Sketch Planning Methodology

One of the major constraints in medium to large-size cities in the capacity to undertake travel demand analysis on a regular basis as part of a urban transport master plan development, implementation, monitoring and evaluation. The major activity in such efforts is the conduct of travel demand estimation. Up to now, estimation of urban travel demand in medium and large-size cities in the Philippines has been very limited. And the prevailing mindset among planners and decision-makers is that such activities are very costly. However, it is argued that the development of simplified travel demand estimation techniques has been the subject of research work for a long time now[33] and best practice approaches and traffic modeling tools are now readily accessible by cities.

Dimitriou (1995) outlines some of the fundamental lessons drawn from the experiences in urban transport planning in the industrialized countries of relevance to a third world context as follows:

(i) Urban transport planning (UTP) requires a more multi-disciplinary approach; the past treatment of the field as an engineering science is especially inappropriate to Third World countries.
(ii) A degree of institutionalization and standardization of transport planning practice is necessary to ensure a consistency of approach on a national basis
(iii) The urban transport planning process and its derivatives are more supportive of private motorized transport; planning efforts are needed therefore to cater for non-motorized movement often more appropriate to the Third World context.
(iv) The 'Four Stage Model' of travel demand has helped to constrain innovative thinking in the field; new pre-occupations need to take place of the travel demand component of the planning exercise.

[33] Notable works include 1) Ortuzar, Juan de Dios, ed., Simplified Transport Demand Modelling: A compilation of major papers selected from PTRC's Summer Annual Meetings and Courses 1984-1989, 1992; and 2) Dimitriou, Harry T., A Development Approach to Urban Transport Planning: An Indonesian Ilustration, Avebury, 1995.

(v) The mechanics of model-building and other techniques have obscured the need for context-sensitive approaches that take into account the political and socio-economic environments of urban transport policy making and planning.
(vi) Normative directives with political backing should replace the trend planning that has characterized most planning practices in the field.
(vii) Conventional approaches are not 'comprehensive'; they need to be adapted to address new environmental considerations and take into account public participation.
(viii) The UTP process is typified by an inappropriate emphasis on cost revenue schemes, short-term considerations, an inflated involvement of the private sector and the development of projects outside of a coherent planning framework.
(ix) UTP process derivatives are drawing investment and attention away from more innovative approaches and have often only partially addressed the problems they address with the results that many past errors of urban transport planning have been perpetuated.
(x) Less attention should be focused upon the 'line-haul' travel in urban transport planning since this leads to an unbalanced system with inadequate attention being paid to the transport 'lowerarchy'; particularly at the neighborhood/ community level.

Dimitriou (1995) further identifies the following lessons on urban transport planning for third world cities:

(i) It is prudent for government to remain in the decision-making 'driving seat' of all major urban development investments, especially strategic transport investments. In doing so, it can thereby remain the initiator and protector of overall city development.
(ii) Greater attention needs to be paid to issues of management, operations and maintenance of urban transport systems. This is especially the case for fast-growing cities with populations between half and one million.
(iii) More concerted efforts are needed to translate macro development planning objectives into meaningful local and transport sector terms. Empirical evidence suggests that understanding the dynamics and issues of third world urban development are as much as a prerequisite for urban transport planning and traffic engineering practice as a sound professional engineering competence.
(iv) Transport problems need to be perceived and, thus, tackled from different (but coordinated) standpoints. Furthermore, while urban transport problems are readily presented in terms of a traditional agenda, they also need to be differentiated in terms of 'root' and 'manifestation' problems.
(v) Unclear and unrealistic goal setting should be avoided. This represents one of the most common sources of problems in urban transport planning during both plan-making and project implementation. Some aspects of this relate to the mismatch between adopted urban transport goals by government and the grassroots needs of a third world city.
(vi) Resorting to traffic and highway engineering measures independent of land use planning cannot resolve urban transport problems. Any planning approach that does not accommodate the complexities of the problems it needs to address is destined not only to fail, but will also generate additional and costlier problems.
(vii) The critical technology-transfer question is not about the techniques of urban transport planning but of strategy. The principal issue is whether or not a third world city should duplicate the same kind of development and transport strategy typically pursued by industrialized countries.

(viii) There are severe limitations to the exclusive use of economic rationale in urban transport planning. The economic rationale of the UTP process finds it very difficult to plan for basic needs or 'entitlements' that are not evident in the marketplace. It is irrational, however, to presume that when people cannot afford to pay for transport needs then they do not need them.

(ix) Lesson 9: The value of money is so inflated in third world countries that the relative values of time has become undervalued for most of the population, especially among the less privileged, and thereby puts into question the viability of many conventional project appraisal exercises.

(x) The implementation costs of many first choice urban transport planning options can often render them ineffective and/or too costly. The cost of putting a system in place and the losses associated in doing this can very often be so large that one may be better off having a more acceptable system that does not work so well but easier to introduce.

A feasible approach to simplified transport demand estimation is the development of sketch planning tools**.** Sketch planning [34] is the preliminary screening of possible configurations or concepts. It aims to realize highlighted objectives based on simplified process, released parameters estimation, and using data sets at rougher level or with coarser resolution. In comparison with a full-scale model, it can offer merits such as quick response, ease of use and understanding, and low cost development. The key idea of sketch planning method is to facilitate the generation of alternatives quickly and easily.

The main features of the sketch planning methodology include:

(i) Adopting the logic structure of the traditional transportation modeling process;

(ii) Limiting the classification of trip purposes (working, schooling, shopping and others) and trip modes (private car, transit and walking);

(iii) Setting the appropriate zoning system (grouping of residents and activities) that are consistent with past zoning systems);

(iv) Updated network representation with appropriate level of aggregation;

(v) Utilization of past OD tables as bases for OD table updating; and

(vi) Modest model calibration but where practicable, employs extensive use of matrix estimation techniques.

Sketch planning in the context of urban transport planning is seen as a relatively low-cost, rapid planning exercise, employing short-cut methods and suited to circumstances where quick responses are often required to tackle complex urban transport problems. Such circumstances are typically characterized by limited or invalid local data with which to formulate an effective and efficient response, obliging one to rely on proxy data collected from similar settlements in the same region, country or region.

Where primary data is not available, sketch-plan methodologies can rely on traffic generation and production relationships derived from former studies of settlements with similar characteristics**.** There are used to limit data collection and expedite the executive of sketch-plan exercises. In instances, however, where OD traffic surveys have been

[34] US Department of Transportation, URL: http://ntl.bts.gov/DOCS/UT.html

conducted in the past, the use of low-cost methods of updating trip patterns in travel demand forecasting are especially appropriate.

The principal steps of the sketch-plan methodology are:

(a) Step 1: This entails an assessment and review of existing conditions which concerns 1) current national, provincial and urban transport and development policies, plans, and projects affecting the study area; 2) the present characteristics and condition of urban transport services and facilities; and 3) selected priority areas of concern for which critical data is needed.

(b) Step 2: This requires the undertaking of simple urban travel demand analysis and forecasting exercises tempered by normative, enabling and controlling policies as appropriate. 'Normative' policies or plans are those that provide direction, aspirations and standards for government, community and the private sector to pursue and strive after. 'Enabling' polices and plans are designed to support welcome market forces and community preferences that simultaneously contribute to normative directives. 'Controlling' policies and plans are those that provide the basis for enforcement and regulation, particularly of the private sector and communities, to ensure both normative ad enabling directives are followed within the prescribed limits.

(c) Step 3: This involves the identification of transport infrastructure and service problems.

(d) Step 4: This requires the screening of identified urban transport problems. It involves the categorization and prioritization of problems in terms of spatial and aspatial characteristics, different professional and vested interests, 'root' and 'manifestation' problems, and current and future problems impeding important development considerations.

(e) Step 5: This entails the preparation of responses to screened problems for citywide and area/corridor/street-specific situations under selected policy circumstances.

(f) Step 6: This requires the evaluation and appraisal of urban transport proposals. Firstly, a proposal's contribution to national, provincial and local development objectives is assessed together with its compatibility to available resources. Secondly, it will be assessed in terms of more conventional optimization terms.

(g) Step 7: This involves the integration and co-ordination of proposals generated by the planning approach.

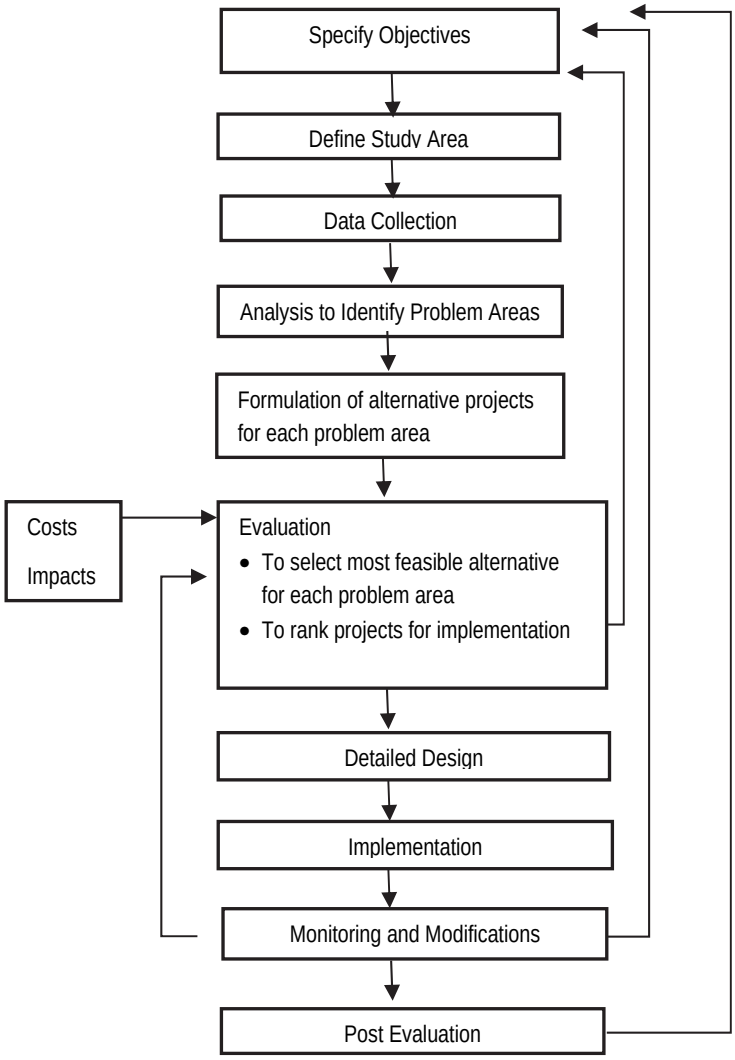
The above-mentioned steps are not in any way strictly sequential, but allow forward and backward feedback.

There is a need to develop clear guidelines, standards, and toolkits on the sketch-plan methodology in urban transport planning for medium to large-size cities in the country. These guidelines and standards should be integrated with existing statutory guidelines and standards in land use planning, local development planning, as well as, existing engineering standards for the built environment.

5 URBAN TRANSPORT PLAN PREPARATION

The general procedure for conducting transportation planning studies is presented in Figure 5.1. The figure shows the main steps of the process and the feedback loops.

Figure 5.1: Transportation Planning Process



(a) **Statement of the Study Objective:** This is the first and most important step in a transportation study. It states why the study must be done. The objective of the study sets the proper limits to the work involved in each succeeding step and are reasonable and achievable within the capabilities of the locality. In the course of the study, the objective may be modified or restated to reflect current findings. This allows fine-tuning of the study.

(b) **Definition of the Study Area:** This step fixes the limits of the study in terms of the operating land area, political jurisdictions, extent of the measures to be proposed and areas of responsibility of different cooperating agencies. The reasons for delimiting the study include financial considerations, local technical capability, and manageability of the study.

(c) **Data Collection:** In this step, data needed for the study area collected. The data may be secondary data (those which may be obtained from another agency which

normally collects and keeps data), or primary data (those data that must be collected specifically for the study). Usually, data collection will require a substantial share of the study funds. This covers such elements as survey personnel, survey materials, logistic support and, in some cases, survey equipment.

(d) **Problem Identification:** This step deals with the identification of transportation problems. Before any set of actions can be formulated to constitute a remedial measure, it is necessary to know what has to be solved. Therefore, the problem must be identified, described, and stated.

(e) **Plan Formulation:** Once the problems have been identified and properly described the next step is to formulate remedial measures. Because land use and transport constitute a dynamic system there can be no permanent solution. Rather, to formulate courses of action aimed at alleviating the effects of the problem or delaying the time when the problem truly gets out of hand. The most that a planner can hope for is to be one or two steps ahead of the problem.

(f) **Evaluation:** More than one set of measures may be formulated to deal with the problem, each having a different level of effectivity and a different cost. Usually, as the solution becomes more sophisticated, the more expensive it becomes. At other times, different measures benefit different groups unequally. The planner must then make a selection from among the possible alternatives.

In this step, the planner must analyze the proposed plans in turn in order to select which course or courses of action to follow. The planner may also have to schedule the courses of action, first undertaking that is most favored. The selection must be according to some agreed criteria. The criterial may be economic, financial, political or environmental. The most common approach is to select projects according to economic criteria. For the government, the commonly accepted criterion is the benefit/cost ratio. In this criterion, a project is accepted if the ratio is greater than one, that is, the benefits exceed the costs.

Currently, it is becoming more and more popular to use a multi-criteria approach. Here project desirability is not limited to one criteria, but to several criteria each having a particular weight.

(g) **Detailed Design and Implementation:** This step pertains to the final form of the plan that is ready for implementation. Implementation is the carrying out of the plan. If a road is planned, implementation starts with the paper work needed to begin the project. In the preceding steps, the plan may be very conceptual in nature or a very broad outline is given. At that time, only the aspects of the plan needed for the evaluation of the alternative projects are known. The details on the implementation of the project are ironed out in this step.

Part 2

PUBLIC TRANSPORTATION PLANNING

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ABBREVIATIONS

ADB	Asian Development Bank
AGT	automated guideway transit
BRT	Bus Rapid Transit
CA	concession agreement
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
EWR	Eat West Railway Project
GCMT	global cities mass transit
GCR	greater capital region
GOP	Government of the Philippines
HIS	household interview survey
JICA	Japan International Cooperation Agency
JPY	Japanese Yen
km	kilometer
kph	kilometer per hour
m	meter
mm	millimeter
LRMC	Light Manila Rail Corporation
LRT	Light Rail Transit
LRTA	Light Rail Transit Authority
LRV	light rail vehicle
LTFRB	Land Transportation Franchising and Regulatory Board
MMSP	Metro Manila Subway Project
MRT3	Metro Rail Transit
MRT	Mass Rapid Transit
MRTC	Metro Rail Transit Corporation
NEDA	National Economic Development Authority
NLEX	North Luzon Expressway
NPC	National Power Commission
NR	North Rail
NSCR	North South Commuter Rail Project
NSRP	North South Railway Project
PHP	Philippine Peso
PPHPD	passengers per peak hour per direction
PPP	public–private partnership
PNR	Philippine National Railway
PRA	Philippine Railway Authority
ULC	Universal LRT Corporation
USD	United States Dollar

1 Public Transportation System

1.1 Definition and Role

Public transportation comprises of passenger transport services which are available for use by the general public as opposed to modes for private use such as cars, motorcycles and vehicles for hire. The role of public transportation is not only providing transport services for general public but also ensuring people's mobility at least minimum level. Public transportation services are usually funded by fares charged to each passenger, with varying levels of subsidy from local and central government. In some cities, it is operated with no subsidy, fully subsidized or zero fare system, etc.

Public transportation is provided by a company or authority that operates a fleet of vehicles. They may or may not be regulated or subsidized by authorities. The infrastructure used may be exclusive or shared with private vehicles. In many of Asian cities, para-transit modes, such as jeepney and tricycle in Philippines and Bajaj in Indonesia, provide services as public transportation modes.

1.2 Types of Public Transportation Systems

There are many existing kinds of public transportation system. A combination of those systems is selected and introduced depending on the volume and characteristics of passenger demand. Systems are categorized from various points of view such as transport capacity, speed and route distance, etc. Among various systems, bus is very flexible to adjust with various demand groups (see Table 1.1 and Figure 1.1).

Public transportation systems are to be compared not only by transport capacity but also by unit transport cost. For instance, a railway system could transport huge passengers with relatively lower unit transport cost but the unit transport cost tends to increase when demand is low. On the other hand, a bus system can meet wide range of transport demand with relatively lower unit transport cost (see Figure 1.2).

There are various ways of classifying public transport services:

(i) General classification as to whether they are fixed-route services or paratransit or for hire (no fixed route);

(ii) Classification by space interval of stops: collector/distributor service, regular service, accelerated service, express or rapid service;

(iii) Classification by Right-of-Way: Level 1 (mixed traffic), Level 2 (semi-exclusive), and Level 3 (exclusive);

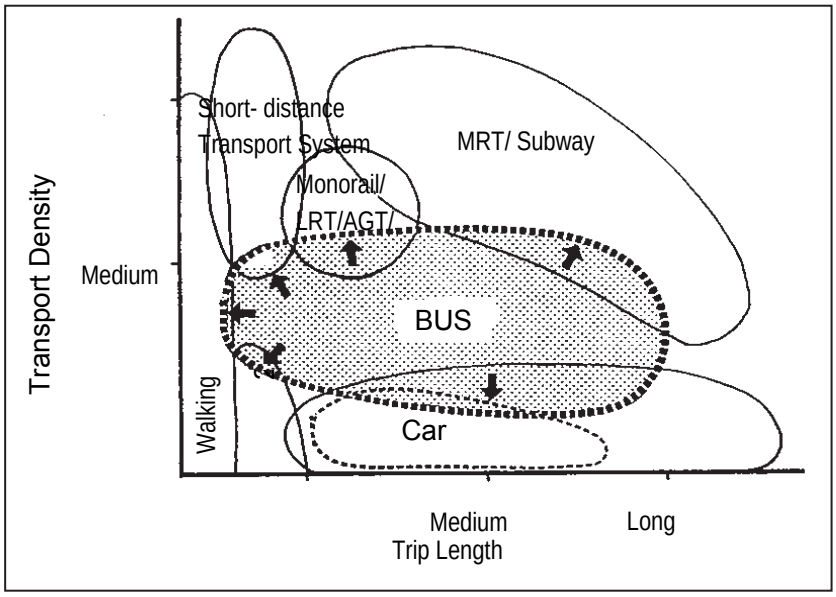
(iv) By technology: Support, propulsion, guidance, control.

Table 1.1: Characteristics of Public Transportation System

Item	Unit	MRT/ Subway	Monorail	LRT/AGT	Tram	Bus
Transport Capacity	1,000 pax /h/direction	40-50	15-20	10-15	10-15	5-10
Speed	km/h	25-30	25-30	15-25	10-15	10-15
Headway	Min	2	2	1.5-2	1.5-2	1.5-2
Transport Unit	1,000 pax	1.5-2.5	0.5-1.0	0.3-0.5	0.2-0.3	0.1
Station Interval	Km	1.0	0.7-1.0	0.5-0.7	0.3-0.5	0.3-0.5

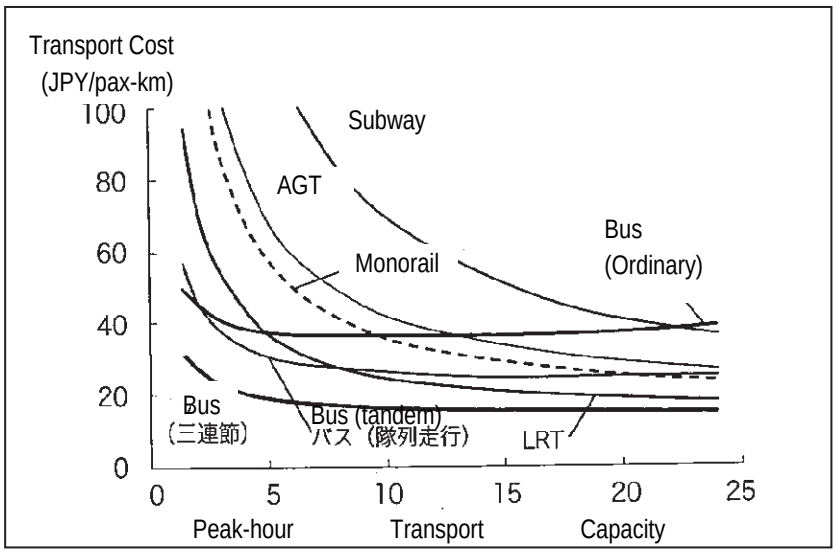
Source: Traffic Engineering Handbook, JSTE

Figure 1.1: Transport Modes and Capacity/Distance Relation



Source: Prof. Fumihiko Nakamura, Yokohama National University

Figure 1.2: Transport Capacity and Cost by Mode of Transport



Source: Prof. Fumihiko Nakamura, Yokohama National University

1.3 Status of Urban Transportation in Major Asia Cities

Travel demand in major Asian cities was estimated by using the results of Household Interview Survey (Person Trip Survey) and other transportation surveys. Those large-scale surveys were conducted under JICA-funded urban transport master planning studies.

(a) **Trip rate:** The trip rates were compared among the selected cities. Trip rate represents a level of people's mobility. Jabodetabek has relatively lower trip rates, while Vietnamese cities have higher rates (see Table 1.2).

(b) **Vehicle ownership:** Jakarta and Bangkok indicate relatively high ownership rate in both of car and motorcycle. Vietnamese cities indicate significantly high motorcycle

ownership rate. Manila and Chengdu indicate low ownership rate of motorcycle (see Table 1.3).

(c) **Modal share:** In the context of the above-mentioned situations such as mobility and vehicle ownership in each Asian city, modal share is represented as characteristics of urban transportation. In mega cities such as Jakarta, Manila and Bangkok, the public transportation including railway, bus and para-transit, shares more than 50% of travel demand and plays significant role in entire urban transportation system. In Jakarta and Bangkok, bus shares 52% and 35%, respectively, of the total passenger trips. In Manila, bus shares 17% but para-transit modes such as jeepney and tricycle transport more than 50% of the total passenger trips (see Table 1.4).

Table 1.2: Trip Rate in Selected Asian Cities

City (Country)	Jakarta [1] (Indonesia)	Manila [1] (Philippines)	Bangkok (Thailand)	Chengdu (China)	Hanoi [1] (Vietnam)	HCMC [1] (Vietnam)
Year	2002	1996	1995	2000	2005	2002
Population	21,594	13,565	n.a.	3,090	3,897	7,693
Trip Rate (incl. walk trips)	1.7	2.2	2.3	2.6	2.7	3.0
Trip Rate (excl. walk trips)	1.1	1.8	n.a.	1.8	1.9	2.5

Source: culled from various reports
Note: [1] covers the metropolitan area

Table 1.3: Vehicle Ownership in Selected Asian Cities [1]

City (Country)	Jakarta (Indonesia)	Manila (Philippines)	Bangkok (Thailand)	Chengdu (China)	Hanoi (Vietnam)	HCMC (Vietnam)
Year	2002	1996	1993	2000	2006	2002
No. of vehicles ('000)						
- Motorcycle	2,490	73	1,105	166	1,124	2,040
- Car	1,350	806	1,147[1]	134	63	66
- Other 4 wheel-vehicles	400	142	291		70	92
No. per 000 population						
- Motorcycle	115	8	136	54	350	378
- Car	63	85	142	43	20	12
- Other 4 wheel-vehicles	19	15	36		22	17
Population (mil.)	21.6	9.5	8.1	3.1	3.2	5.4

Source: culled from various reports
Note: [1] including buses

Table 1.4: Modal Share in Selected Asian Cities [1]

City (Country)	Jakarta (Indonesia)	Manila (Philippines)	Bangkok (Thailand)	Chengdu (China)	Hanoi (Vietnam)	HCMC (Vietnam)
Year	2002	1996	1995	2000	2005	2002
Private modes sub-total	43	22	51	77	90	94
- Bicycle	-	-	-	63	28	13
- Motorcycle	22	1	21	4	60	79
- Car	17	19	31	7	2	2
- Others	4	2	-	3	-	-
Public modes sub-total	57	78	49	22	10	6
- Bus	52	17	35	15	6	2
- Railway	2	2	-	-	-	-
- Taxi, Para-transit, others	3	59	14	7	4	4
Total	100	100	100	100	100	100

Source: Culled from various reports
Note: [1] excluding walk trips

1.4 Considerations in Public Transportation

These are important considerations that transport planners and managers should be mindful of:

1) Mismatch between Design and Practice

There will be problems when big vehicles that are intended as high-capacity modes behave like a local mode, stopping everywhere to pick up and unload passengers. Similarly, there are problems when an arterial road is used as a collector or local road where vehicles can stop anywhere. In such a case, safety and efficiency become issues.

2) Modal Integration

Different public transport modes should be integrated in terms of route structure, physical aspects, fare, and information.

Routes should feed into other routes in such a way that passengers, when there is a need to transfer, can do such transfer in a safe, comfortable, and efficient manner or seamless manner.

There must be physical integration of public transport routes and services. For instance, opportunities for integration of mass transit lines must be pursued through the provision of common stops or stations.

Fares should also be integrated. Ideally, a single fare system should be established so that passengers will have to purchase a ticket only once. The act of purchasing a ticket can be costly in terms of time, money, and convenience.

Lastly, information on public transport services should also be integrated. This means that information should be given on a comprehensive manner. Transfer information such as list of available services at stops or terminals should be provided, not just information that is specific to the particular service that a passenger is on.

3) Rationalization

Public transport rationalization refers to achieving a good match between public transport supply and passenger demand at the right place and at the right time. Such a good match will ensure the attainment of two objectives – passengers are adequately served in the most efficient and cost-effective manner. This therefore requires a clear understanding of passenger demand, not only in terms of scale but also the temporal and geographic characteristics of such demand. This is then followed by the provision of the required public transport services to meet the demand.

Symptoms of a mismatch between public transport supply and passenger demand are:

- Long queues of empty or only partially filled buses burning fuel and occupying precious road space while waiting for passengers or running along its route. This is an example of supply exceeding demand.
- Long queues of passengers waiting for buses or jeepneys, wasting precious time or reduced productivity of people. This is an example of demand exceeding supply.

The objective of any public transport plan is to find this optimum match between demand and supply – a rationalized public transport.

1.5 Public Transport Performance Indicators

There is a constant need to monitor and evaluate the performance of public transport to ensure that objectives are met in the most efficient and effective manner.

A performance indicator is mostly a quantifiable measure of the level of success (or failure) of public transport in meeting its objectives.

In Table 1.5 is a list of the basic indicators that are used in assessing public transport performance:

Table 1.5: Indicators used in Assessing Transport Performance

Indicators	Description
1. Frequency	• Number of vehicles dispatched per unit time. • Also measured in terms of headway, the time interval between dispatched vehicles • One measure of adequacy and reliability
2. Travel Speed	• Average speed of the vehicle from its trip origin to destination
3. Reliability	• Indicates level of availability of a transit service • Quantified by average waiting time
4. Safety	• Refers to risk of being harmed when using a transit service • Can be based on statistical data
5. Point capacity	• Maximum number of passengers a transit service can carry past a certain point along the route per unit time • Unit: passengers/unit time • Line capacity
6. Distance Capacity	• Carrying capacity of a transit service in terms of number of passengers carried over a certain distance • Unit: passengers/km • Passengers/mile
7. Passenger expense	• Price (fare) for a transit service • Fares should be affordable and socially acceptable
8. Utilization	• Measures the degree at which the service has utilized its capacity • Measured by load factor which is the ratio of actual passenger occupancy to capacity • Also by ratio of number of units used to total fleet size
9. Other performance indicators	• Quality of service - Degree of which passengers enjoy transit services rendered in terms of comfort, convenience, aesthetics, attitude of crew, cleanliness, ease of using the system and other amenities • Impact to the environment

Source: JICA Project Team

1.6 Principles of Public Transport Planning

Public transportation plan should be formulated with clear basic development orientation of urban transportation to provide appropriate mobility and accessibility of urban services and shift the use of private cars and motorcycles to public transportation.

Public transportation planning is basically a formulation of public transportation service network. For this, the existing conditions of demand and supply are carefully analyzed and people's mobility needs are to be identified by use of the existing data and information and results of special surveys. The type and service level of public transport system are then carefully examined with consideration to potential demand of public transportation users.

1.7 Public Transport Planning Process

Public transport planning process is similar to the general transport planning process.

(i) Establishment of the Study Area: Corridor within a public transport network, district within an urban area, whole urban area, province or region;

(ii) Statement of the Problems: Examples: long passenger waiting time, low speeds, poor route structure;

(iii) Setting up of objectives: Use the principles of SMART;

(iv) Analysis of existing situation: Determining the actual demand versus the actual capacity or supply;

(v) Forecast demand;

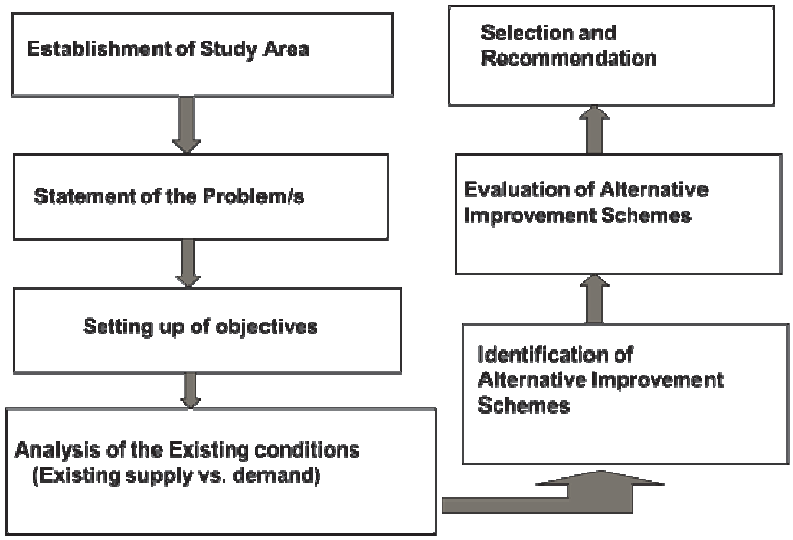
(vi) Identification of alternative improvement scheme;

(vii) Evaluation of alternative improvement schemes (economic, operational, and environmental);

(viii) Selection and recommendation.

Schematically, the process can be depicted as follows:

Figure 1.3: Public Transport Planning Process



It must be noted, however, that planning:

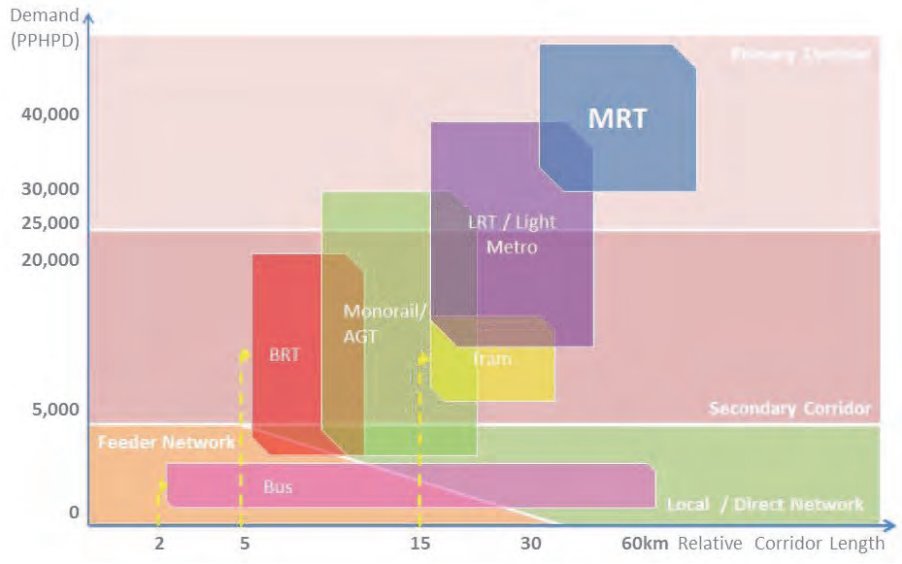
- Is not a linear process
- Should allow for iterations
- Should be user needs-based
- Should be adaptive

2 Railway Planning

2.1 Public Transport Planning Process

Urban rail transit is an all-encompassing term for various types of local rail systems providing passenger service within and around urban or suburban areas. The set of urban rail systems can be roughly subdivided into the following categories, which sometimes overlap because some systems or lines have aspects of each. Figure 2.1 shows some of the most common public urban transport system, including non-rail systems, and their relation with capacity and distance covered.

Figure 2.1: Transport Modes and Capacity/Distance Relation



Source: JICA Project Team

1) Tram

A tram, streetcar, or trolley system is a rail-based transit system that runs mainly or completely along streets (i.e. with street running), with relatively low capacity and frequent stops. Passengers usually board at street- or curb-level, although low-floor trams may allow level boarding. Longer-distance lines are called interurbans or radial railways. Few interurbans remain, most having been upgraded to commuter rail or light rail or abandoned.

The term "tram" is used in most parts of the world. In North America, these systems are referred to as "streetcar" or "trolley" systems; in Germany, such systems are called "Straßenbahn" which literally translates as "street train" or "street railway".

The track can be segregated or not from parallel road traffic, but there will be always some level crossings which may affect the operation of trams in case of heavy traffic or other events. Cost of construction is very low, but also capacity is equally low. Figure 2.2 shows its main features.

2) Monorail

A monorail is a railway in which the track consists of a single rail, as opposed to the traditional track with two parallel rails. Unlike some trams and light rail systems, modern monorails are always separated from other traffic and pedestrians. They are both guided

and supported via interaction with the same single beam, in contrast to other guided systems like rubber-tyred metros, or guided buses or trams. Monorails do not use pantographs as power supply is provided along the track beam. Figure 2.3 shows the main features of a monorail.

Figure 2.2: Tram System

Length (m)	16.0
Width (m)	2.4
Height (m)	3.4
Guidance System	Steel rail
Power Collector	Catenary / Conductor rail
Track	Steel rail
Max speed	70 (kph)
Min curve radius	150 m (Desirable) 100(m Absolute Min.)
Max gradient (%)	3.5 %
Capacity	2,000~3,000 pax/hr/dir
Cost	Civil (Viaduct) : US$ 5.4 M/km E&M + R.S: US$ 7.5 M/km

Source: JICA Project Team. Photo from internet.

Figure 2.3: Monorail System

Length (m)	15.0
Width (m)	3.0
Height (m)	5.2
Guidance System	Guide Wheel (Rubber)
Power Collector	Conductor rail
Track	Track beam
Max speed	80 (kph)
Min curve radius	30 m
Max gradient (%)	6.0 %
Capacity	7,000 ~ 30,000 pax/hr/dir
Cost	Civil (Viaduct) : US$ 8.25M/km E&M: US$ 15.14M/km Rolling Stock: US$ 2.71 M/car (large)

Source: JICA Project Team. Photo from internet.

3) Automated Guideway Transit (AGT)

AGT is a fully automated, driverless, grade-separated transit system in which vehicles are automatically guided along a "guideway". The vehicles are often rubber tired, but other systems including steel wheels, air cushion and maglev systems have also been used in experiments. The guideway normally provides both physical support, like a road, as well as the guidance. In the case of fixed-route systems, the two are often the same in the same way that a rail line provides both support and guidance for a train. For systems with multiple routes, most AGT systems use smaller wheels riding on the guideway to steer the vehicle using conventional steering arrangements like those on a car. Figure 2.4 shows the main features of an AGT.

Figure 2.4: AGT System

Length (m)	9.0
Width (m)	2.5
Height (m)	3.5
Guidance System	Lateral pinched Guidance
Power Collector	Conductor rail
Track	Concrete Slab
Max speed	60 (kph)
Min curve radius	30 m
Max gradient (%)	6.0 %
Capacity	7,000 ~ 30,000 pax/hr/dir
Cost	Similar to Monorail

Source: JICA Project Team. Photo from internet.

4) Light Rail

A light rail system is a rail-based transit system that has higher capacity and speed than a tram, usually by operation in an exclusive right-of-way separated from automobile traffic, but which is not fully grade-separated from other traffic like rapid transit is. Light rail also generally operates with multiple unit trains rather than as single tramcars. It emerged as an evolution of trams/streetcars. Light rail systems vary significantly in terms of speed and capacity. They range from slightly improved tram systems to systems that are essentially rapid transit but with some level crossings. The Light Rail Transit (LRT) has a larger capacity then AGT & Monorail, but has smaller cars than MRT and it is usually suitable for secondary corridors (feeders). Figure 2.5 shows the main features of the LRT.

Figure 2.5: LRT System

Length (m)	16.0
Width (m)	2.4
Height (m)	3.4
Guidance System	Steel rail
Power Collector	Catenary / Conductor rail
Track	Steel rail
Max speed	75 (kph)
Min curve radius	150 m
Max gradient (%)	3.5 %
Capacity	10,000~40,000 pax/hr/dir
Cost	Civil Works (elevated): US$13~9 Mill/km E&M: $15.54~$14.6 Mill/km Rolling Stock: $2.55 Mill/car

Source: JICA Project Team, Photo from JICA Project Team member.

5) Rapid Transit

A rapid transit, underground, subway, tube, elevated, metro or Mass Rapid Transit (MRT) system is a railway—usually in an urban area—with high passenger capacities and frequency of service, and full grade separation from other traffic (including other rail traffic).

In most parts of the world, these systems are known as a "metro" which is short for "metropolitan." The term "subway" is used in many American systems as well as in

Glasgow and Toronto. The system in London uses the terms "underground" and "tube". Systems in Germany are called "U-Bahn", which stands for "Untergrundbahn" (underground track). Many systems in East and Southeast Asia such as Taipei and Singapore are called MRT, which stands for Mass Rapid Transit. Systems which are predominantly elevated may be referred to as "L" as in Chicago or "Skytrain" as in Bangkok and Vancouver. Other less common names include "T-bane" (in Scandinavia) and "MTR".

The MRT system has the largest capacity among all other urban rail systems, and therefore it is mainly used for main corridors and longer routes. Due to its size, it has some alignment restrictions, such as minimal curves and maximal slopes. Figure 2.6 shows main features of a MRT.

Figure 2.6: MRT System

Length (m)	20.0
Width (m)	2.95
Height (m)	3.4
Guidance System	Steel rail
Power Collector	Catenary / Conductor rail
Track	Steel rail
Max speed	70 (kph)
Min curve radius	150 m (Desirable) 100(m Absolute Min.)
Max gradient (%)	3.5 %
Capacity	30,000~70,000
Cost	Civil works: Tunnel: $35 Mill/km Viaduct: $18 Mill/km E&M: $15 Mill/km Rolling Stock: $2.5 Mill/car

Source: JICA Project Team. Photo from internet.

2.2 Current Status of Railways in Metro Manila

Mass urban railway services are currently operated only in Metro Manila. It consists of a network of electrified and diesel, rail-based mass transit systems that augment the road network system in trying to meet the transport demand in the metropolis. Three urban railway transit systems plus the Philippines National Railway (PNR) commuter line are now operational and four more are in the planning stage or already in the pipeline for construction. In addition, 3 extension projects of existing lines are currently on-going or about to start bidding process. The four railway transit systems in operation are the following:

(i) PNR Commuter service between Metro Manila and Alabang; and PNR long distance services to southern locations in Luzon Island;

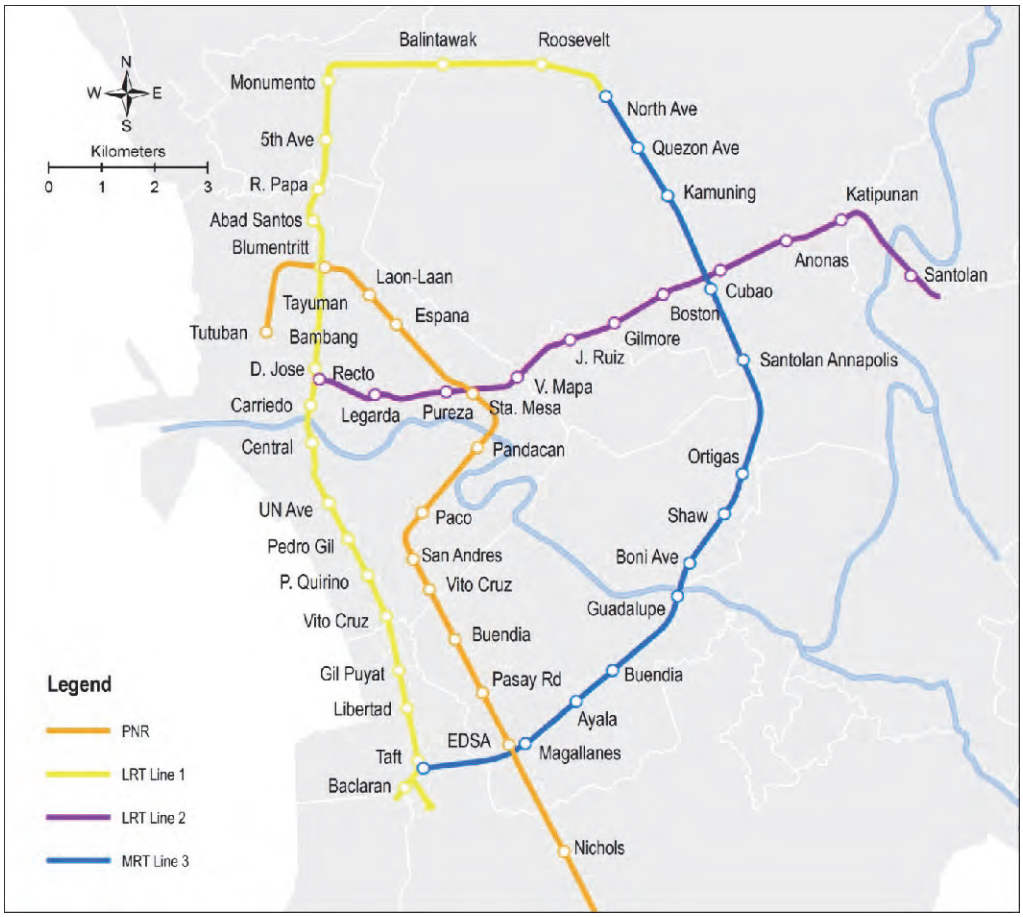
(ii) LRT Line-1, north-south line from Roosevelt (Quezon City) to Baclaran (Pasay City);

(iii) LRT Line-2, east-west line from Santolan (Pasig City) to Recto in Manila City; and,

(iv) MRT Line-3, semi-circle north-south line from North Avenue in Quezon City to EDSA station in Pasay City.

The operational lines are shown in Figure 2.7. This Section describes the key features of these lines, services provided, and the future roles of these lines in serving the urban and sub-urban transportation needs of the Metro Manila and the Greater Capital Region (GCR) population.

Figure 2.7: Existing Railway Systems in Manila, 2015



Source: METI BCDA GCMT Study

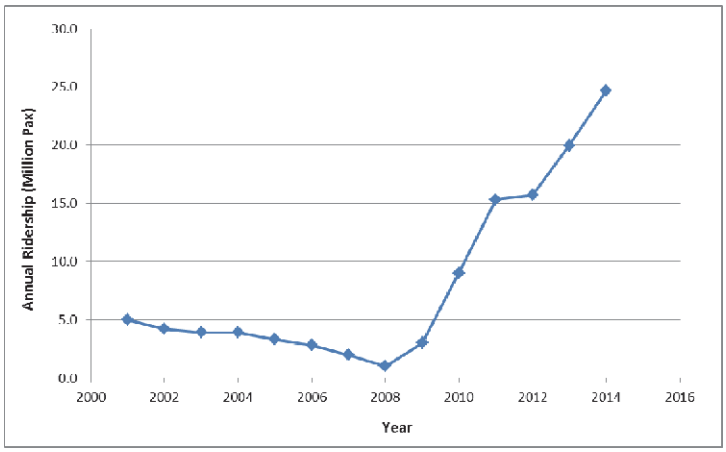
1) Philippines National Railways (PNR)

The PNR network In Luzon mainly consists of a north-south line operating out of Metro Manila main railway station of Tutuban. Services to the north out of Metro Manila have been suspended since almost the conception of the North Rail (NR) Project; the long distance services to the south of Metro Manila to Bicol were suspended after the severe typhoon in September 2006. The only remaining on-going service since 2006 has been between Metro Manila and Alabang.

Analysis of the patronage over the last decade paints a bleak picture. However, in 2009, PNR introduced new (mostly refurbished) rolling stock for services between Metro Manila and Alabang and some limited service to Binan and beyond to Bicol. As a result, the patronage has increased considerably on the Metro Manila-Alabang section of the line. Figure 2.8 below shows the annual ridership on the PNR network for Metro Manila-Alabang and other services.

The PNR network in the GCR extends from Tutuban to Alabang, which is a narrow gauge double track (except Sucat-Alabang section) over a length of about 28km. PNR operates this section from 5:00 AM to 7:00 PM daily, with 30-minute hourly service during the AM & PM peak periods (6:00-11:00 & 15:00-19:00) from Monday through Saturday and hourly service during the inter-peak times and on Sundays.

Figure 2.8: PNR Patronage 2001-2012



Source: JICA Project Team, PNR Data

The PNR network in the south of Luzon Island is shown in Figure 2.9. It is a single 415 km long track from Metro Manila to Bicol/Mayon. PNR runs three (3) trains a week to Bicol and three trains back to Metro Manila. PNR also runs limited commuter services in the Bicol area with patronage of less than 2,000 pax per day. There is little interest in this service because a ride should take about 13 hours from Metro Manila to Bicol per the timetable, but it has been known that more often it takes up to 20 to 24 hours. This is mostly due to very poor track condition, numerous at-grade level crossings, and old rolling stock. Therefore, for obvious reasons, the patronage is very low on the long haul section. This service is run for social reasons at a very low fare rather than to provide rail travel between Metro Manila and Bicol. Figure 2.10 shows the main features of PNR.

Figure 2.9: PNR Network in Luzon Island Philippines

Source: PNR Website

Figure 2.10: PNR Main Features

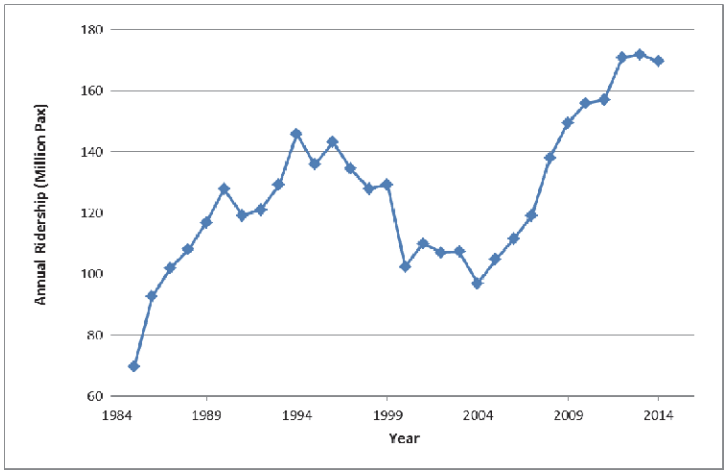
Item /Description	PNR
Structure Type	At grade
Route Length	28 Km (commuter section)
No. Stations	17
Track Gauge	1067 mm
Min. curve radius	200 m (main line; 150 m (depot)
Maximum gradient	
Car-body length	20,800 ~ 21,300 mm
Height	varies
Car-body width	2,850 mm
Axle load	15 ton max
Train make-up	4 units/train
Capacity	960 pax/train (4 car formation)
Max, Speed	80 kph (EDSA – Nichols section)
Car Maker	Diesel Locomotives, Korean DMU, JR East passenger cars (former EMU)
Scheduled Speed	30
Signalling	None
Fare	Distance-wise. Min P9.5, max P15
Voltage	Diesel Power
Feeder system	Self propelled
Travel Time	90 min round trip (Tutuban – Alabang)
Headway	30 minutes
Cost (US$ Millions)	

Source: JICA MMSP Team. Photo from internet.

2) LRT Line 1 (LRT-1)

LRT-1 operates along a 20.35km elevated railway system servicing Taft Avenue-Rizal Avenue and North EDSA corridors. It currently handles about 457,000 passengers per weekday with peak traffic reaching 525,000 passengers during special festive dates of the year. Due to the increased ridership of LRT-1, a train acquisition project was conceptualized with the primary objective of expanding the LRT-1 capacity by 50% from a nominal carrying capacity of 18,000 passengers per peak-hour per direction to 27,000 or 235,000 additional commuters daily. This objective was achieved in 2000 through the procurement of seven new, air-conditioned 4-car trains and the transformation of the existing 2-car trains to 3-car trains with corresponding modifications to the existing vehicles, systems, facilities, and structures to support the operation of the expanded system. Later in 2007, the Light Rail Transit Authority (LRTA) completed the Phase II of the LRT-1 Capacity Expansion Project, which effectively increased the capacity of LRT-1 to 40,000 passengers per hour per direction from the previous capacity (Phase I) of 27,000 hourly passengers. The historical annual ridership is shown in Figure 2.11.

Figure 2.11: LRT-1 Annual Patronage



Source: JICA Project Team, LRTA Data

Figure 2.12: LRT-1 Rolling Stock

Figure 2.12 shows the three different type of rolling stock being used in Line 1.

Source: CMX Consortium

The LRT-1 North Extension is a 5.7 km elevated viaduct that was completed in 2009, adding two more stations (Balintawak and Roosevelt) to the revenue operation of LRT-1. The last phase of this project is to build a Common Station that will connect the LRT-1 and MRT Line 3 and, in the future, with Line 7 as well. The construction of this station has been stopped by a Supreme Court Temporary Restriction Order due to commercial disputes between a major retail shopping mall conglomerate and the DOTC/LRTA over the location of the said station. Figure 2.13 shows the main features of LRT-1.

Figure 2.13: LRT-1 Main Features

Item /Description	Line 1
Structure Type	Elevated track with PC-I beams
Route Length	20.35 km
No. Stations	20
Track Gauge	1435 mm
Min. curve radius	170 m main line, 28 m in yard
Maximum gradient	4.0%
Car-body length	26,000 mm (G2,G3) 29,280 (G1)
Height	3,320 mm (G2) 3,272 (G1) 3,350 (G3)
Car-body width	2,590 mm (G2, G3) 2,485 (G1)
Axle load	10.7 tons (G2) 8.7t (G1) 10.3t (G3)
Train make-up	4 cars/train (G2, G3); 3 cars/train (G1)
Capacity	1388 pax/train (G3 formation)
Max, Speed	60 kph
Car Maker	Original (G1): Bombardier BN Capex I (G2): Adtranz Capex II: Kinki Sharyo, Nippon Sharyo
Scheduled Speed	38 kph
Signalling	ATP, ATS
Fare	Distance-wise. Min P12, max P20
Voltage	750 V DC
Feeder system	Over Head Contact
Travel Time	53 minutes
Headway	112 sec. After Capex 2 Project
Cost (US$ Millions)	$500, or $35 per km (₱ 3.5 billions of 1982)

Source: JICA Project Team, LRTA Data

3) LRT Line 2 (LRT-2)

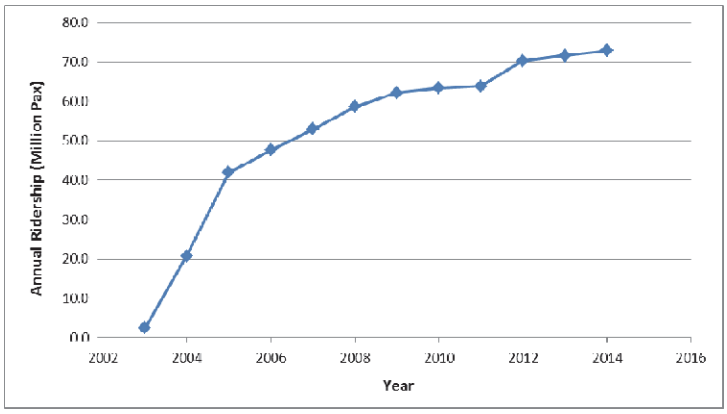
The Megatren, more popularly known by its generic name LRT-2, is a 13.8km mass transit line that traverses four cities in Metro Manila namely Pasig, Quezon, San Juan, and Manila along the major thoroughfares of Marcos Highway, Aurora Boulevard, Ramon

Magsaysay Boulevard, Legarda and Recto Avenue. The Megatren, which started initial commercial operation in April 2003, is the latest of its kind in the world today. It is an Automatic Train Operation system which is at par in terms of facilities and technology with those in other parts of the world. It is equipped with a CCTV system that enables the railway operator to monitor activities of passengers and employees at the stations and inside the trains. Moreover, the LRT-2 is commuter friendly and has facilities especially designed for the elderly and persons with disabilities. The Megatren system has 18 four-car trains. Each train is 92.6 meters long and consists of four motorized cars. One train can seat 232 passengers. It can accommodate 1,396 more standing passengers along its spacious coaches.

Data from LRTA showed average daily ridership growing rapidly from its opening year 2004 and tapering off after 5 years reaching 213 thousand in 2013. This ridership was way below (by as much as 2/3) the original traffic forecast when the feasibility study was made in the late 1990s.

The historical annual ridership is shown in Figure 2.14 below and the main features of LRT-2 in Figure 2.15.

Figure 2.14: LRT-2 Annual Patronage



Source: JICA Project Team, LRTA Data

Figure 2.15: LRT-2 Main Features

Item /Description	Line 2
Structure Type	Elevated PC concrete box girder
Route Length	13.52 km
No. Stations	11
Track Gauge	1435 mm
Min. curve radius	175m main line, 100m depot
Maximum gradient	5.0%
Car-body length	22,500 mm
Height	3,700 mm
Car-body width	3,200 mm
Axle load	16.6 ton
Train make-up	4 units/train
Capacity	1,628 pax/train (4-car train)
Max, Speed	80 kph
Car Maker	ROTEM, South Korea
Scheduled Speed	32.8
Signalling	ATP, ATO, ATS
Fare	Distance-wise. Min P12, max P15
Voltage	1500 V DC
Feeder system	Over Head Contact
Travel Time	30 minutes
Headway	Min. 1.5 minutes
Cost (US$ Millions)	$850, or $61.6 per km

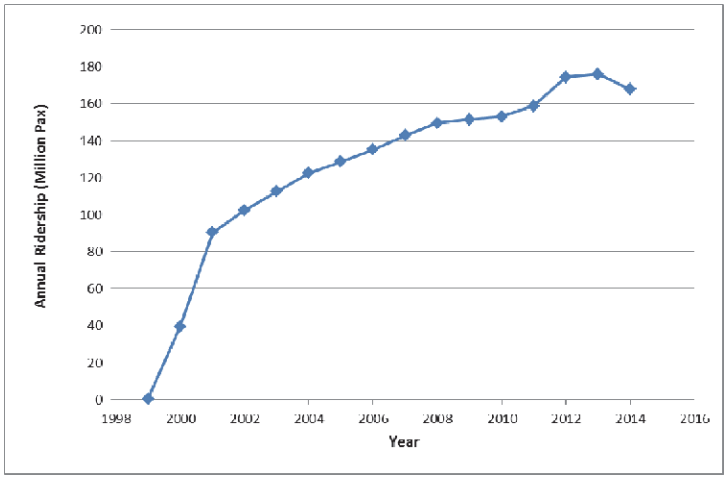
Source: JICA Project Team, LRTA Data

4) MRT Line 3 (MRT-3)

Under a BLT contract to Metro Rail Transit Corporation (MRTC), the EDSA MRT or MRT Line 3 (Metrostar Express) is a 16.9-kilometer modern rail system stretching along EDSA from North Ave., Quezon City to Taft Ave., Pasay City that was constructed from 1998 to 2001. This Metro Rail system is designed to carry traffic in excess of 23,000 passengers per hour per direction initially and is expandable to accommodate 48,000 passengers per hour, per direction. The rail system has a total fleet of 73 Czech-made modern air-conditioned rail cars of which up to 60 cars in three-car trains are operated daily during the peak hours. Each train can seat 216 passengers and carry under crush capacity 1,182 riders. This line has been losing is carrying capacity in the recent years due to unavailability of rolling stock, reaching critical levels in 2015, and also providing a lower-than-standard level of service due to often power interruptions, signaling problems, and even derailments.

It is expected that in the coming month this situation will improve with the introduction of new rolling stock from China, the implementation of the common ticketing system, and some systems enhancements. The historical annual ridership is shown in Figure 2.16 below and the main features of MRT-3 in Figure 2.17.

Figure 2.16: MRT-3 Annual Patronage



Source: JICA Project Team, DOTC Data

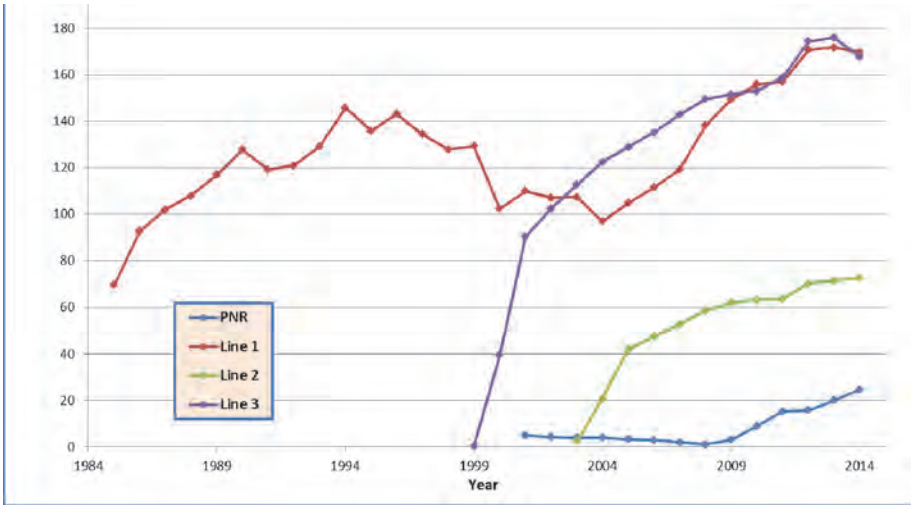
Figure 2.17: MRT-3 Main Features

Item /Description	Line 3
Structure Type	Elevated & underground track with PC-I beams
Route Length	16.9 km
No. Stations	13
Track Gauge	1435 mm
Min. curve radius	370m main line, 25m depot
Maximum gradient	5.0%
Car-body length	31,720 mm
Height	3,250 mm
Car-body width	2,500 mm
Axle load	9.3 ton
Train make-up	3 units/train
Capacity	1,182 pax/train (3 car formation)
Max, Speed	65 kph
Car Maker	CKD Tatra, Czech
Scheduled Speed	30
Signalling	ATP, CTC
Fare	Distance-wise. Min P9.5, max P15
Voltage	750 V DC
Feeder system	Over Head Contact
Travel Time	
Headway	Min .3 minutes
Cost (US$ Millions)	$698, or $41.3 per km

Source: JICA MMSP Team. Photo from internet.

Figure 2.18 shows the annual ridership of the all four (4) railway lines in Metro Manila, and Table 2.1 shows a summary of the main parameters of the three existing electric railway lines.

Figure 2.18: Annual Patronage for all Four Railways in Metro Manila



Source: JICA MMSP Team

Table 2.1: Main Parameters of Manila Railway Lines

Item/Description	Line 1	Line 2	Line 3
Structure Type	Elevated track with PC-I beams	Elevated PC concrete box girder	Elevated & underground track with PC-I beams
Route Length	20.35 km	13.52 km	16.9 km
No. Stations	20	11	13
Track Gauge	1435 mm	1435mm	1435 mm
Min. curve radius	170m main line, 28 m in yard	175m main line, 100m depot	370m main line, 25m depot
Maximum gradient	4.0%	5.0%	5.0%
Car-body length	26,000 mm (G2,G3) 29,280 (G1	22,500 mm	31,720 mm
Height	3,320 mm (G2) 3,272 (G1) 3,350 (G3)	3,700 mm	3,250 mm
Car-body width	2,590 mm (G2, G3) 2,485 (G1)	3,200 mm	2,500 mm
Axle load	10.7 tons (G2) 8.7t (G1) 10.3t (G3)	16.6 tons	9.3 ton
Train make-up	4 cars/train (G2, G3); 3 (G1)	4 units/train	3 units/train
Capacity	1388 pax/train (G3 formation)	1628 pax/train	1,182 pax/train
Max, Speed	60 kph	80 kph	65 kph
Car Maker	G1 Original: Bombardier G2 Capex I: Adtranz G3 Capex II: Kinki Sharyo	ROTEM, South Korea	CKD Tatra, Czech
Scheduled Speed	38 kph	32.8	30
Signaling	ATP, ATS	ATP, ATO, ATS	ATP, CTC
Fare	Distance-wise: min. P12, max. P20	Distance-wise: min. P12, max. P15	Distance-wise: min P9.5, max. P15
Voltage	750 kV DC	1500 V DC	750 kV DC
Feeder system	Over Head Contact	Over Head Contact	Over Head Contact
Travel Time	53 minutes	30 minutes	
Headway	112 sec. After Capex 2 Project	Min. 1.5 minutes	Min .3 minutes
Cost (USD Millions)	$500, or $35 per km (₱3.5 billions of 1982)	$850, or $61.6 per km	$698, or $41.3 per km

Source: JICA MMSP Study

2.3 Description of Rail Systems in Manila

The following projects are being proposed either by Government agencies or private investors for future implementation. The operational lines are shown in Figure 2.19. This section describes the key features of these lines, services provided, and future roles of these lines in serving the urban and sub-urban transportation needs of the Metro Manila and GCR population.

Figure 2.19: Future Railways in Metro Manila & GCR Areas

Source: JICA MMSP Study

1) Line 1 South (Cavite) Extension Project

The project aims to extend the existing 20.35 km LRT-1 System southward by an additional 11.7km, of which approximately 10.5km will be elevated and 1.2km will be at-grade. The South Extension will start from the existing line's last station at Baclaran and will traverse the cities of Parañaque and Las Piñas in Metro Manila and reach the municipality of Bacoor, Province of Cavite. The extension will initially include 8 new passenger stations with a provision for 2 additional passenger stations. A satellite depot for light rail vehicle (LRV) storage and light maintenance will be located at Zapote, near the southern end of the proposed line and an expansion of the existing Baclaran depot will be built. Intermodal facilities will also be installed at high-demand stations. Additional 120 LRVs (30 4-car-trains) will be also purchased.

The project is funded under a Hybrid PPP (public–private partnership) Scheme where the private sector would build the civil works for viaduct and stations and build and install all electro-mechanic systems, while the public sector would purchase the rolling stock and build two depots (civil works and maintenance equipment) and acquire ROW and General Consultant.

The key features of the Line 1 Cavite Extension Project, based on the project study conducted by JICA, are:

(i) Interconnectivity to the existing Line 1 at Baclaran Terminal to form a continuous line and transport more people
(ii) Compatible technology with the existing Line 1 to permit through running of trains
(iii) Integrated fare collection system, with ticket commonality for seamless travel
(iv) Intermodal facilities at three high demand stations
(v) Common maintenance facility for the extension and the existing Line 1 in Pasay City

The project seeks to (i) immediately provide safe, reliable and environment-friendly transportation services in Metro Manila and the suburbs; (ii) immediately alleviate the worsening traffic condition in the Parañaque-Las Piñas-Cavite area, and (iii) catalyze commercial development around the rail stations. Figure 2.20 shows the proposed alignment for this project.

As of September 2015, the following are the status of the project:

(i) The concessionaire has been selected and awarded, and Concession Agreement (CA) was signed on 2nd October 2014. The contract was awarded to the Light Manila Rail Corporation (LRMC)
(ii) The contract for Consulting Services for the Grantors' portion (ODA Loan) was awarded to the CMX Consortium. The mobilization started on 2nd February 2015.
(iii) Bidding Documents for LRVs and depots have been submitted for approval and concurrence in September 2015

2) Line 2 East Extension Project

The Line 2 East Extension Project consists of extending the elevated tracks of Line 2 by approximately 3.9km from its current terminus in Santolan to the Masinag market in Antipolo along the center-line of Marcos Highway and providing two new stations. The two stations that will be constructed are: (a) the Emerald Station straddling Imelda Avenue and adjoining Robinson's East Mall and the Sta. Lucia East Mall in Cainta, and (b) the Masinag Station near the Masinag market at the crossroad of Marcos and Sumulong

Highways. The works for Line 2 extension does not require right-of-way acquisition, no procurement of rolling stock, and no depot expansion

These works are again to be executed by two mechanisms. In this case, a) the Government of the Philippines (GOP) shall fund the engineering consultants to prepare the detailed design and assist with the procurement and supervision of construction contractors, and construction of the civil and structural works; b) the ODA JICA loan will be used to procure the E&M systems works and rail systems works of the extension, including integration with the existing system.

The status of the project as of September 2015 is as follows:

(i) The Detailed Design Consultant for the Civil works was selected, mobilized and already completed the detailed design of the viaduct works, and concept design for the Design and Build contract for the two stations. The Consultant is the Consortium formed by FDSC, KRNA, and Soosung from Korea.

(ii) The contract for the viaduct civil works was awarded to D.M. Consunji Inc., and they were mobilized by the end of April 2015.

(iii) Groundbreaking Ceremony held on June 9 2015

(iv) The contract for Consulting Services for the E&M works' portion (ODA Loan) was awarded to the CMX Consortium. The mobilization started on 2nd February 2015.

(v) Bidding Documents for E&M (ODA portion) has been submitted for approval and concurrence in September 2015

Figure 2.21 shows proposed alignment for this project.

3) Metro Rail Transit Line 7 Project

The Metro Rail Transit Line 7 (MRT-7) will be the fourth rapid transit line to be built in Metro Manila. When completed, the line will be 23 km long with 14 stations and operated by the Universal LRT Corporation (ULC) for 25 years. The line will run in a northeast direction traversing Quezon City and a part of Caloocan City in Metro Manila before ending at the City of San Jose del Monte in Bulacan province. Passengers will be able to transfer to the Yellow Line and Blue Line through the Metro Manila Integrated Rail Terminal (a.k.a Common Station) that will link the three lines at North Avenue in Quezon City.

Under the proposal, the project will have a combined 45-km of road and rail transportation running from the Bocaue exit off the North Luzon Expressway (NLEX) to the intersection of North Avenue and EDSA. The 22-km, 6-lane asphalt road will connect the NLEX to the major transportation hub development in San Jose del Monte. The 23-km of mostly elevated MRT starts from there and ends at the integrated station beside SM City North EDSA.

The construction period is expected to last 3-1/2 years. ULC will operate and manage the system on behalf of the government over 25 years while gradually transferring ownership of the system to the government in proportion to payments of annual capacity fees. Figure 2.22 shows proposed alignment for this project. Currently, the project is in the final stage of financial closing.

Other features are:

(i) Third rail instead of OCS

(ii) Depot: 14ha at Tala for 108 LRVs

(iii) Capacity 28,000 pax/hr/dir, expandable to 38,000

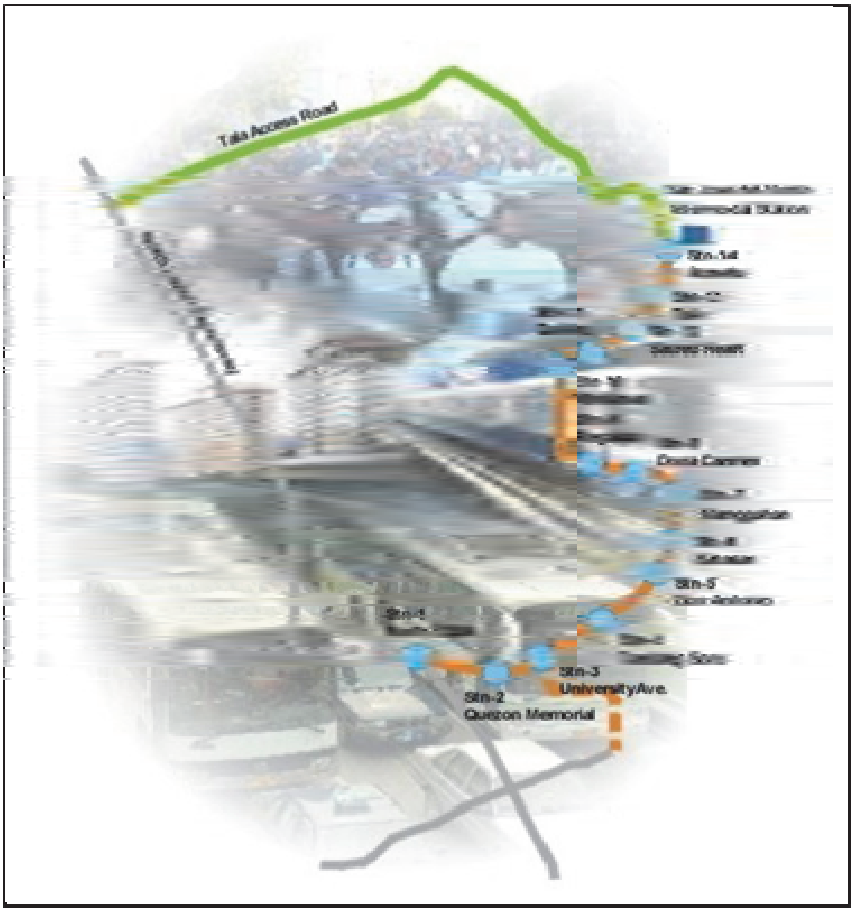
Figure 2.20: Line 1 South (Cavite) Extension Project Proposed Alignment

Source: JICA Project Team

Figure 2.21: Line 2 East (Masinag) Extension Project Proposed Alignment

Source: JICA Project Team

Figure 2.22: MRT-7 Project Proposed Alignment



Source: JICA MMSP Study

4) North South Commuter Rail Project

The North-South Commuter Railway was envisioned at the beginning of the Pre-Feasibility Study of 2012 as a commuter line that will eventually link Clark to NAIA with the intention of combining an Airport Rail Express Service with the Commuter Service within the same infrastructure. Changes were later made regarding the alignment based on study findings, coordination with relevant agencies, and deliberations and decisions within DOTC. Alignment changes such as Clark to FTI in Manila, then shortening the north terminal to Malolos and extending the service to the south (i.e., Calamba), and dropping the Airport Rail Express Service were considered. Since mid—2012, two studies have been carried out where the horizontal and vertical alignments have been investigated, together with other parameters such as demand, environmental and social impacts, E&M system, and operation plan, among others.

Among the conclusions from the mentioned studies is the decision to follow the PNR ROW as the basic horizontal alignment for the entire length of system. However, as the selected alignment is also shared with three different highway projects by DPWH, the vertical and horizontal alignments between the Caloocan—FTI Section have been challenging due to its huge cost and severe environmental/social implications for all projects involved. Despite this, a final agreement has been reached and the NSCR Project has been envisioned.

- **Phase 1: Malolos Station to Tutuban Station** to be funded by ODA JICA. The Tutuban station to be built adjacent to Recto Avenue, where Tutuban Shopping Mall is currently located. The Loan Agreement is currently being negotiated (as September 2015).
- **Phase 2: renamed North South Railway Project (NSRP)** to branch off from Solis Station toward the South until Calamba, providing a commuter services that will operate seamlessly with the NCR in the north. This project would be implemented under PPP Scheme. ADB has been nominated a Financial Transaction Advisor for this project, and bidding is expected by early 2016. This section will also offer long distance services towards the southern cities of Luzon Island.

1) North South Commuter Rail Project (NSCR)

The main parameters of this project are as follows. Figure 2.23 shows proposed alignment and type of rolling stock.

(i) 37.9km of suburban commuter railway
- 30.8 elevated
- 7.1 embankment

(ii) 10 stations (15 in the future)

(iii) 1 depot at Valenzuela

(iv) 13 train sets (8-car formation)

(v) Narrow gauge: 1067 mm

(vi) Tutuban Station to be built at Recto Av. and adjacent to future Line 2 Station

(vii) Travel time from Malolos to Tutuban: 35 min

(viii) Currently JICA ODA Loan Agreement in process

(ix) Expected start of Detailed Design by the end of 2015

(x) Expected opening: 2020

(xi) Connection to NSRP South Line at Solis Station

Figure 2.23: NSCR Project Proposed Alignment and Rolling Stock

Source: NSCR JICA Project Team

2) North South Railway Project (NSRP)

The main parameters of this project are as follows. Figure 2.24 shows the proposed alignment.

(i) 653km of railway

- 56km of Commuter line (Tutuban—Calamba)
- 478km Long Haul (Tutuban—Calamba—Legazpi)
- 58km Long Haul (Calamba—Batangas)
- 117km Long Haul (Legazpi—Matnog)

(ii) 19 stations for commuter line

(iii) 1 depot near Calamba

(iv) 14 train sets (8-car formation, EMU)

(v) Narrow gauge: 1067mm

(vi) Travel time from Calamba to Tutuban: 53 min

(vii) Currently preparing for PPP bidding

(viii) Expected opening: 2020

(ix) Connection to NSRP North Line at Solis Station

3) LRTA Line 2 West Extension Project

This implementation of this project was initiated by the Department of Transportation and Communications (DOTC) and the LRTA in light of the impending implementation of phase 2 of LRT-2 (extension to the East). Thus, the project can be classified as phase 3 of LRT-2 System.

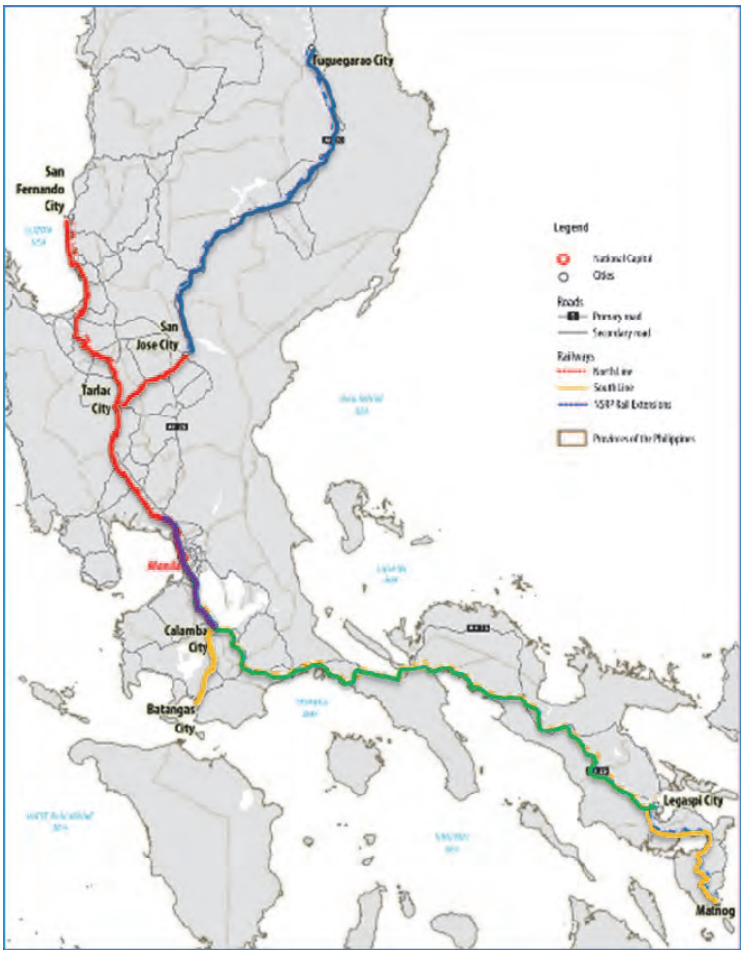
Regarding electro-mechanic parameters, logic dictates that any extension should follow the technology of the existing Line 2 system. The focus of this effort is therefore on the re-planning of the extension in the light of a firm decision to include the effect of the.

The LRT-2 Phase 3 focuses on the western extension of LRT Line 2 from the existing Recto Station in the east to Tutuban PNR Station near the Divisoria market where it will connect to the North South Commuter Railway (NSCR) — with Tutuban/Divisoria as its terminal hub — and further to Pier 4 along Road R10 for about 3km. It would have three (3) additional stations. Figure 2.25 shows the proposed three stations and alignment.

The objective of the Line 2 Phase 3 project is to extend the existing Line 2 westward in accordance with the 1998 MMUTIS Plan as well as the more recent 2013 Transport Roadmap for the Greater Capital Region. The design parameters will essentially be the same as those of the original line. The Tutuban Station is foreseen to be a major transfer station — or a common station for NSCR Commuter Service and LRT-2 — thus, strengthens the interconnectivity of the evolving mega Manila rail network. Figure 2.26 shows a concept design of the future Tutuban Station Hub area.

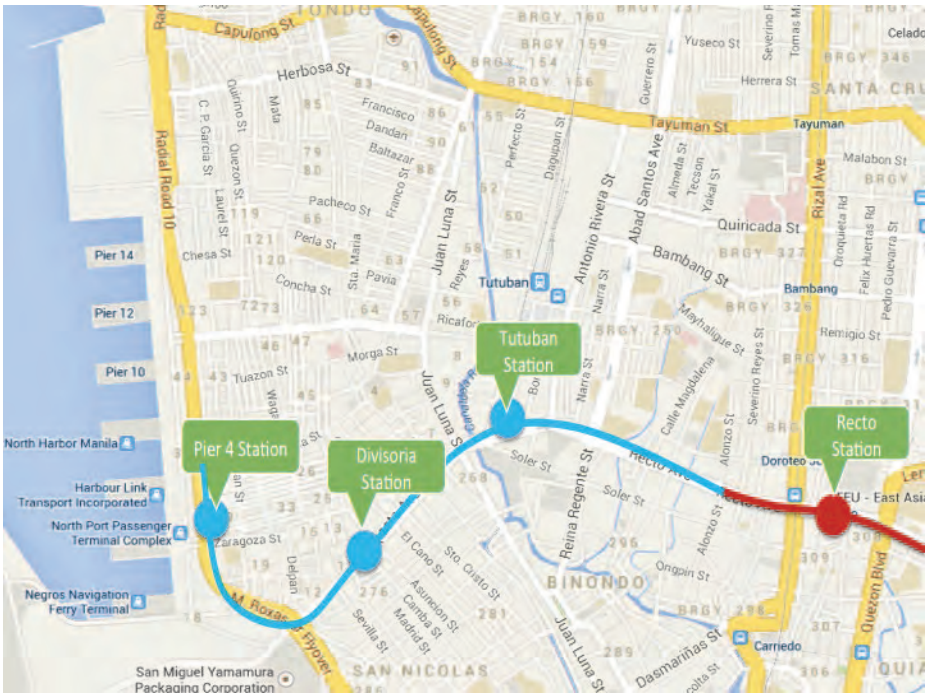
This project has been approved by NEDA and will be implemented under GAA funding.

Figure 2.24: NSRP Project Proposed Alignment



Source: PPP Center

Figure 2.25: Proposed Alignment and Stations for Line 2 West Extension



Source: DOTC Line 2 West Extension Study

Figure 2.26: Future Tutuban Station Hub Area

Source: JICA TOD Study

Figure 2.27: Proposed Alignment for EWR

Source: METI Study on Medium Capacity Transit System Project in Metro Manila

4) East West Railway Project (EWR)

Originally called MRT-8 East Rail, this project was based on the concept developed by a private group (ATS), and the first alignment concept traversed portions of Manila in Sta. Mesa, Mandaluyong, Pasig, Quezon City, and Rizal. It was about 17-km long and had 16 stations and a depot on a 13 ha lot owned by Filinvest, 1.75km from San Juan station in Cainta. This unsolicited proposal was put on hold in 2009.

In September 2014, METI funded a Pre-Feasibility Study to revive this project called "Study on Medium Capacity Transit System Project in Metro Manila," which proposed a modified alignment from Cainta City, taking Ortigas extension then turning into ADB Avenue in Ortigas CBD then Shaw Blvd., crossing EDSA and continue until Aurora Blvd. connecting to Line 2 at V. Mapa station. The total is 18.8km, 2.2km of which is underground, with 12 stations, and incorporates an AGT System. The study was completed in March 2015.

As of September 2015, this project has been reformulated under the PPP Center as the Line 4.

There are three more projects that have been studied, but still have no approval from NEDA. These are the Metro Manila Subway Project, the Makati Loop Subway System, and the Global Cities Mass Transit Project.

5) Metro Manila Subway Project (MMSP)

The study Information Collection Survey for the Mega Manila Subway Project (hereinafter called the "MMSP") aimed to collect and confirm basic information regarding the proposed subway project in the Roadmap Study (hereinafter called as the "Project", not necessarily limited to the particular route proposed in the Roadmap Study, but the planned subway in north-south corridor through the GCR in general), which will be a beneficial and valuable input to the realization of the Project in particular application to the NEDA ICC (Investment Coordination Committee) by the DOTC of the Republic of the Philippines. The main outcome of the Study was the several options of the implementation of the north-south corridor subway project without definite suggestion or recommendation on a particular option among several that shall be proposed, but only with rough cost estimate, construction schedule, and results of rough economic and financial analysis. Other important aspects related to the project implementation, i.e. disaster and risk prevention, potential project implementation scheme, non-railway business opportunities, etc., were also presented in the deliverables of the Study.

Some of the main parameters of this project are shown below as a result of the study:

(i) Project divided into two phases: Central & Overall
(ii) Phase 1: "Central"
- 22.7—27.0 km underground
- 13 to 15 stations

(iii) Phase 2: Overall ("North" & "South")
- 59.1—63.4 km mostly elevated or underground *(including Central)*
- 27 to 29 stations

(iv) Two proposed Depots

(v) Rolling stock:
- 25 train sets (6-car formation) (2025)
- 55 train sets (10-car formation) (2045)

(vi) Funding scheme under evaluation

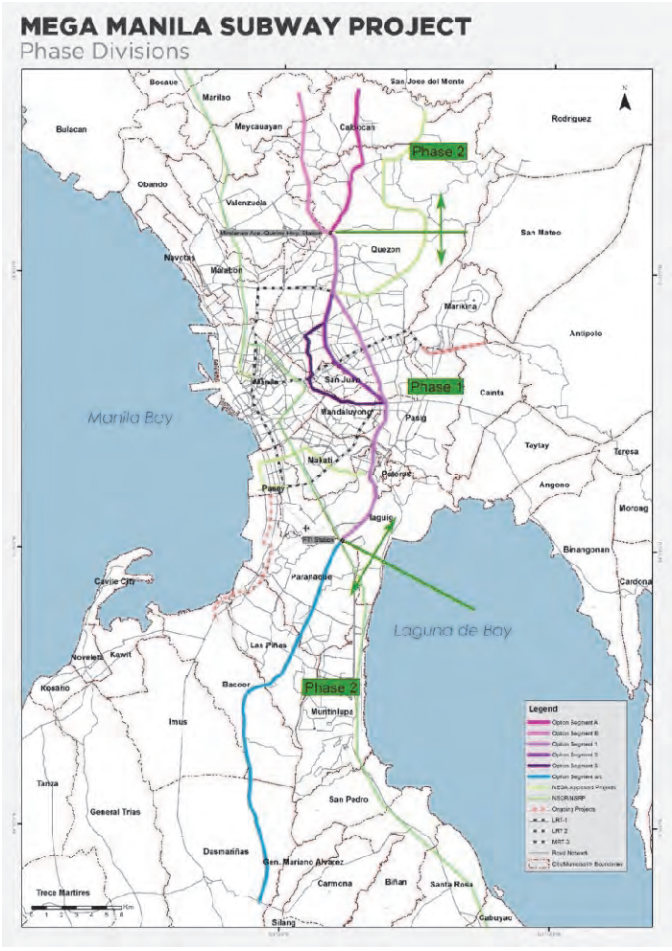
(vii) Expected revenue openings: unknown

(viii) Cost: around $ 4.47 billions for Phase 1 only
- CW (stations & tunnels): $ 2.4 billion
- E&M: $ 383.91 million
- Rolling Stock: $ 317.57 million
- ROW compensation: $ 230.91 million
- Engineering: $ 347.19 million
- Indirect Cost: $ 788.24 million

(ix) Expected additional ridership (pax/day):
- 421,000 (2025)
- 1,470,000 (2035)
- 2,049,000 (2045)

Figure 2.28: Proposed Alignment for MMSP

Source: JICA Project on MMSP



Further investigation will be carried out during full blown feasibility study.

6) Makati Loop Subway System

This project proposed a subway system between BGC and reclamation area that passes by Makati CBD. The cost has been mentioned in the mass media at around 370 billion pesos. This project is for approval from NEDA.

(i) This project proposed a subway system between BGC and reclamation area, passing by Makati CBD;

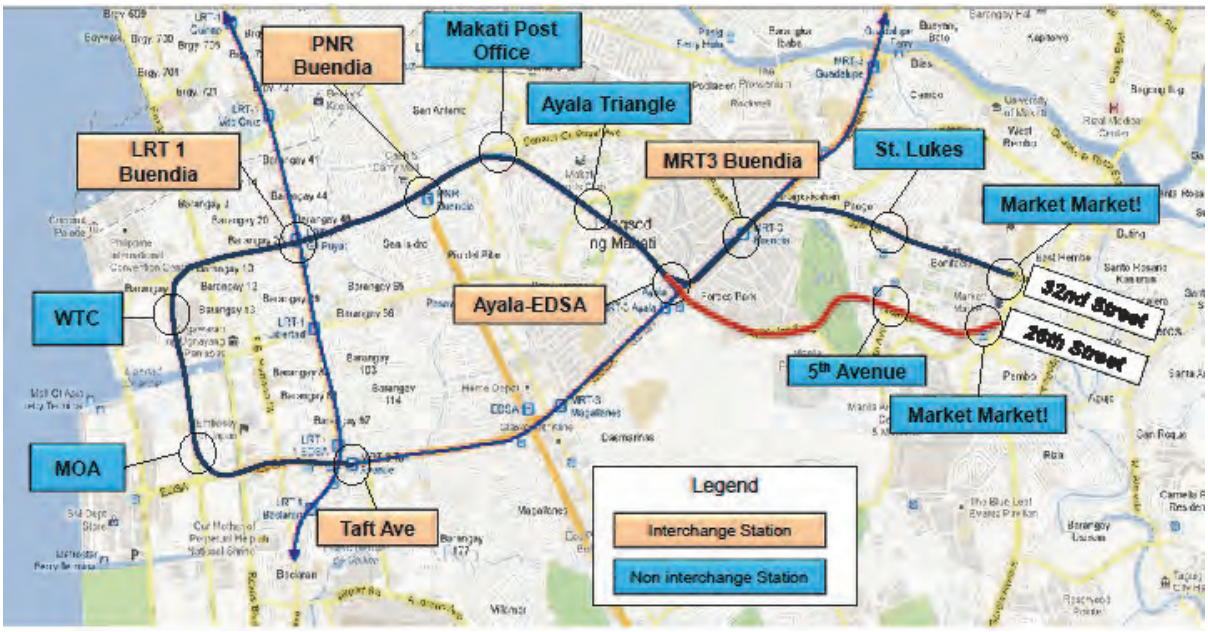
(ii) 12km of tunnel;

(iii) 10 to 11 stations;

(iv) The cost has been mentioned in the mass media at around 370 billion pesos (—$8.2 billion)

(v) For approval from NEDA.

Figure 2.29: Proposed Alignment for Makati Loop Subway



Source: JICA Project on MMSP

7) Global Cities Mass Transit (GCMT) Project

METI pre-FS study carried out in 2012, proposed a monorail system between Makati CBD, and Global cities of BGC, McKinley Hills, McKinley West, Newport, and NAIA Terminals 1,2, and 3, and finally with Line 1 Cavite Extension. The cost is estimated at PHP70 Billion. The Project is currently on-hold.

(i) 19.2 km of double track
- 16.25 elevated (including depot access)
- 7.4 tunnel (*two locations*)

(ii) 14 stations (1 sta. underground)

(iii) Depot at grade and covered by park at Consular area

(iv) 40 train sets (4-car formation) (large type)

(v) Connecting Makati CBD—BGC—McKinley Hill—Newport—NAIA and LRT-1

(vi) Cost: around PHP 70.4 billion

(vii) Ridership at full project: 475,000 (pax/day)

(viii) On-hold

Figure 2.30: Proposed Alignment and Rolling Stock for GCMT

Source: METI BCDA GCMT Study

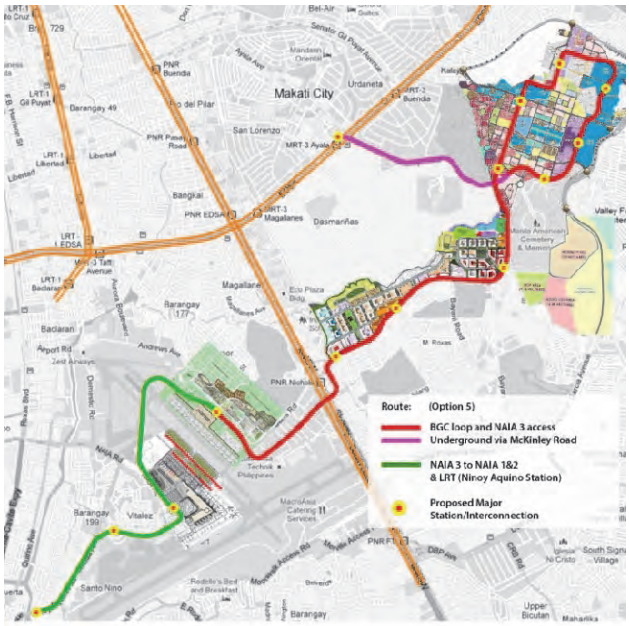
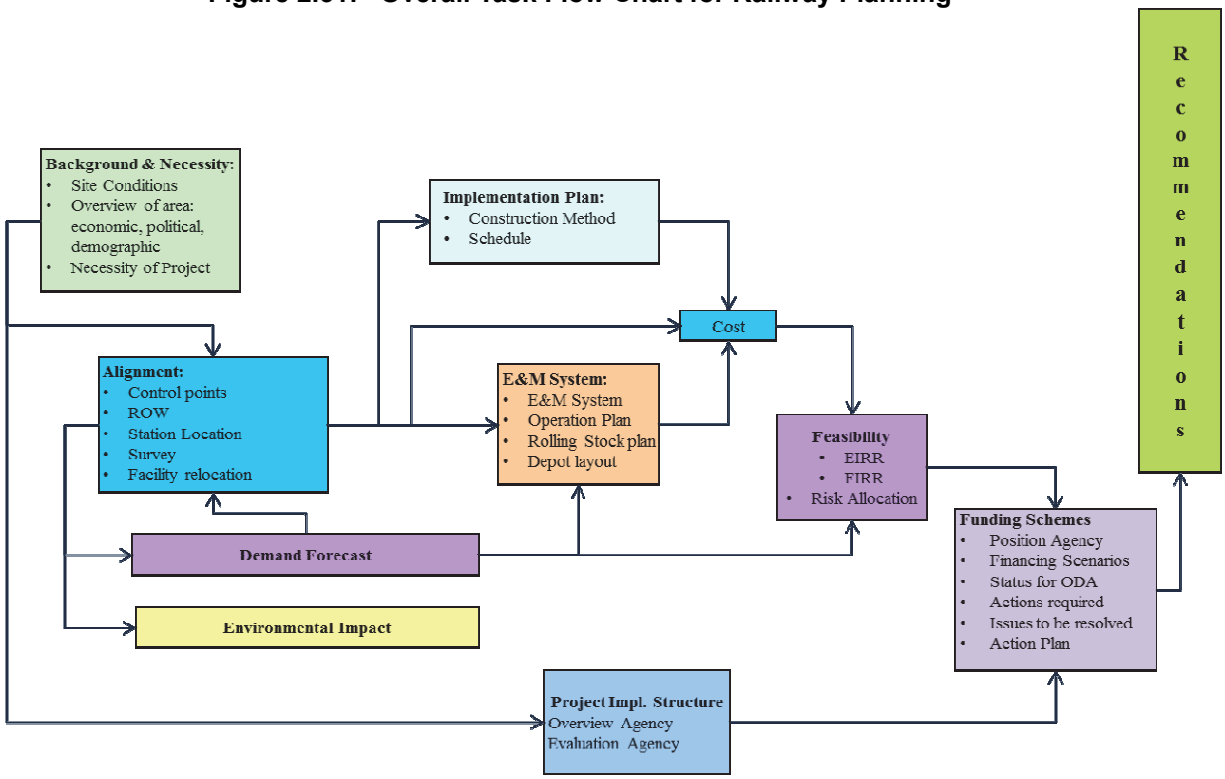


Figure 2.31: Overall Task Flow Chart for Railway Planning



Source: JICA Project Team

2.4 Overall Task Flow for Railway Planning

Based on a necessity (existing or future) to transport a large amount of people along a certain corridor, under certain restrictions, define the most economic, feasible, attractive system to achieve the objectives.

It is necessary to define the technical parameters of the system, its cost, the time needed to implement, its social impact, and its feasibility.

The task flow for a typical feasibility study or planning for a railway system, is shown in Figure 2.31.

1) Necessity and Background

The starting point is to identify the necessity of the project. Usually this comes from separate demand studies which identify the Origin/Destination Matrix and the main corridors within an urban area. Then the site conditions and background are investigated such as, but not limited to:

(i) Basic site conditions
- Urban/rural
- Heavy built/greenfield

(ii) Geopolitical/Demographic condition of country/area

(iii) Geotechnical/Hazard Conditions

(iv) Transport Conditions (current/planned)

(v) Legal Framework

2) Alignment

After the target corridor has been identified, the potential alignment shall be investigated. The parameters to be considered are, but not limited to:

(i) Control Points
- Existing and future structures
- Topographic conditions

(ii) ROW

(iii) Station Locations
- Accessibility
- Potential Patronage

(iv) Facility Relocation
- Plan & Profile
  - Minimum curve radius (60m—150m)
    - o Speed restrictions
    - o ROW acquisition
  - Maximal slopes (1%—6%)
  - Vertical curves
  - Vertical and horizontal clearances
  - Clearance of existing structures

After identification of the possible alignment, additional demand forecast for those alignments are carried out and feedback to the study to confirm and screen best options for route and station location. In parallel, an Environmental Impact Assessment should be carried out for the selected route(s).

3) Implementation Plan

Once the alignment is defined it will be possible to estimate the Implementation Plan. This IP will depend on the construction method, type of structure, packages and advance construction fronts, etc. The IP will have an important effect on cost and time, thus several options should be studied.

4) E&M System

Once the alignment is defined, and in parallel to the study of the Implementation Plan, it will be possible to define the E&M Systems. The items to be defined are, but not limited to:

(i) System Selection
- MRT, AGT, Monorail, AGT, LRT, BRT
- Power distribution
- Track
- Signalling, Telecommunication
- AFC

(ii) Operation Plan

(iii) Depot Layout

(iv) Rolling Stock plan

For the selection of the system, the following main parameters should be considered:

(i) Demand

(ii) Alignment conditions

(iii) Control points

(iv) Environment / Aesthetics

(v) Cost

5) Operation Plan

The operation plan should be defined as part of the E&M System and include definitions on system capacity, headways, number of trains, fleet requirements, type of operation, and others.

The parameter needed to estimate the size of the system (system capacity) is the demand, particularly, the passengers per peak hour per direction (PPHPD). The PPHPD is obtained from the loading/unloading data per station and estimating the maximal peak hour link.

The system capacity is given by:

(i) Capacity = maximal capacity (during peak hour) = capacity of a car by # cars by # trains per hour

(ii) Capacity of cars = usually defined as "aw3" = aw1 + 7pax/m^2; aw3 is usually called 200% load. Aw1 is the seating capacity. System Capacity must be larger than PPHPD.

(iii) Train per hour is defined as [60 min/minimal headway], where minimal headway [min] = 60 min * pax per train/PPHPD.

(iv) Finally, fleet requirement would be estimated as [Operational trains = trains per hour * total round trip time [hr]/60], and total # trains = operational + reserve trains (10 ~ 15%).

6) Depot Layout

Another important factor in the definition of the E&M System is the confirmation of availability of land for the depot. In case of land availability restrictions the type of rolling stock (system) should be reconsider. This should be used as feedback to recalculate Operation Plan.

7) Cost and Project Evaluation

After the Implementation Plan and E&M System are defined, the cost (Capital and O&M) can be estimated and, consequently, the evaluation of the project can be determined by calculation of financial and economic rates of return (FIRR and EIRR).

Possible funding schemes and proposals for implementation agencies, if any, will complete the planning for a given railway project.

2.5 Railway Development in the Philippines

There are many aspects that should be improved in order to accelerate and facilitate the development of railway systems in Philippines. However, there are two not addressed yet and are critical for the said objective:

- Need of a National Railway Planning and Supervisory Authority
- Need for a Legal Framework for the Subterranean Space and Right of Way

1) Establishment of Philippines Railway Authority (PRA)

The creation of an autonomous Philippines Railway Authority (PRA) as a governing body for setting transport policy, regulatory parameters, and for implementing all railway programs is recommended for the long term vision of the railway sector in the Philippines. The main objectives are to ensure delivery of regulatory obligations and to assure satisfaction levels of passengers equivalent to the best in railways and other forms of transport.

The key tasks of the new entity are to provide for:

(i) Changes in the regulation of public transport operations for Government-owned operator as well as in joint venture with the private sector and private operator;

(ii) Health and safety regulation

- Accident and incident investigation;
- Regulation and certification;
- Safety approvals, safety directive, interoperability, train driving licenses and certificates, and rail vehicle accessibility;
- Inspections and audits;

- Conduct inspections and audits to check that the rail industry has the management systems in place effectively controlling health and safety risks;
- Enforcement of health and safety legislation;
- Safety guidance and research;
- Provide on-site and written advice and guidance on how to comply with the law;
- Worker and infrastructure safety; and
- Occupational health - Moving the health agenda forward

(iii) Land acquisition power;

(iv) Access and market regulation: Responsible for licensing the companies that operate trains, stations, light maintenance depots and networks. These operators must hold a license, or be exempted from doing so by this Authority.

- Operator licensing
- Competition and consumer issues
- Sustainable development
- Investments
- Closures

(v) Setting up a transparent, consistent, efficient administrative mechanism to create a level playing field for all participants and protect the interests of all stakeholders;

(vi) To prepare a projects list to be implemented under Government funds, ODA, or to be offered for PPP and take them forward, after approval from the Planning Agency, with assistance of the highly qualified staff through a transparent selection process; and,

(vii) Putting in place an effective and efficient institutional mechanism for speedy clearance of the projects.

The PRA would be funded through a combination of license fees and a railway safety levy. Economic regulation activities are funded through the license fee while the health and safety activities through the safety levy. Figure 2.32 shows the concept of the new PRA and its relationships with existing and future entities.

2) Legal Framework for Subterranean Space and Right of Way[1]

(1) Legal Framework for Compensation to Land Owners and Construction Implementation in relation to Underground Construction

Currently, the primary law on property as regards to subterranean areas may be found in Article 437 of the Civil Code of the Philippines, which states:

“The owner of a parcel of land is the owner of its surface and of everything under it and he can construct thereon any works or make any plantations and excavations which he may deem proper, without detriment to servitudes and subject to special laws and ordinances. He cannot complain of the reasonable requirements of aerial navigation.“

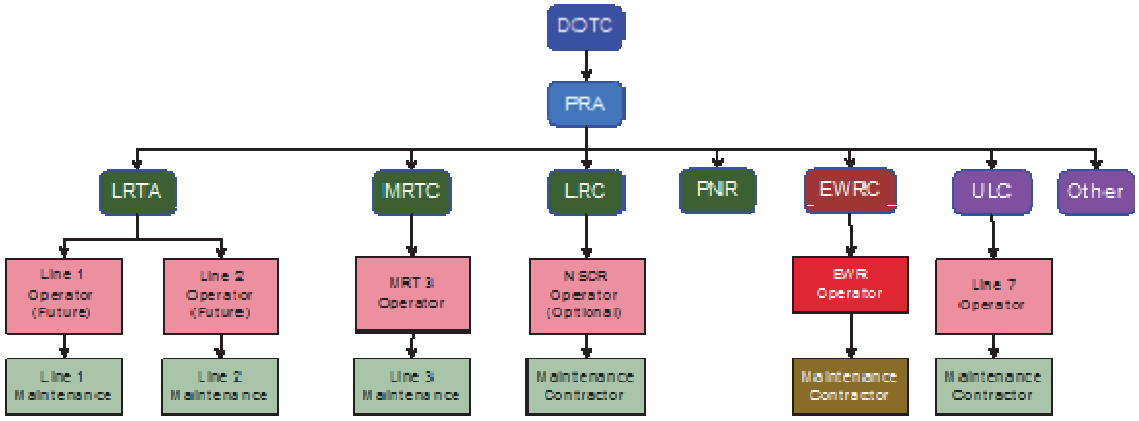
The Supreme Court has ruled in a case against NPC that even NPC only occupied a subterranean portion of the parcel, it was liable to pay not merely an easement fee but rather the full compensation for land.

If the current Philippine framework standards are applied to any future subway project, the proponent of a subway project can expect that the subsurface entrance to the private

[1] Information Collection Study for the Mega Manila Subway Project, Draft Final Report, JICA, 2015

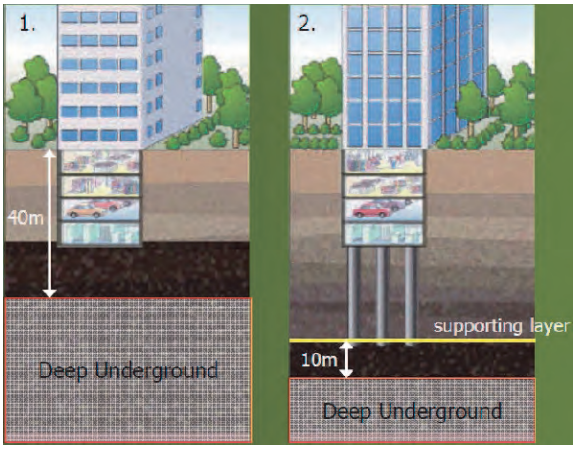
property, whether clandestine or overt, the land owner is entitled to the full value of his property as compensation.

Figure 2.32: Relationship of PRA with existing and future entities



Source: JICA Project Team

Figure 2.33: Deep Underground Space



Source: METI Japan

(2) Recommendations for Necessary Legal Framework

It becomes readily apparent, from a cursory reading of the available legislation and jurisprudence on the matter that the Civil Code allows for the enactment of special laws and ordinances in order to modify private ownership over subterranean areas, but that the legislature has so far declined to act affirmatively. In contrast, specific laws and regulations have already been enacted with regards to the use of property rights over airspace. The lack of law is even more emphasized when the Philippine Civil Code is compared to other progressive jurisdictions.

The Japanese Model is especially interesting to dissect. In 2001, the Japanese Parliament passed the “Special Measures for Public Measures for Utilization of Deep Underground”.

(a) **Background:** (i) Although underground spaces of public roads were congested by underground facilities, underground use of private land was not fully developed. (ii) Meanwhile it was possible to develop underground space without impacting on-ground facilities by means of technological advances.

(b) **Purpose:** Encourage the utilization of deep underground space without compensation to land owner.

(c) **Coverage:** Area 3 major metropolitan spheres (Tokyo Capital Region, Kinki Region, and Chubu Region)

(d) **Definition of Deep Underground:** Deep underground spaces unutilized for basement floor (-40m in depth), deep underground space unutilized for building foundation (-10m below the supporting layer)

The Senate Bill No. 2447 was introduced by Sen. Teofisto Guingona III in November 2014. It intends to amend relevant provisions of Republic Act No. 8974 in order to meet the stated purpose with the following salient points:

- It provides and offers a more comprehensive computation of the proper amount to be deposited to the court, which again facilitates a faster resolution of any issue.
- It gives the project implementing agency even more ways to compel the court to issue the Writ of Possession once the proper amount has been deposited.

The proposed amendments remove much of the discretion on the part of the court and enable a smoother and quicker end of expropriation proceedings of the covered projects. Perhaps the most important provision in this Senate Bill is Section 10:

"Section 10. Entry into Private Lands for Subsurface or Subterranean Works. – Whenever necessary for a government infrastructure and development project to construct or install underground works like railroads or tunnels in the subsurface or subterranean portion of lands owned, occupied or leased by other persons, **the government or any of its authorized representatives may not be <u>prevented</u> from entering into the subsurface or subterranean portions** of such private lands by the surface owners or occupants if such entry is made more than **fifteen (15) meters from the surface**."

Implication of Senate Bill 2447 Section 10:

(i) It would appear that this new provision exempts any government works more than fifteen (15) meters underground from the payment of just compensation to the owners of the surface property;

(ii) However, seeing as the provision merely prohibits the "prevention" of entering subsurface portions of private property in order to implement works, it is possible that payment of "just compensation" for an easement may still be required.

(iii) The hearings on the proposed Bill shall likely shed further light on this issue once they have commenced

Recommendations:

(i) To actively monitor the progress of SB 2447 amendment and to support efforts on the speedy passage and approval of the legislation

(ii) To reach out lawmakers and provide data and research input to further improve on the bill, possibly giving consideration to the use of deep underground space without compensation (similar to Japan's case)

Without deep underground space and compensation law, subway projects will not be feasible in Philippines.

3 BUS TRANSPORT PLANNING

3.1 Bus Transport Surveys and Analysis

1) General

In order to formulate effective policy and plan for public transportation, especially for bus transport, it was discussed that a scientific approach is absolutely essential. Necessary data and information are to be collected and analyzed and should depend on the planning level and objectives.

2) Utilization of the Existing Data and Survey Results

The following existing data and survey results are useful for the analysis:

(a) **Person Trip Survey:** Usually it is large-scale survey covering entire metropolitan area and conducted every 5-10 years. OD traffic volume by mode of transport is available.

(b) **Actual Performance of Bus Operation:** Bus ridership (pax, pax-km) and fare income by route, level of supplied bus services (operating hours, frequency, assigned buses, cost), etc.

(c) **GIS data:** Bus route map, route coverage area, route-side land use, etc.

3) Conduct of Bus Transportation Surveys

(a) **Bus Operation Survey:** the survey observes the actual operational performance such as operation hours, frequency, travel time and speed by section, traffic and on-road parking conditions along the route, etc.

(b) **Passenger Boarding/Alighting Survey:** The number of boarding and alighting passengers is surveyed to improve bus services.

(c) **Passenger Interview:** Assessment and needs on the existing bus services and perception to alternative bus services.

3.2 Bus Route Network Planning

1) Basic Considerations

In bus route network planning, options such as road sections, frequency, and bus assignment are examined by route. Since those options are related to each other and have a lot of flexibility, it is difficult to make it optimum as a whole. However, its convenience for residents must given importance. The major focus points are identified by the stakeholder as follows:

(a) **Bus Operator:** Profitability (balance of revenues and expenditures, etc.)

(b) **Bus Users:** Convenience (route, transfer, frequency, fare, simplicity, etc.)

(c) **Entire Local Society:** Service Fairness (service bias, area with poor public transport service, etc.)

The items which are considered in the network planning are listed as follows:

(i) Matching locations of route origin/destination with users needs

(ii) Figuring out population density along the route

(iii) Reducing friction of transfers

(iv) Considering alternative and competitive transport modes

(v) Simplify route network by route integration

(vi) Shortening route length and operation time

(vii) Reducing indirect route ratio

(viii) Examining bus stop interval

(ix) Examining headway and operation schedule

(x) Examining road conditions

(xi) Considering equity of provision of bus services

(xii) Emphasizing route design process

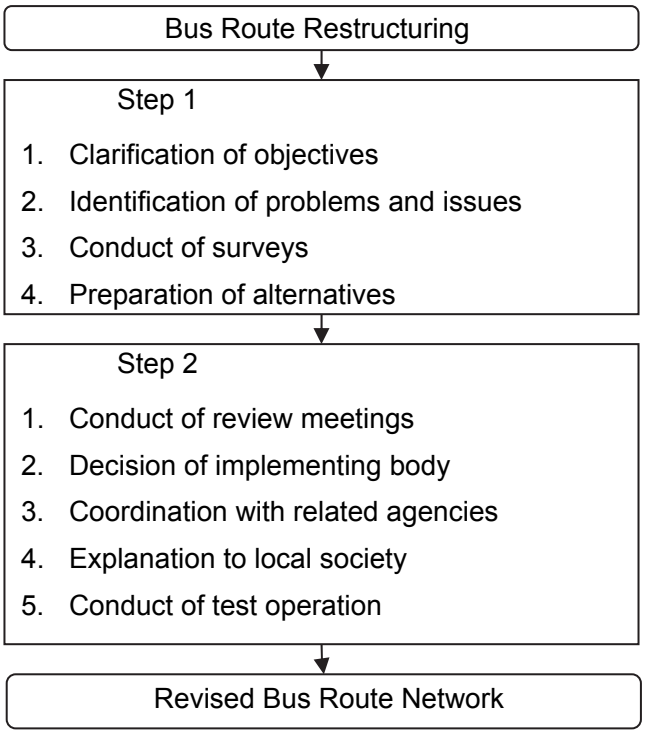
2) Network Planning Tools

In network planning, some commercial model packages for traffic demand analysis such as JICA STRADA and CUBE among others are used as tools for simulating modal choice and transit assignment. Using those models, traffic demand and passenger-km and passenger-hour are to be calculated by alternative bus route.

3) Bus Route Restructuring

In order to meet the transport needs of residents, bus route network and its services should be adjusted as the need arises. Effects of route restructuring would be reduction of travel time, security of proper frequency, reduction of assigned buses, etc. Systematic and hierarchical structure is considered in the restructuring of the bus route network and the restructuring should support the development of zonal transportation hub and local community. The planning process of bus route restructuring is presented in Figure 3.1.

Figure 3.1: Planning Process of Bus Route Restructuring



Source: Handbook of Bus Transportation Service Planning JSCE, 2006

3.3 Bus Transport Improvement Measures

Improvement measures for bus transportation are broadly divided in five (5) types (see Table 3.1 and Figure 3.2):

(i) Improvement on Bus Running Environment

(ii) Improvement on Bus Fleet

(iii) Improvement on Bus Route Network and Facilities

(iv) Improvement of Bus Operation

(v) Improvement of Fare and Subsidy Systems

Table 3.1: Bus Improvement Measures

Primary Classification	Secondary Classification	Tertiary Classification
1. Improvement on Bus Running Environment	Bus Lane	- Bus exclusive lane - Bus priority lane - Bus reverse lane
	Signal System	- Bus priority signal system - Coordinated signal system
2. Improvement on Bus Fleet	Bus Entrance and Exit	- Door widening - Lower step bus - Fare collection system
	Engine Performance	- Performance of speed acceleration and deceleration - Low-emission bus
	In-vehicle Comfort	- Smaller vehicle - Air-conditioned - seat and aisle
3. Improvement on Bus Route Network and Facilities	Bus Route Restructuring	- Route network pattern - Shortening route length
	Bus Stop and Terminal	- Location of bus stops - Facilities for bus terminals and bus stops - Parking for Park & Bus Ride System
4. Improvement of Bus Operation	Bus Route	- Bus Location System - Free boarding and alighting system - Demand bus operation - Route deviation
	Frequency	- No. of assigned vehicles
	Operation time	- Mid-night bus
5. Improvement of Fare and Subsidy Systems	Fare system	- Fare for transit passenger (bus-rail, bus-bus) - Fare discount system
	Subsidy system	- Unprofitable route and strategic route

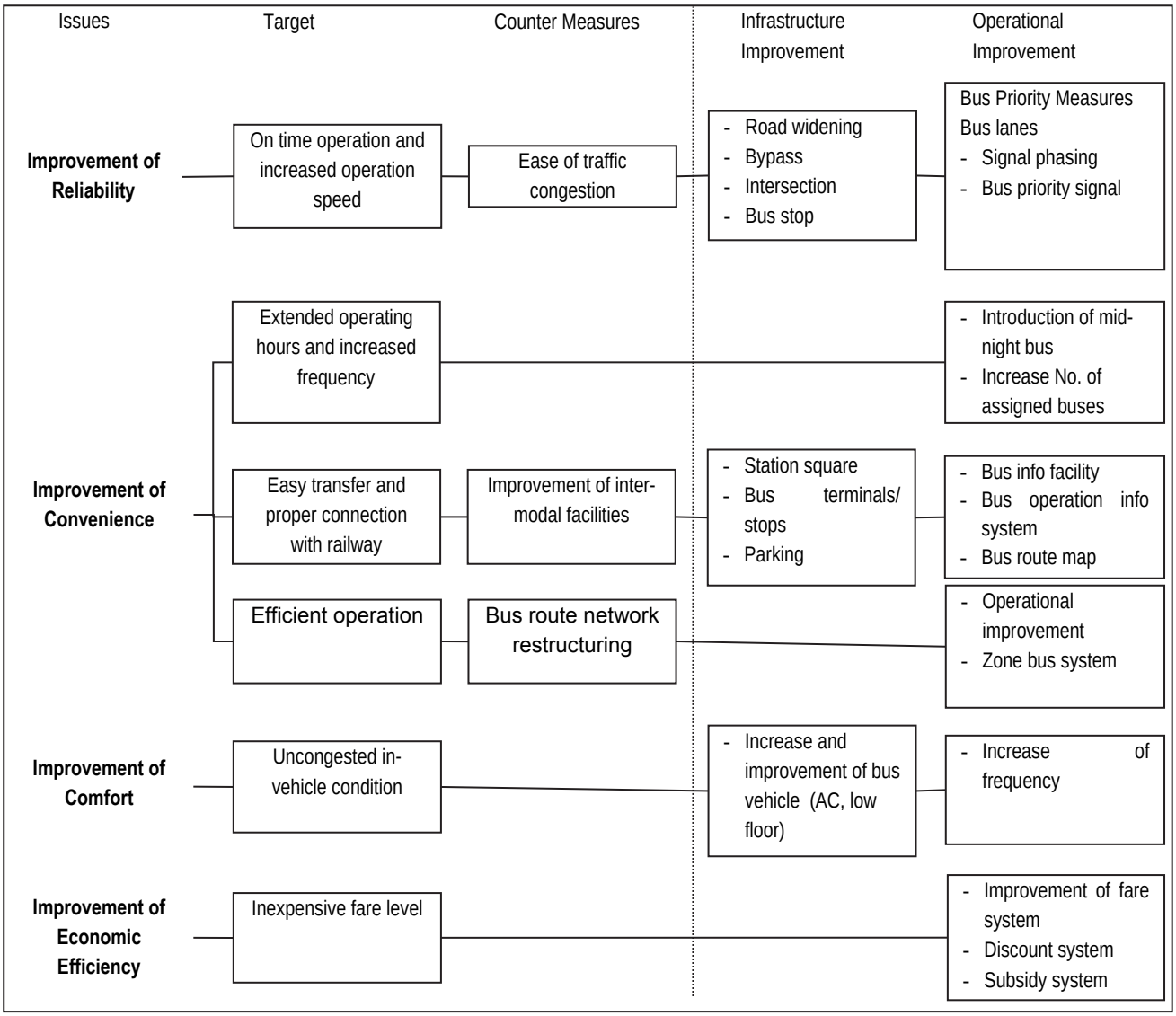
Source: Traffic Engineering Handbook, JSTE

3.4 Promotion of Bus Usage

There are two basic approaches to promote the use of bus transportation:

- Improvement of level of bus services (such as operation, fare system, route network, etc.)
- Direct promotion to residents

Figure 3.2: Bus Issues and Improvement Measures



Source: Traffic Engineering Handbook, JSTE

There are many tools to conduct direct promotion. These are:

(1) General Promotion Method:

- Publication: advertisement through poster, flyer, mass media, website, in-vehicle add, etc.
- Merchandising: provision of free ticket, prize, frequent program, survey, etc.
- Direct Marketing: conduct of orientation meeting, survey, etc.

(2) Provision of Guidance Information: The following information is provided at bus stop and inside bus, and through telephone and internet, etc.

- Static information: bus route map, time table, fare system
- Dynamic information: real time bus location (using GPS) and operation information

(3) Promotion through Interview Surveys and Pilot Projects: Disseminate to public the importance and superiority of bus transportation compared to private transportation mode