JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

NATIONAL ECONOMIC DEVELOPMENT AUTHORITY (NEDA)

ROADMAP FOR TRANSPORT INFRASTRUCTURE DEVELOPMENT FOR METRO MANILA AND ITS SURROUNDING AREAS (REGION III & REGION IV-A)

FINAL REPORT

SUMMARY

March 2014

ALMEC CORPORATION

The rate used in the report is

USD1.0= Php 40

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ABBREVIATIONS

AAGR	anual average growth rate
AER	airport express railway
AFCS	automatic fare collection system
ATI	Asian Terminals Inc.
BGC	Bonifacio Global City
BOT	build–operate–transfer
BRT	bus rapid transit
BRLC	Bulacan, Rizal, Laguna and Cavite
CALA	Cavite Laguna
CALABARZON	Cavite, Laguna, Batangas, Rizal and Quezon
CAVITEX	Manila-Cavite Expressway
CBD	central business district
CGC	Clark Green City
CIAC	Clark International Airport
CLLEx	Central Luzon Link Expressway
DMIA	Diosdado Macapagal International Airport
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
EDSA	Epifanio de los Santos Avenue
FTI	Food Terminal, Inc.
F/S	feasbility study
GCR	greater capital region
GDP	gross domestic product
GHG	greenhouse gas
GRDP	gross regional domestic product
GOCC	government-owned and/or controlled corporation
HRT	heavy rail transit
ICTSI	International Container Terminal Service, Inc.
ITS	integrated transport system
JICA	Japan International Cooperation Agency
kph	kilometer per hour
LCC	low-cost carrier
LGU	local government unit
LRT	light rail transit
LRV	light rail vehicle
LTFRB	Land Transportation Franchising & Regulatory Board
LTO	Land Transport Office
MC	motorcycle
MGB	Mines and Geosciences Bureau
MICT	Manila International Container Terminal
MM	Metro Manila
MMDA	Metro Manila Development Authority
MMEIRS	Earthquake Impact Reduction Study for Metro Manila
MMTROPLAN	Metro Manila Transport, Land Use and Development Planning Project
MMUTIS	Metro Manila Urban Transportation Integration Study
MNHPI	Manila North Harbour Port Inc.
MOA	Mall of Asia
MRT	Metro Rail Transit
MTDP	medium-term development plan
MTPDP	Medium-term Philippines Development Plan

MUCEP	Manila Urban Transportation Integrated Study (MMUTIS) Update and Capacity Enhancement Project
NAIA	Ninoy Aquino International Airport
NCR	National Capital Region
NEDA	National Economic and Development Authority
NH	North Harbor
NLEX	North Luzon Expressway
NSCB	National Statistical Coordination Board
NSO	National Statistics Office
ODA	Official Development Assistance
PCU	passenger car unit
PHP	Philippine peso
PM	particulate matter
PNCC	Philippine National Construction Corporation
PNR	Philippine National Railways
PPA	Philippine Port Authority
PPP	public-private-partnership
PUB	public utility bus
PUJ	public utility jeepney
SCTEX	Subic-Clark-Tarlac Expressway
SLEX	South Luzon Expressway
TA	technical assistance
TC	tricycle
TEAM	traffic engineering and management
TEU	twenty-foot equivalent units
TRB	Toll Regulatory Board
TRIP	transport investment program
TOD	transit oriented development
UG	underground
USD	US dollar
V/C	volume capacity ratio

1 INTRODUCTION

1) Background and Objective

1.1 This Study was conducted in response to NEDA's request for assistance in formulating a comprehensive roadmap for transport development covering Metro Manila and the two adjoining regions of Central Luzon and CALABARZON. It is intended to guide the NEDA Infrastructure Committee in its deliberations on the contents and priorities of a short-term (2014 to 2016) and a medium-term (2017-2022) transport investment program or TRIP.

1.2 Accordingly, the short-term transport investment program (TRIP) translates the goals of the Philippine Development Plan for 2011 to 2016 into specific projects in the transport sector. Investing massively – to as much as 5% of GDP - in infrastructure is one of the five key strategies to achieve this Plan. In the last decade or more, the country as a whole had been under-investing (~2% of GDP) in infrastructure.

1.3 The key transport agencies involved in the Study have compiled a long list of projects. It provided a take-off for the Study, as well as a plethora of development and sectoral master plans – many of which had been crafted (but largely remained un-implemented) with technical assistance from international donors. In anticipation of future growth and problems, the Study produced a transportation roadmap for the sustainable development.

1.4 The Study area is as follows (shown in Figure 1.1):

- **Greater Capital Region (GCR):** the three regions of the National Capital Region or Metro Manila, Region III, and Region IV-A;
- **Mega Manila:** Metro Manila, Bulacan, Rizal, Cavite and Laguna; and
- **Metro Manila:** 17 towns (16 cities and 1 municipality)

Source: JICA Study Team

Figure 1.1 Study Area Location

2) Study Implementation

1.5 The study was implemented from March 2013 to March 2014 in close coordination with the NEDA infrastructure staff. Key consultations were held with leaders of NEDA, DPWH, DOTC, MMDA as well as with other relevant government and private entities.

2 PRESENT SITUATION

2.1 The Setting

1) Greater Capital Region (GCR)

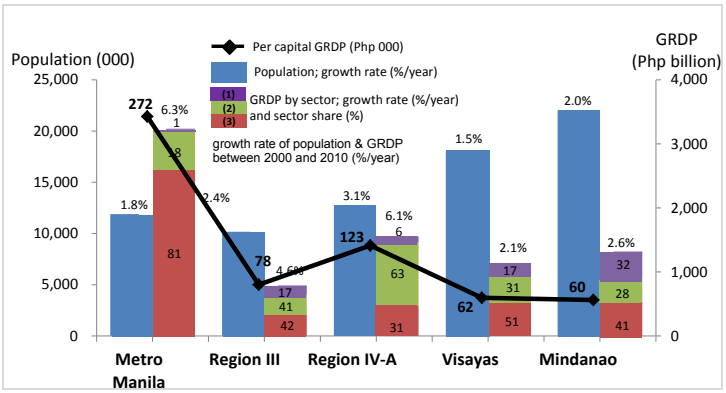
2.1 Greater Capital Region or GCR is an economic powerhouse driving the country's global competitiveness, and home to more than 1/3 of the country's population. On the GCR land area of 39.5 thousand km^2 (~11.5% of the Philippines), population grew faster than the rest of the country, from 15.4 million in 1980, 20.6 million in 1990, and 34.6 million in 2010 - suggestive of in-migration attracted by perceived higher economic opportunities.(see Table 2.1 and Figure 2.1)

2.2 The topography, crisscrossing rivers, and seismology of the GCR expose it to multiple natural hazards – with flooding as recurrent every year in many low-lying areas (see Figure 2.2).

Table 2.1 Key Characteristics of GCR

Geographical Area	Area (km^2)	Population (000)		GRDP (PHP billion)	
		2000	2010	2000	2010
Philippines	343,448	76,507	92,338	3,916	5,702
Metro Manila	620	9,933	11,858	1,113	2,043
Central Luzon	22,015	8,205	10,138	327	514
Calabarzon	16,873	9,321	12,610	557	1,004
Total (3 Regions)	39,508	27,458	34,604	1,997	3,562
Study Area/Philippines	11.5%	35.9%	37.5%	51.0%	62.5%

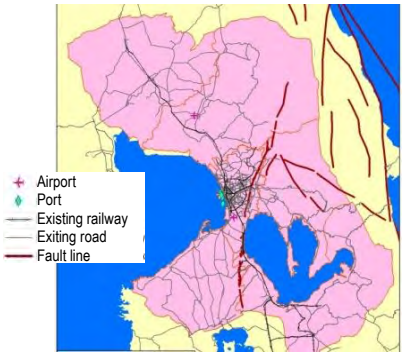
Source: NSO



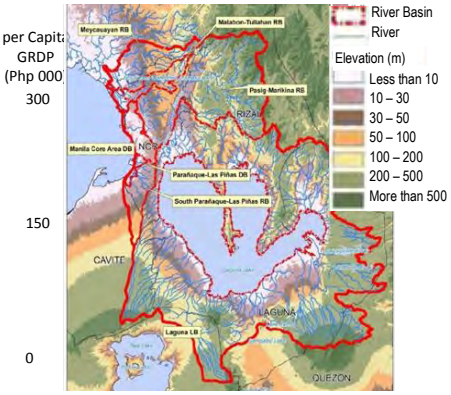
Source: NSO

Notes: GRDP in 2000 prices.

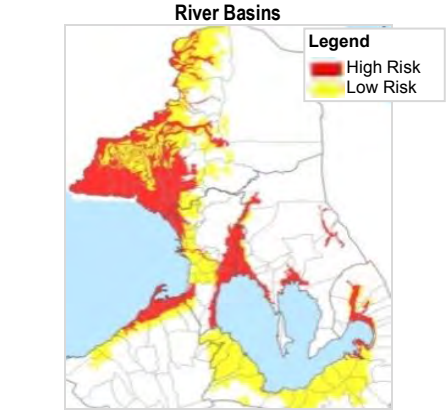
Figure 2.1 GRDP and Population Growth of GCR



Earthquake Fault Lines



River Basins



Flood-prone Areas

Source: MMEIRS (JICA, 2004), MGB

Figure 2.2 Natural Hazards in GCR

2) Manila to Metro Manila and further to Mega Manila

2.3 The City of Manila once realized a public transport based well planned compact city. At the dawn of the 20th century, electric powered Tranvias were introduced and provided the city of 300,000 with the first urban mass transit. The network was quickly expanded to a total of 85km and covered CBD and suburban areas. New housing estates were developed along the routes by the Tranvia developer. Transvias served 40% of daily traffic demand together with calesas and carromata which provided feeder services. Motorization commenced and taxi-auto-calesa and bus eroded Tranvias' share. By mid 1940's war-damaged Tranvias ceased its operation (see Figure 2.3 and photos.)

2.4 Manila's population continued to swell: from 1.6 million in 1948, to 2.5 million in 1960, then nearly doubling to 4 million just a decade later. 1980 sees another increase to 6 million, and 7.9 million in 1990. Today Metro Manila, is a city of approximately 12 million people which still continues to grow at 1.8% per year within a relatively small urban land area of 620km^2 (see Table 2.2).

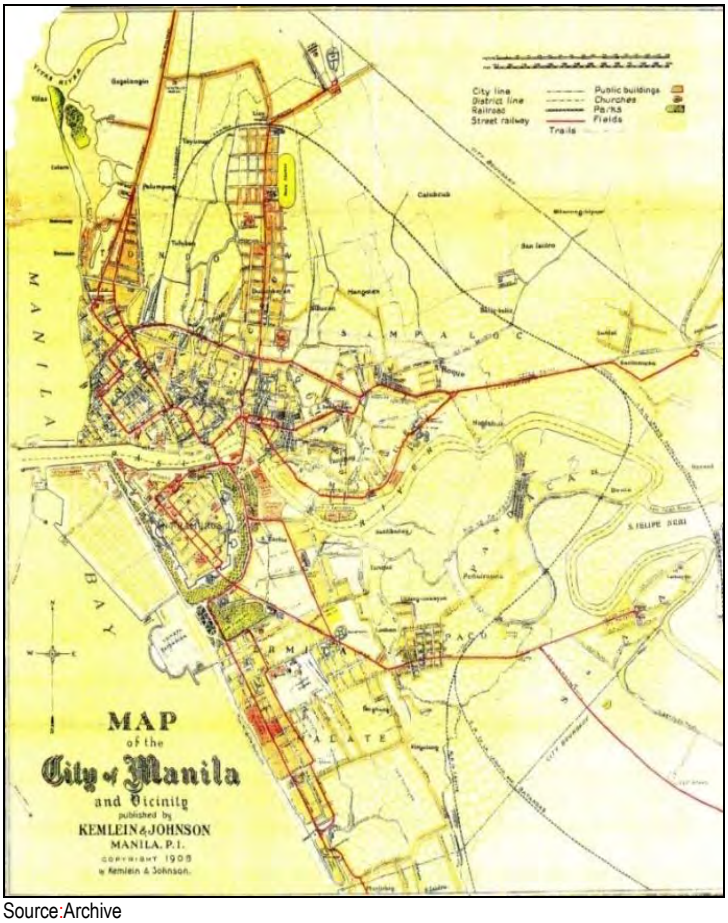
2.5 Densification accelerates the expansion of the existing urban areas unto outer areas beyond the boundary of Metro Manila forming a city-region. Today, the actual metropolitan area extends to the adjoining provinces of Bulacan, Rizal, Laguna and Cavite (BRLC). Many people reside in these peri-urban areas and commute to Metro Manila. By 2030, the population will exceed that of Metro Manila and Mega Manila will become one of the largest urban area in the world with total population of 30 million (see Figures 2.4 and 2.5).

2.6 The unabated urbanization of the metropolitan region has been and is associated with economic growth as well as with increase in motorization. A growth that brings about enormous diversified impacts on land use, transport and environment, threatening sustainable development. The high population density of Metro Manila (191 persons/ha), which is quite high compared to other Asian cities, aggravate the situation (see Table 2.2 and Figure 2.6).

Table 2.2 Population Growth from 1980 to 2010 in Metro Manila

Province/City/Municipality		Area (km^2)	Population (000)					Annual Population Growth Rate, (%)		Population Density (persons/ha)	
			Actual			Estimated[1)]					
			1990	2000	2010	2020	2030	'90 –'00	'00 –'10	2010	2030
Metro Manila		620	7,929	9,933	11,858	13,109	13,904	2.3	1.8	191	224
Adjoining Provinces	Bulacan	2,796	1,505	2,234	2,924	3,472	3,958	4.0	2.7	11.3	14.2
	Rizal	1,192	977	1,707	2,485	2,999	3,474	5.7	3.8	20.8	29.1
	Laguna	1,918	1,370	1,966	2,670	3,223	3,733	3.7	3.1	13.9	19.5
	Cavite	1,574	1,153	2,063	3,091	3,731	4,321	6.0	4.1	19.6	27.5
	Sub-total	7,479	5,005	7,970	11,170	13,425	15,486	4.8	3.4	14.9	20.7
Total Mega Manila		15,059	12,934	17,903	23,027	26,534	29,390	3.3	2.5	15.3	19.5

Source: National Statistics Office (NSO), 2010.
1) JICA Study Team estimated based on the population forecast of National Statistical Coordination Board (NSCB)



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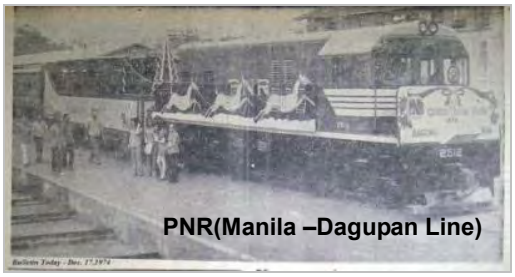
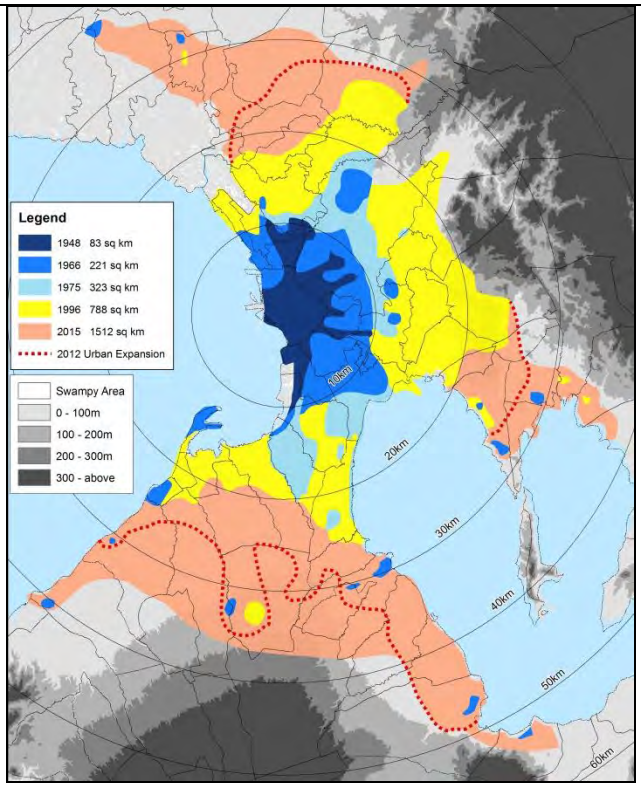
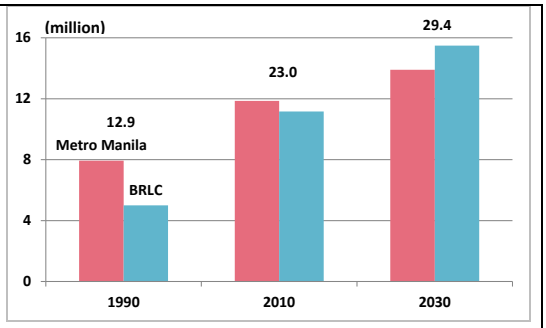


Figure 2.3 Manila in 1908 covered by Tranvia Network and Suburban Rail



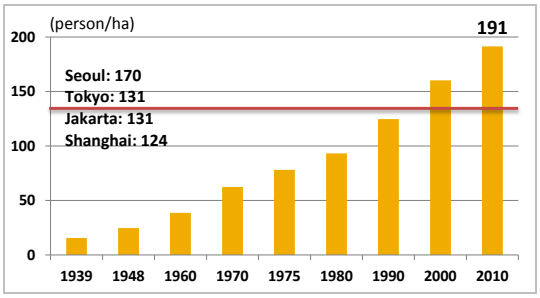
Source: JICA Study Team

Figure 2.4 Trend in Urban Area Expansion of Metro Manila



Source: JICA Study Team

Figure 2.5 Population Growth of Mega Manila (Metro Manila and Adjoining Provinces: Bulacan, Rizal, Laguna and Cavite)



Source: JICA Study Team

Figure 2.6 Population Density of Metro Manila as Compared to Other Asian Countries

2.2 Current Transport Infrastructure

1) Overview

2.7 Metro Manila has a well-articulated radial (R-1 to R-10) and circumferential (C-1 to C-5) roads, which provide the principal trunk roads within the metropolis. Interchanges provide grade separations at several intersections of these roads. However, there are still some missing sections aside from non-compliance to desired standards in many segments due to right-of-way constraints and porous zoning controls.

2.8 Metro Manila is linked by expressways to CALABARZON region on the south by the SLEX (about 60 km long) and atop it is the Skyway (16 km from Makati to Alabang); to Central Luzon on the north by the NLEX (84 km long) which T-connects to Subic-Clark-Tarlac Expressway (94 km from Tarlac City in the East, to the Subic Freeport and its international container port in the West). On the southwest is the Manila-Cavite Expressway (or CAVITEX), which is a 14-km toll road that forms part of R-1 skirting the coastline of Manila Bay to Naic of Cavite.

2.9 Railway is still sparsely developed, although Metro Manila was first among the ASEAN capitals to build one. Three LRTs (elevated for the most part) with a total length of 50 km serve Metro Manila. These are: the 20-km LRT 1 along R-2 in the southern section and R-9 in the northern section, the 13-km LRT-2 along the R-6 corridor, and the 17-km MRT-3 on C-4. A 4th railway line is the PNR South Commuter Line – stretching 28 km, double-track for the most part, from Tutuban in Manila to Alabang in Muntinlupa and a farther 12 km on a single track to Biñan in Laguna. The PNR North Commuter Line (about 32 km to Malolos) was closed in 1984. Attempts to rebuild the line through the decade-old Northrail project have not succeeded.

2) Road Network

2.10 There are 5,464 km of national roads and 27,457 km of local roads in the Study Area, as shown in Tables 2.3 and 2.4. Relative to the country, the road density and quality are better off. The presence of more vehicles, however, makes the roads disproportionately inadequate. Metro Manila only has 1 km of road per 424 vehicles (see Table 2.3 and Table 2.4).

Table 2.3 National Road Inventory and Density in GCR, 2010

Region & Road Classification			Length (km)			Road Density Indices		
			Paved	Unpaved	Total	km/km^2	km/000pax	No. of Veh./km
GCR	Metro Manila	Arterial	88	-	88	0.142	0.008	-
		Secondary	943	-	943	1.522	0.082	-
		Total	1,032	-	1,032	1.665	0.089	1,952
	Region III	Arterial	923	105	1,027	0.047	0.106	-
		Secondary	849	156	1,005	0.046	0.103	-
		Total	1,771	260	2,032	0.094	0.209	476
	Region IV-A	Arterial	1,006	64	1,071	0.064	0.091	-
		Secondary	1,057	277	1,334	0.080	0.114	-
		Total	2,063	341	2,404	0.145	0.205	415
	Total		4,866	601	5,467	0.143	0.158	728
Philippines		Arterial	12,747	2,812	15,559	0.050	0.184	-
		Secondary	8,259	5,551	13,810	0.045	0.164	-
		Total	21,006	8,363	29,370	0.095	0.348	243

Source: DPWH and LTO.

Table 2.4 Local Road Inventory and Density in GCR, 2010

Region		Length (km)	Road Density Indices		
			km/km^2	km/000pax	No. of Veh./km
GCR	Metro Manila	3,723	6.01	0.3140	541
	Region III	14,512	0.66	1.4750	67
	Region IV-A	9,222	0.55	0.7313	108
	Total	27,457	0.70	0.7935	145
Philippines		171,981	0.57	1.8626	42

Source: National Statistical Coordination Board. Vehicle data is for year2011.

3) Railways

2.11 The railway system serving the GCR spans 79 km in 4 lines, and carries about 1.3 million passengers per day. Only 5 km of the 73-km planned expansion (laid out in 1998) got built in the last decade (see Table 2.5).

Table 2.5 Railways in GCR

Urban Railway Line	Ridership (Pax/Day)	Remarks
Line 1 – Baclaran to Roosevelt (20.5 km)	518,600	139 LRVs, of which 105 are operational. 20 stations. Original line completed in 1984
Line 2 – Recto to Santolan (13.5 km)	212,000	18 trainsets (18x4 LRVs) and 11 stations. Completed in 2004.
Line 3 – Taft to North Avenue (17 km)	570,000	Referred to as MRT3, it has 73 LRVs and 153 stations. Completed in 2000
PNR South Commuter - Tutuban to Alabang (28 km)	46,700	Suburban railway, non-electrified and at-grade. 19 stations. 6 trainsets (3 cars/train) +1 Loco w/3 cars.

Source: Statistics from LRTA, DOTC, and PNR

4) Gateway Airports

2.12 There are two major airport systems in GCR: the Ninoy Aquino International Airport (NAIA) located within Metro Manila and the Clark International Airport (CIAC) located within the Clark Freeport Zone in Pampanga. Both airports cater to international flights and domestic flights.

2.13 The passenger traffic at NAIA saw a rapid increase from 12.7 million in 2002 to 31.6 million in 2012, or an average annual growth rate of 9.5%. This has accentuated congestion on the runway – where aircraft movements already exceed its safe capacity (38 to 46 per hour).It has two convergent runways: 06/24 (3,410 m x 60 m) and 13/31 (1,998 m x 45 m). This configuration limited its capacity to one aircraft landing or taking off at any given time (except for the general aviation aircraft under Land-And-Hold-Short Operations). There are currently four passenger terminals at NAIA, namely Terminal 1 (exclusively for international), Terminal 2 (exclusively for Philippine Airlines, both for international and domestic), Terminal 3 (both for international and domestic) and Terminal 4 (domestic low-cost carrier).

2.14 Clark Airport has two parallel runways, namely: the primary runway (Runway 02R/20L) at 3,200 m x 60 m and the secondary runway (Runway 02L/20R) at 3,200 m x 45 m. The existing passenger terminal building has been expanded to accommodate 5 million international and domestic passengers per year. The annual passenger count as of 2012 is 1.3 million with international passengers at 1 million and domestic passengers accounting for close to 300 thousand. Traffic is dominated by low-cost carriers (LCCs).

2.15 Decade-old plan to replace NAIA with Clark has been derailed by inability to complete a rapid rail link and persistent doubts about the efficacy of an airport 100-km away from its lode center. On the other hand, indecisions on remedial measures also cascaded into delayed developments of the necessary improvements for both NAIA and CIAC airports.

5) Ports

2.16 Of the 31 ports listed for Luzon, 14 are found within the GCR area. The major ports are the Port of Manila, Batangas Port and the Subic Port.

2.17 The Port of Manila is considered a super-hub port of the country. It handles both domestic and international maritime vessels. Actually, it consists of three main port groups, namely: (i) Manila North Harbor; (ii) Manila South Harbor; and (iii) Manila International Container Terminal. In addition to these 3 ports, there is a nearby private commercial port called the Manila Harbour Centre.

2.18 Batangas Port is located about 110 km from Metro Manila, along the south western part of Luzon. It occupies a total area of 150 hectares. The international container terminal was completed in 2006, with capacity for 400,000 TEUs/year.

2.19 Subic Port is located about 110 km north of Metro Manila and has the natural advantage of a protected bay and deep natural harbor of 13.7 m. The port area covers a total area of 41 ha and has 12 operational piers and wharves. It has three container terminals, a fertilizer terminal at the Boton Wharf, a grains bulk terminal at the Leyte Wharf and a general containerized cargo terminal (Marine Terminal) at the Sattler Pier. Its container port was completed in 2008 with a total capacity of 600,000 TEUs/year.

2.20 The Manila ports have been identified by traffic authorities as a source of traffic congestion. For this reason, there is growing clamor to phase them out and move the traffic to the under-utilized ports (~5% utilization rate) of Subic and Batangas. PPA reportedly has given the order to stop expansion of the ports of Manila that had previously been committed by the private concessionaires. A total phase-out of the ports of Manila is not tenable in the short to medium-term period – because the total capacity in the two alternate ports (=1 million TEUs) is insufficient to handle all the container traffic – which, in 2012 exceeded the 2.7m TEUs mark. In addition, it would have a negative impact on the logistics cost to export of the country.

Table 2.6 Market Share of Ports in the GCR

Port	Operator	Capacity (TEUs)	Volume (TEUs)	Volume/Capacity (%)
MICT	ICTSI	2,500,000	1,732,897	69.3
South Harbor	ATI	850,000	914,521	107.5
Batangas	ATI	400,000	6,754	2.3
Subic	ICTSI	600,000	35,215	4.2

Source: Assembled by Study Team from multiple sources: ICTSI Annual Report 2012; ATI website; and for Subic Port Calls Asia News 2013.

6) Road-based Public Transport

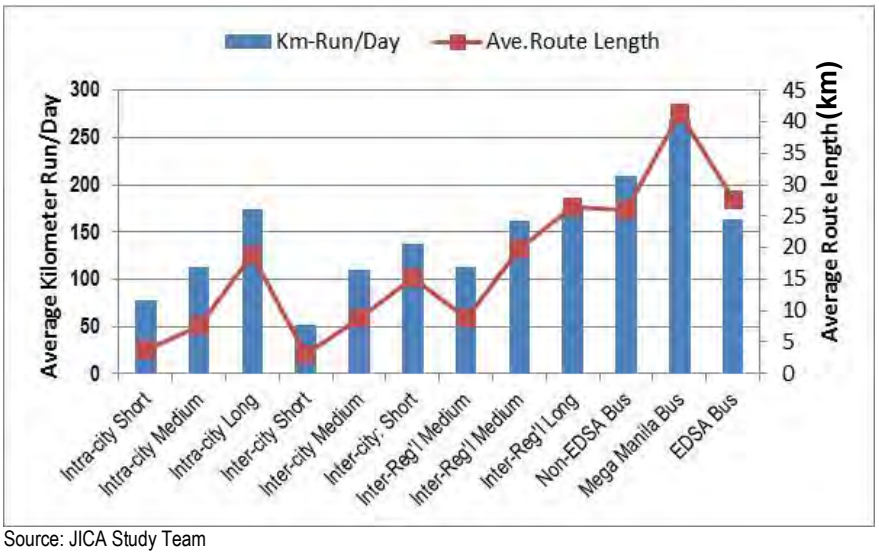
2.21 Overall in the Mega Manila area, car travel accounts for 30% of person-km, but constitutes 72% of the road traffic in terms of PCU-km. In the adjoining provinces, because of lower car ownership, the travel by car is somewhat lower, i.e., car passenger-km is 26% of the total passenger-km against 69% of PCU-km. The modal split shows that public transport remains the dominant mode of travel (see Table 2.7).

Table 2.7 Number of Motor Vehicles by Type in GCR, 2011

Area		Cars/ SUV	Utility Vehicle	Buses	Trucks	MC/TC	Total
GCR	Metro Manila	602,294	575,614	13,345	89,032	734,465	2,014,750
	Region III	114,819	239,239	4,949	52,450	556,228	967,685
	Region IV-A	129,688	248,603	5,036	29,103	585,793	998,223
	Total	846,801	1,063,456	23,330	170,585	1,876,486	3,980,658
Philippines		1,112,686	1,748,402	34,478	361,916	3,881,460	7,138,942
GCR% (to Phils.)		76%	61%	68%	47%	48%	56%

Source: DOTC - Motor Vehicle Registered by District and Type, 2007–2011.

2.22 A variety of public transport modes, all privately-owned, are in service – tricycles, taxis, and community taxis (FX van) on non-fixed routes, and jeepneys and buses on fixed routes. There are various estimates of their numbers – most of which are on the low side. One survey, made in 2007, came out with "210 public utility bus (PUB) operators maintaining close to 3,000 units plying in 62 routes, excluding about 15 provincial routes, and around 48,366 units of public utility jeepney plying some 600 routes." The jeepneys operate mostly as independent small-scale enterprises that compete for passengers and for scarce road space. DOTC placed the number of urban buses in NCR at 5,331 in 2011, and the provincial buses at 7,736. Whatever the figure, the fact remains: they account for more than 50% of daily commuting trips, incur no subsidy, and with low productivity. (see Figure 2.7). One study, for example, determined that a 50% reduction of buses on EDSA is possible, without corresponding decrease in service level. The average speed of buses ranged from 16.3 to 19.4 kph during the day, while that for jeepneys fared worse with 12.7-15.1kph.



Source: JICA Study Team

Figure 2.7 Public Transport Production by Route Type

2.23 Part of the low yield of public transport is due to congested roads. Most of NCR roads are at capacity and the situation is not much better at the four nearby provinces of Bulacan, Rizal, Laguna and Cavite (BRLC). The Mega Manila road network, which represents about 50% of the GCR network, on average operates at V/C ratio of 0.80, with close to half of the road network operating below 20kph. The traffic situation outside NCR is slightly better, at 0.53 average V/C ratio for BRLC. Bulacan and Rizal experience higher V/C ratios of 0.61 and 0.68, respectively. It is not surprising therefore that traffic congestion has become a serious problem across Mega Manila.

3 CORE URBAN ISSUES FACING METRO MANILA

1) Continuing Expansion of Urban Area

3.1 Urban populaton growth in Metro Manila continues at a very high rate (1.8% per year for the period 2000-2010). As a result, this growth has spilled over to the towns and cities within the 30 to 50-kilometer radius of the metropolis. It is estimated that the population of Metro Manila and the adjoining provinces will have to accommodate an additional of about two million and six million by 2030, respectively. The population density of Metro Manila will increase to 224 persons/ha if this trend continues. Today, the population density of Manila and Mandaluyong are extremely high; surpassing 650 persons/ha. At the barangay level, about 50% of the people live in high density areas, which has more than 300 persons/ha. (see Figures 3.1 and 3.2.)

3.2 On the other hand, population in the adjoining provinces of Bulacan, Rizal, Laguna and Cavite (BRLC) are increasing at a much higher rate of 3-4% per year to accommodate the overflow of Metro Manila but population densities are still low (11-25 persons/ha). How to manage the growth of Metro Manila, i.e., decongestion of Metro Manila, and encourage suburban development in a sustainable manner is the core issue for landuse, transport and environmental planning and development for Mega Manila.

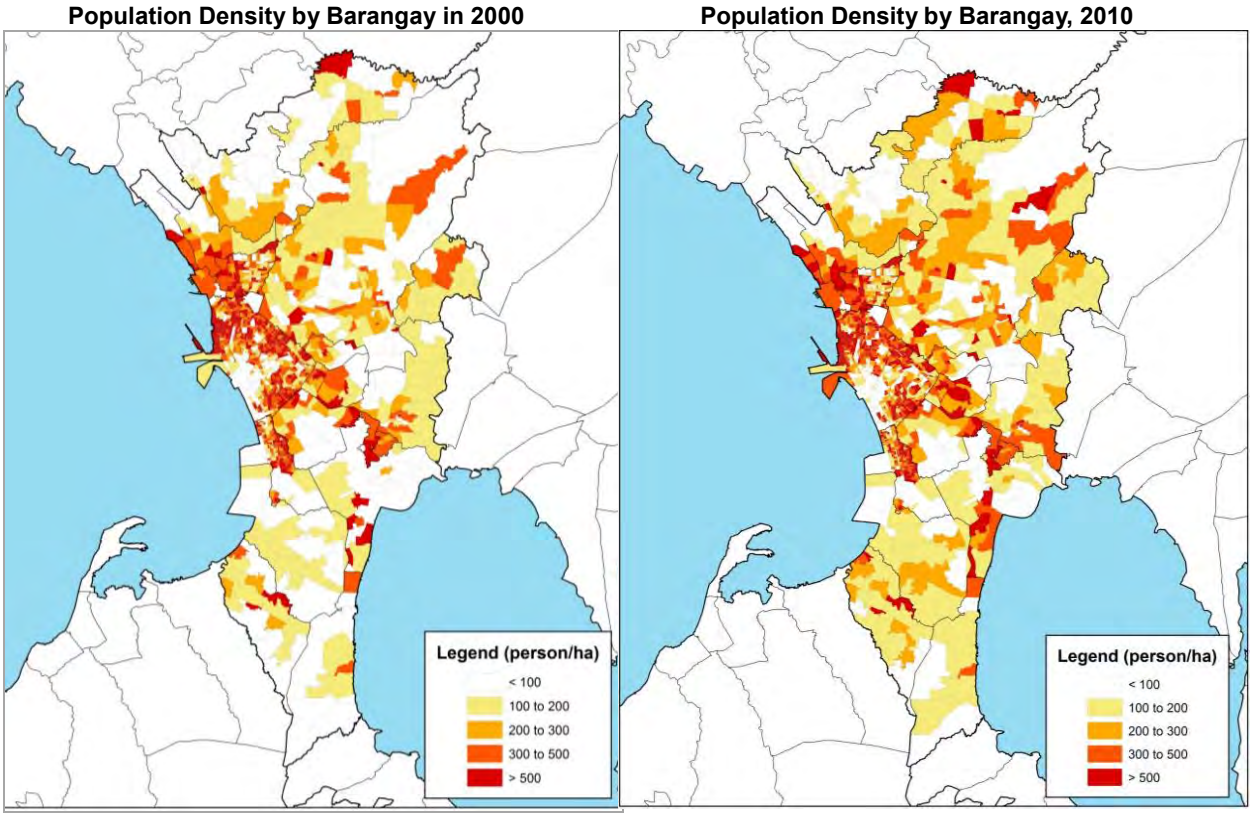
2) Increasing Demand for Urban Lands free from Disaster Risk and with Affordable Housing and Improved Environment

3.3 The high population density and urbanization of Metro Manila resulted in degradation of environment and in the poor quality of life. A lack of affordable housing and poverty force people to live in poor environment or informal settlements where disaster risk is high. Provision of and access to public facilities and services are far from sufficient to satisfy people's needs.

3.4 The informal settlers are one of the big issues in Metro Manila. As of 2010, the number of informal settler families is more than half a million[1] which is about 20% of total household in Metro Manila. Forty percent (40%) of informal settler families live in Quezon City, followed by City of Manila (19%). Most of the informal settlers are located in government owned lands (41%) and privately owned lands (34%).Those settlements in high risk areas and danger zones need to be relocated for their safety. In particular, 19,500 families along the eight priority waterways are targeted to be relocated for DPWH's flood management project.

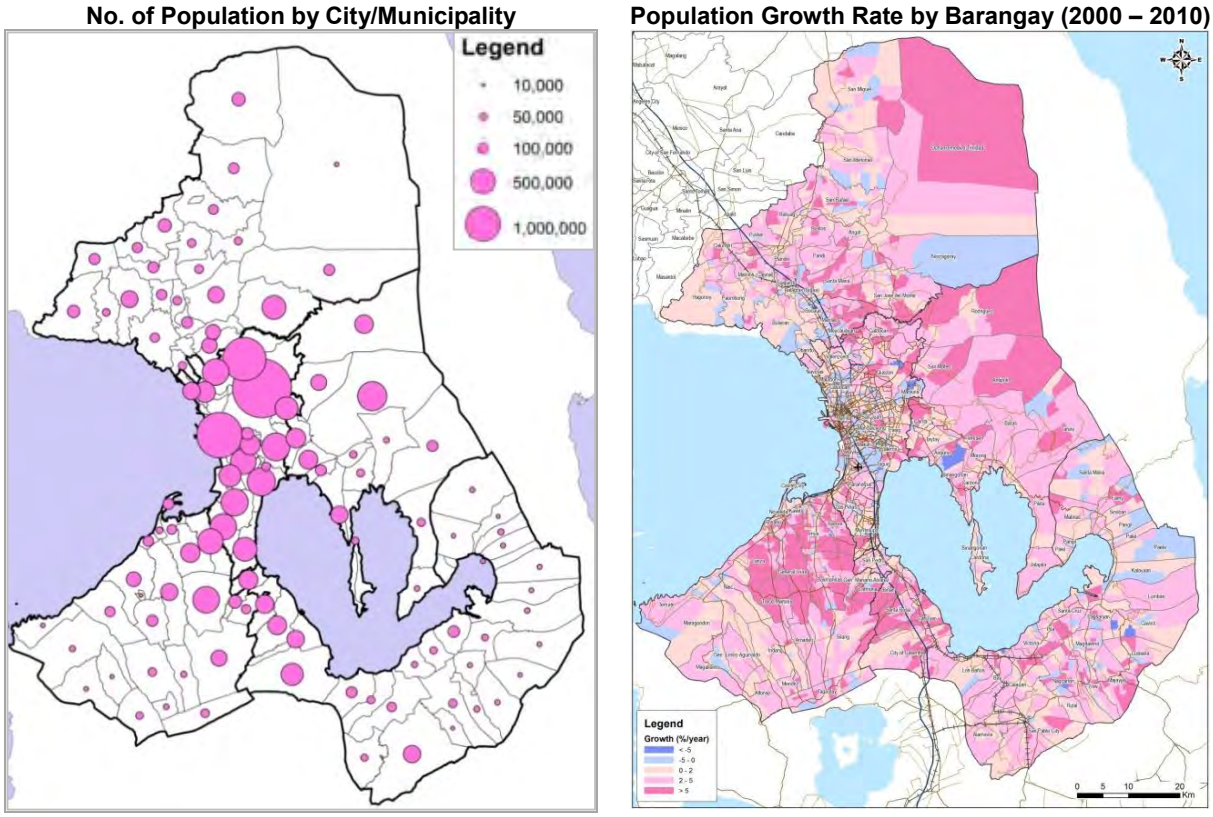
3.5 A lack of affordable housing is a long pending problem. Housing needs from 2005 to 2010 consisting of backlog and new households reached almost 500,000 units in Metro Manila, 461,400 units in Central Luzon, and 828,250 units in CALABARZON[2]. Estimated housing need in Metro Manila is projected to reach 1.74 million units from 2010–2016[3]. Due to the high living cost in Metro Manila, many people reside in adjacent provinces and spend long hours for commuting. In view of such large demand, urgent attention is critical to determine directions and areas for expansion of urban areas.

[1] Consolidated Data from Metro Manila Development Authority (MMDA) 2010 based on local government units' information. Total inventory is 556,526 informal settler families.
[2] Housing and Urban Development Coordinating Council (HUDCC).
[3] Medium Term Philippine Development Plan (MTPDP) 2011-2016.



Source: JICA Study Team developed based on the data from NSO.

Figure 3.1 Population Density in Metro Manila



Source: JICA Study Team developed based on the data from NSO.

Figure 3.2 Population Distribution and Growth in Mega Manila

3) Disaster Risks in Mega Manila

3.6 Metro Manila is susceptible to natural disasters, i.e., earthquake, tsunami, flood, etc. Recent disasters in the world alarmingly portrayed the vulnerability of cities and the need to build a disaster resilient city.

3.7 **Flood:** The hazard risk of flood in Metro Manila has been anticipated and is indeed a serious concern of people over a long period of time. Typhoon Ondoy that hit Metro Manila in September 2009 caused unprecedented floods and heavy damages to the economy and livelihood. The main causes of flood disasters identified include: the existences of a large number of settlements in the flood prone areas along waterways and Laguna de Bay, a lack of flow capacity of the rivers, inadequate drainage system compared with rainfall, insufficient protection of residences along the lakeshore, lack of integrated flood control plans, and improper warning and evacuation activities. According to the flood simulation map, the high hazard areas are located along the rivers, particularly the cities of Navotas, Malabon, Valenzuela, Manila, Quezon, Mandaluyong, Makati, Pasay, Paranaque, Las Piñas, Taguig, Pateros, Pasig and Marikina. Damages occurred almost all over Metro Manila (see Figure 3.4 and Box 3.1).

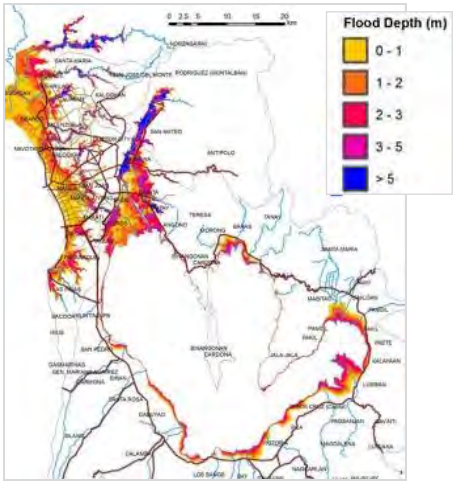
3.8 **Earthquake:** A number of faults located in Metro Manila and GCR have a potential to cause significant damage to Metro Manila. Since a fault is crossing the west side of Metro Manila and many roads are lying on this fault, the roads have a risk of damage by earthquake hits. The earthquake risk is estimated in liquefaction potential, building collapse, and flammability; and these are compiled into an earthquake hazard map. The high hazard areas are located along Manila Bay including Manila, Pasay, Paranaque, Navotas, and along Laguna Lake including Pasig, Pateros, and surrounding areas (see Figure 3.5).

3.9 **Tsunami:** The tsunami hazard was also estimated based on the other scenario earthquake which occurs at the Manila Trench with magnitude 7 and causes tsunami. The possible height of tsunami was estimated at 2 m to 4 m and arrival time was estimated at 70 minutes after earthquake occurrence. The map shows the distribution of tsunami hazard levels. The high hazard areas are located in the cities of Navotas, Malabon, Valenzuela, Manila, Paranaque and Las Piñas.

3.10 **Multi-Hazard Risk:** From analysis of vulnerability to and damages by earthquake and tsunami, and flood hazard, the possible hazards by natural disasters in Metro Manila are evaluated according to hazard level marked by hazard scores of three levels (high, moderate, low). The hazard scores calculated are summed up and evaluated into three levels of multi-hazard risk scores. The high hazard areas are located in Navotas, Malabon, Valenzuela, Manila, Pasay, Paranaque, Las Piñas, Taguig, Pateros, Pasig and Marikina (see Figure 3.6).

Box 3.1 Disaster by Typhoon Ondoy

Ondoy has affected about one million families or 4.9 million persons and left in its path, heavy loss of lives (i.e., 501 fatalities) mostly in Metro Manila and its neighboring provinces.
The rainfall amount dumped by the typhoon at the core area of Metro Manila is 556.1mm.



Source: National Disaster Coordinating Council Final Report and Inquirer.Net

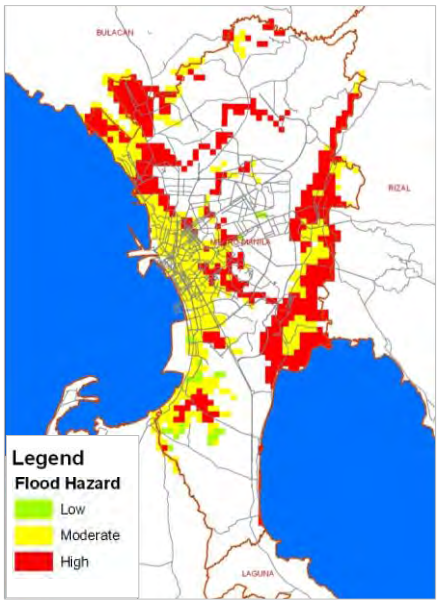
Along Marikina River

Along Marikina River

Floodway in Taytay

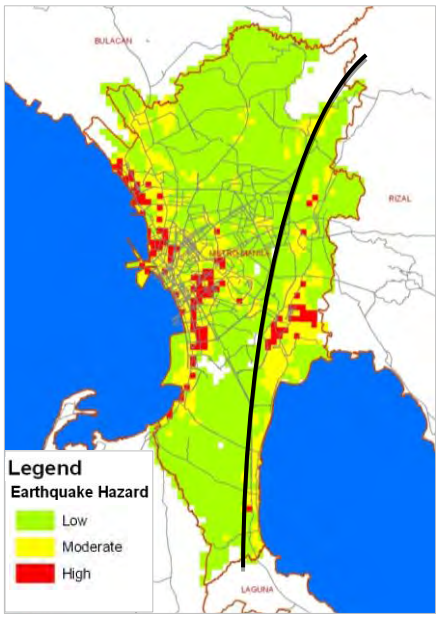
Source: MMDA, Preparatory Study for Sector Loan on Disaster Risk Management (JICA, 2010), Your One Voice,

Figure 3.3 Informal Settlers in Hazard Risk Area



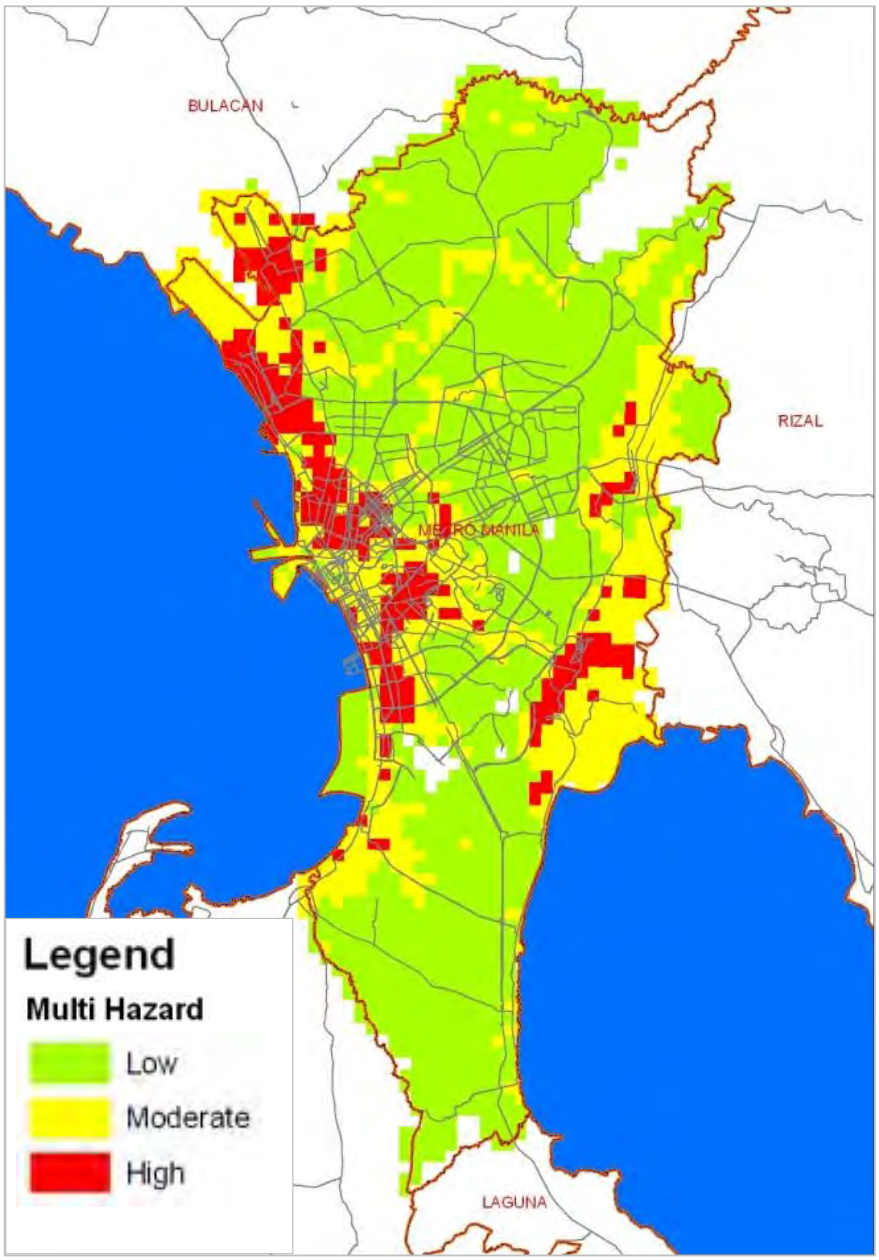
Source: JICA Study Team.

Figure 3.4 Flood Hazard Risk



Source: MMEIRS (JICA, 2004).

Figure 3.5 Earthquake Hazard Risk



Source: JICA Study Team based on Data from previous JICA Study.

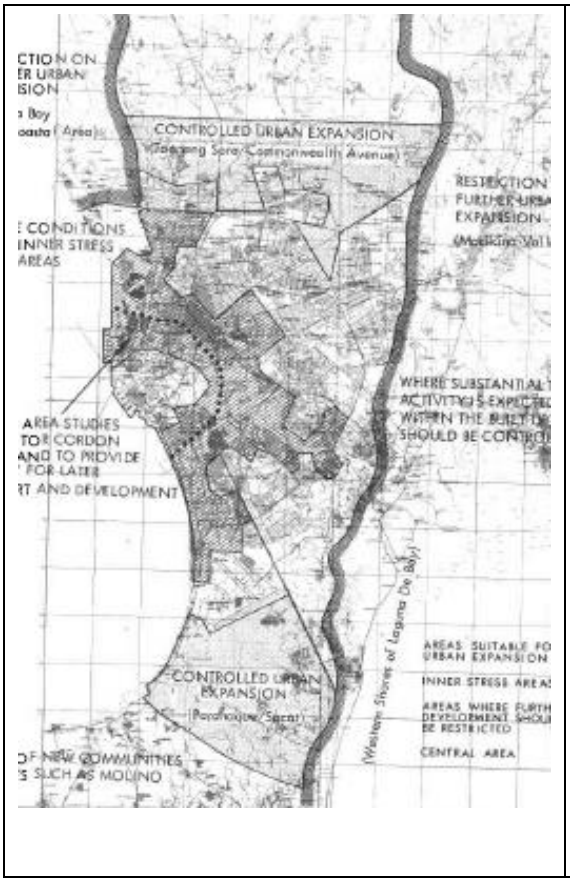
Figure 3.6 Multi-Hazard Risk

4) Direction for Urban Area Expansion

3.11 Metro Manila hardly has any space for expansion of its urban area since most lands are already densely inhabited. Demand for livable environment away from hazard risk and with affordable housing is so large that it can no longer be met within Metro Manila. Analysis on hazard risk clearly indicates that urban area expansion should be directed to the north-south where hazard risk is low to moderate.

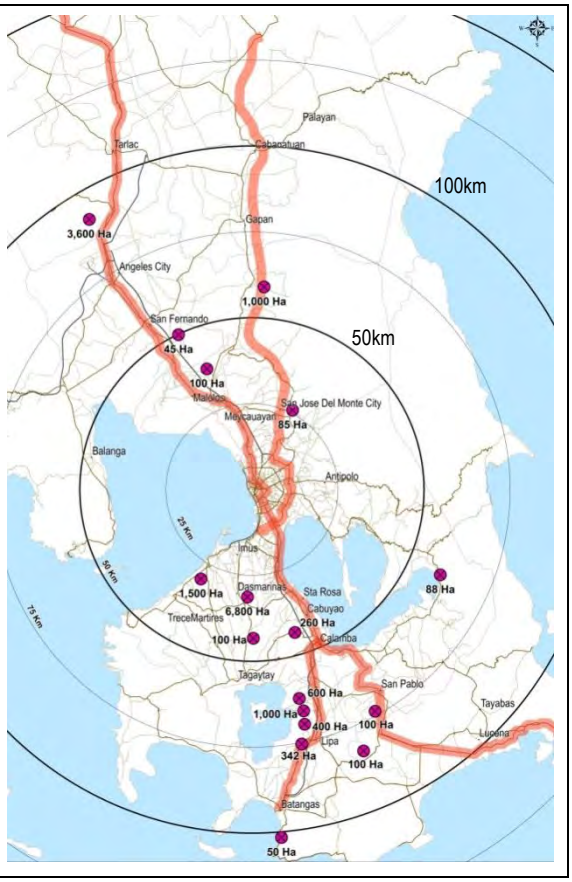
3.12 This orientation was already mentioned in the 1977 Metro Plan for Metro Manila when the population was only about 6 million. Since then, not much attention was paid to guide urban area expansion towards desirable direction or to overall land use management. Urban areas have been sprawling to all directions (except to the west), which amplified the worsening of overall living environment and vulnerability to various hazards (see Figure 3.7).

3.13 A preliminary survey conducted in this study indicates that there are a number of large scale privately owned properties located along the north-south direction well within the areas of Bulacan, Laguna and Cavite i.e., along the north-south main transport corridors. If these properties are developed in integration with mass-transit, it is possible to meet the large demand in the most cost effective manner (see Figure 3.8).



Source: MMETROPLAN (World Bank, 1977).

Figure 3.7 Recommendation of Metro Plan on Expansion and Management of Urban Areas in Metro Manila



Source: JICA Study Team.

Figure 3.8 Locations of Potential Large-scale Private Properties for Possible Planned Development of New Towns/Urban Areas

5) Traffic Congestions

3.14 The popular issue in Metro Manila and its peripheries is traffic congestion. Today, traffic demand is at 12.8 million trips in Metro Manila and 6 million in the adjoining provinces of Bulacan, Rizal, Laguna and Cavite. Most of these trips are done using the public transport owing to its 69% share of total trips. The lesser share of the trips is done by private mode and yet it is this mode that takes up 78% of road space (Table 3.1).

3.15 Traffic volume already exceeds road capacities in most of the urban road sections and congestions is felt all throughout the day from 6 am to 9 pm. Traffic congestion do not only reduce the travel speed of the road users but also increase uncertainly to distinctions and punctuality in transport operation (see Figure 3.9).

3.16 If nothing is done, the situation in 2030 will become a nightmare. All roads will be saturated. Negative impact on economic, social and environmental aspects will be so large deterring the function and livability of Metro Manila (see Figure 3.10).

3.17 Traffic congestions cost much for the society. Today, transport cost of road users including vehicle operating cost and time cost is PHP2.4 billion a day in Metro Manila.4 This will increase to PHP6.0 billion a day by 2030 if nothing is done. While the demand will increase 13% by 2030, the transport cost will be 2.5 times. Increase in transport cost in BRLC is more significant because of relatively poor provision of transport infrastructure. Traffic congestion output is poor air quality (see Table 3.1).

3.18 A preliminary analysis also indicates that average low-income group households have to spend no less than 20% of their monthly household income for transport.

Table 3.1 Traffic Demand and Impacts without Interventions[1]

			2012	2030	'30/'12
Traffic demand (mil. trips/day	Metro Manila		12.8	14.5	1.13
	BRLC		6.0	8.0	1.33
Public transport share in total demand			69%	69%	1.00
Occupancy of road space by private vehicles			78%	78%	1.00
Transport cost (PHP billion/day)	Metro Manila		2.4	6.0	2.50
	BRLC		1.0	3.5	3.50
Air quality	Metro	GHG	4.79	5.72	1.19

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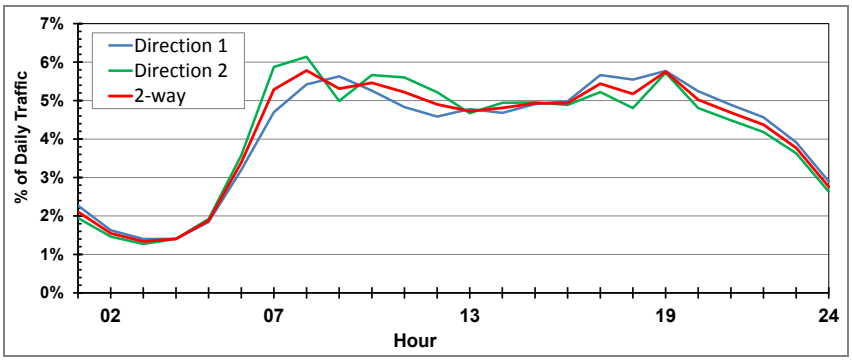


Source: MUCEP, JICA, 2013

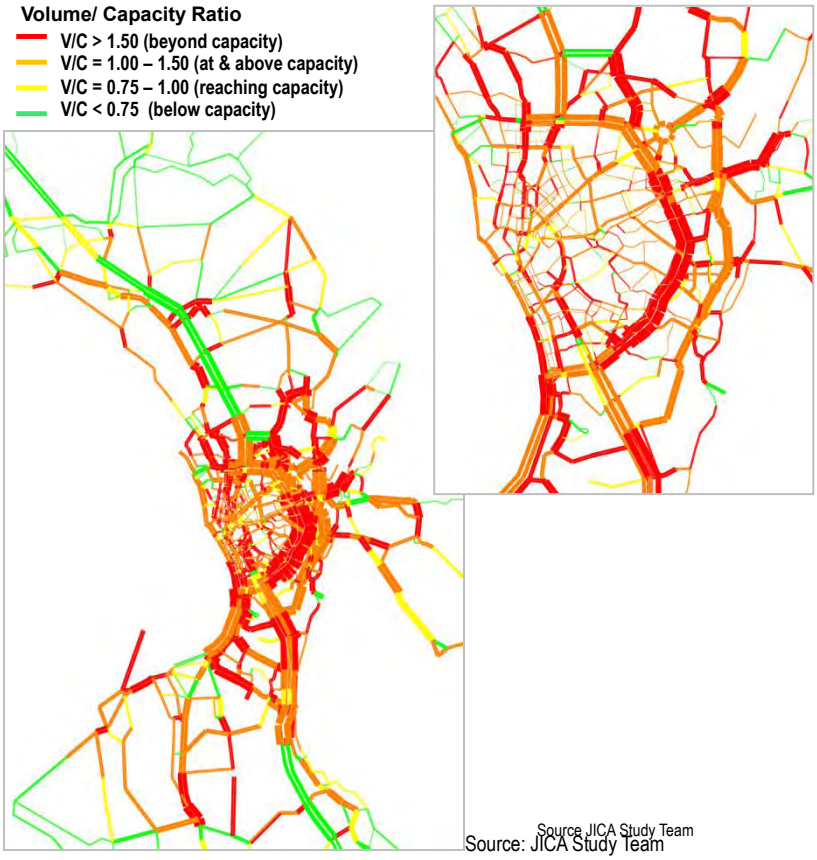
Figure 3.9 Hourly Distribution of Traffic at 11Locations (Main Roads)

[4] Vehicle operation cost (VOC) is calculated based on the estimate of depreciation, fuel/lubricant consumption, tire cost, maintenance, insurance, etc. under different road conditions, while time cost is calculated based on plus the value of people's productive time spent for travels on roads.

EDSA Traffic Congestions

Narrow Sidewalk along Shaw Blvd.

Road Occupied by Too Many Buses



Source: JICA Study Team

Simulated Traffic Situation on Metro Manila Roads without Interventions, 2030

Poor Traffic Management at Intersection

Reckless Driver of Jeepneys

Emissions and Noise from Tricycles

Congestion at Stairways to Access to MRT (Quezon Avenue Station)

Congested Platform at MRT Station (Ayala Station)

Congestion in MRT

Figure 3.10 Transport Conditions of Metro Manila

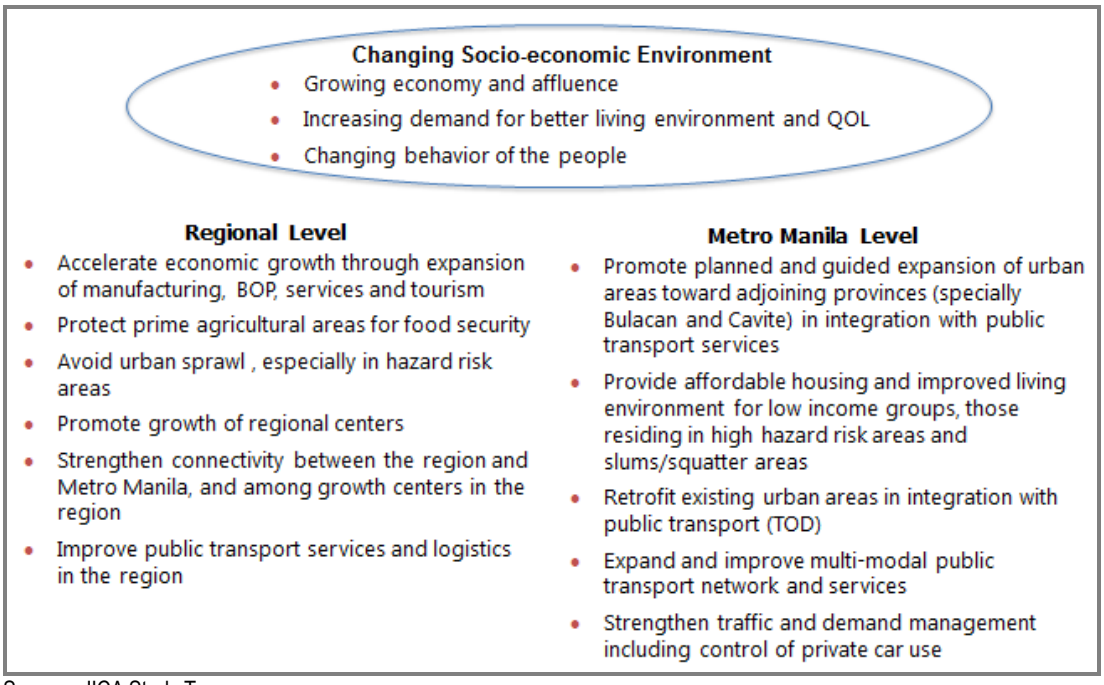
4 DEVELOPMENT FRAMEWORK

4.1 Vision and Key Strategies for Sustainable Development of the Region

4.1 The strong economic performance of the Philippines is expected to continue and people will become more affluent. This will drive up the demand for better living environment and quality of life (QOL). In order to promote and ensure sustainable development of Metro Manila, GCR and the country, the vision is set forth that the region will be the gate to the wellspring of hope, the place for liveable communities and space for dynamic business centers. This will be driven by a well integrated and coordinated GCR comprising of Region III, Metro Manila and Region IV-A, which will be further integrated with the global market and society. The capsulated vision is as follows:

GCR as tri-engine of Growth with GPS to promote:
- **G**ate to wellspring of hope
- **P**lace for liveable communities
- **S**pace for dynamic business centres

4.2 Key development strategies are proposed both at the regional and at Metro Manila level. At the regional level, they include balanced development of agriculture, manufacturing and services, avoidance of urban sprawl, development of regional growth centers, strengthening of connectivity, and improvement of public transport services and logistics. At Metro Manila level, they include planned and guided expansion of urban areas, affordable housing and improved living environment for low income groups; retrofit existing urban areas in integration with public transport; multi-modal public transport network and services; and traffic and demand management (see Figure 4.1)



Source: JICA Study Team

Figure 4.1 Key Development Strategies for GCR and Metro Manila

4.2 Spatial Development Strategies and Structure of GCR

1) Proposed Concept

4.3 Core concept is that the region is broadly classified into five clusters which are connected firmly with strong transport axis (see Figure 4.2). Metro Manila should remain as the central function area; regional growth centers in the north (Clark-Subic-Tarlac) and in the south (Batangas-Lipa-Lucena) should be developed rather independently from Metro Manila. Clark Green City (CGC) is expected to serve the core for development of the regional cluster in the Central and Northern Luzon. As the cluster is already provided with a competitive international gateway port and airport, key success ingredients are to accelerate urban and industrial development. The CGC should function as an independent city and connect directly with growth centers internationally. On the other hand, Batangas and Lipa cluster should be strengthened as domestic gateway of Mega Manila connecting the regions in Visayas and Mindanao.

4.4 Peri-urban cluster in Bulacan in the north and cluster of the Cavite and Laguna in the south should function as suburban areas and buffers for the three Regional Growth Clusters. Then these clusters are connected with the north-south transport corridors comprising of expressways and suburban rails. Development of the peri-urban clusters is the key for decongesting and sustainable expansion of urban areas of Metro Manila (see Box 4.1).

2) Proposed Spatial Structure in GCR

4.5 Today, spatial structure in GCR is highly mono-centric with the prominent feature of Metro Manila. Although developments are taking place in Clark, Subic, Tarlac and other areas in the north and in Batangas, Cavite and Laguna on the south, they are still initial stages and implemented in a rather uncoordinated manner (see Figure 4.3).

4.6 With the introduction of proposed development concept and strategies, the future will be different. Growth centers will be developed in a hierarchical manner and in a way that they are connected and form clusters and the north-south transport corridors can minimize negative impacts on the environment and avoid hazard risks (see Figure 4.4).

4.7 The urban centres and clusters should be developed hierarchically to decentralize and complement the functions of each urban centre and cluster. The proposed urban centres and their functions are as follows (see Table 4.1).

Table 4.1 Proposed Urban Centers in GCR

Hierarchy		Functions
Regional Centers		・Core cities of metropolitan regions which shall serve as a leading center of various activities in the region ・Self-sustained by developing diverse activities ・Regional hub of transport network
Sub-Regional Centers	Provincial Capitals[1)]	・Expected to be the center at the sub-region or provincial level, by providing a wide range of services and facilities ・Existing urban centers located approximately 50 km away from a regional center and connected to regional centers or Metro Manila ・A balanced development and sustainability would be pursued in these centers
	City Centers[2)]	
	Municipal Centers[3)]	
Potential New Urban Centers		・Residential towns equipped with employment opportunities ・Connected to commuter railway or expressway to Metro Manila, with emphasis on access to public transport.

Source: JICA Study Team

1) Provincial Capitals: The capital of the government, economy, and services of a province

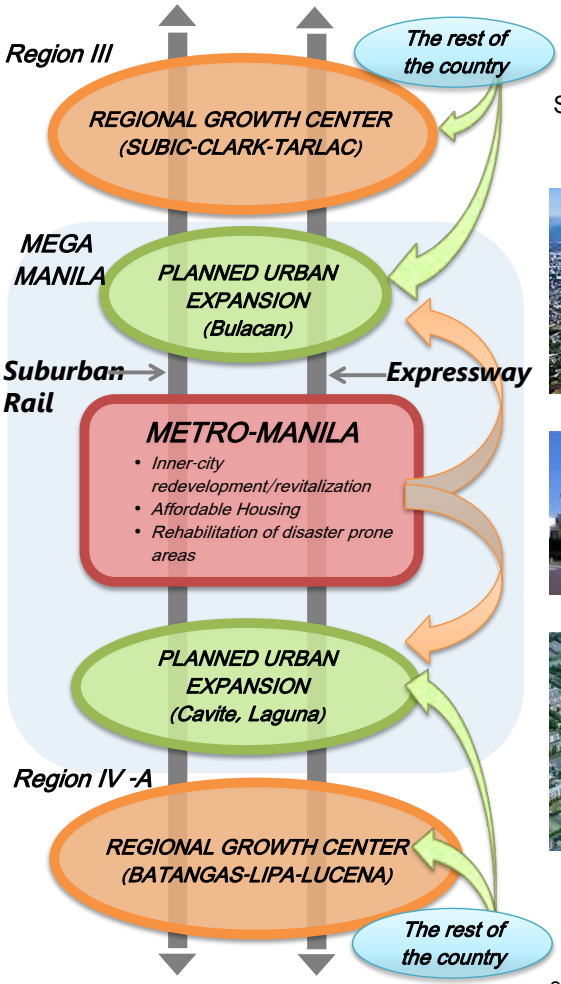
2) City Centers: The center of the government, economy, and services of a city.

3) Municipal Centers: The center of the government, economy, and services of a municipality.

Strategic regional growth centre

Competitive CBD

Industrial cluster integrated with transport



Suburban development integrated with transport

Source: JICA Study Team

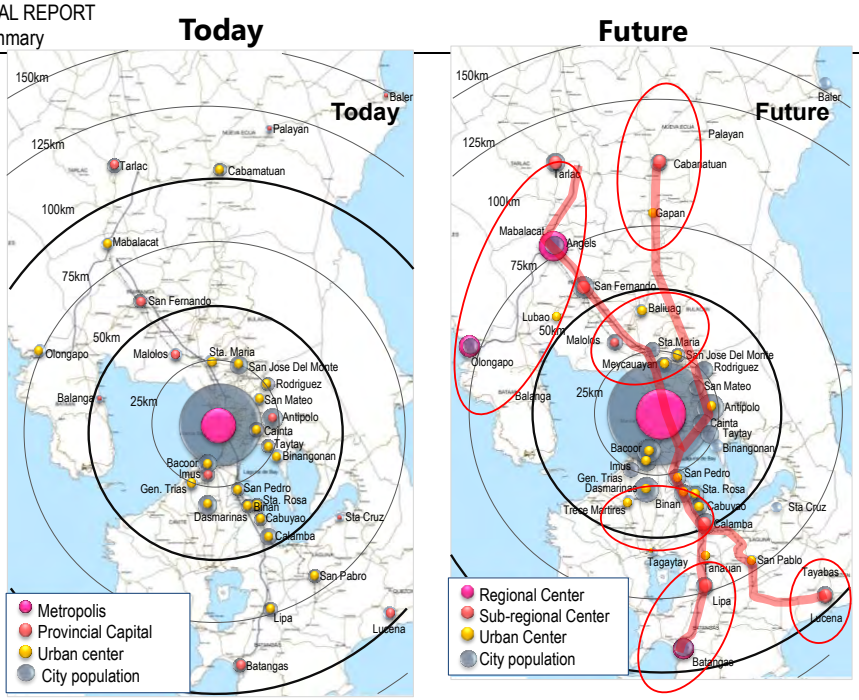
Figure 4.2 Integrated Development Concept of GCR

Box 4.1 Examples of New Towns Integrated with Suburban Commuter Rails in Japan

■ **Kohoku New Town:** This was developed as one of six strategic projects of Yokohama City in the 1960s. It aimed at preventing indiscriminate development. This new town is located 25 km away from Tokyo and 12 km away from Yokohama City center. Total area is 2,500 ha and total population is 180,000 in 2013.

■ **Tsukuba Science City:** This was developed to decongest the Tokyo Metropolitan Area, especially through the relocation of research and educational institutes. This new town is located 50 km away from Tokyo and 40 km away from Narita International Airport. Total area is 28,400 ha with 2,700 ha of central area. Total population was 216,300 in 2011.

Source: Yokohama City, Ministry of Land, Infrastructure, Transport and Tourism (MLIT)

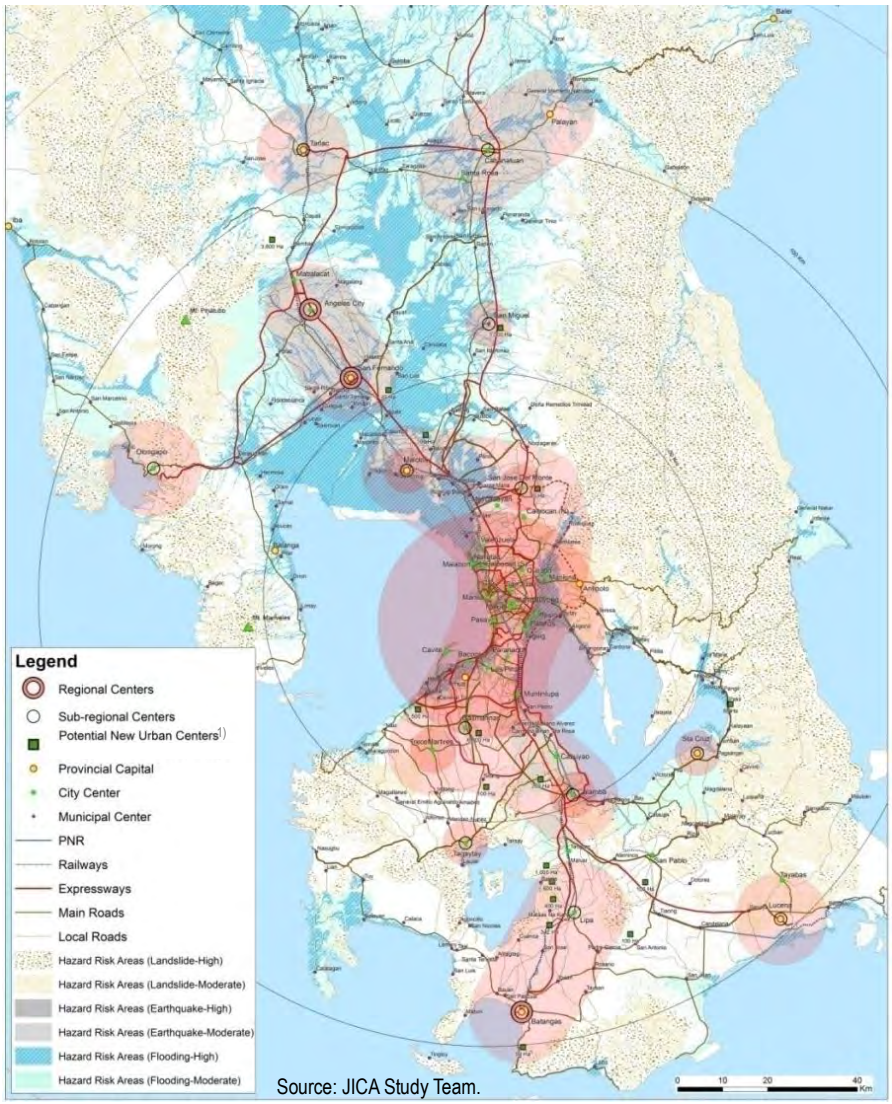


Main Urban Centres

- Metro Tarlac (Tarlac)
- Metro Cabanatuan (Nueva Ecija)
- Metro Clark (Pampanga)
- Metro Olongapo (Pampanga)
- San Miguel-San Ildefonso-Bulacan
- Malolos-Meycauayan (Bulacan)
- San Jose Del Monte (Rizal)
- Antipolo-Cainta (Rizal)
- Calamba-San Pedro (Laguna)
- Metro Batangas/Lipa (Batangas)
- Metro Lucena (Quezon)

Source: JICA Study Team

Figure 4.3 Change in Spatial Structure of GCR



1) Subject to further evaluation

Figure 4.4 Proposed Spatial Structure of GCR

3) Regional Transport Development Direction

4.8 The expected role of transport to promote the envisioned regional development is significant. Transport functions as catalyst to integrate cities, growth centers, gateways, urban and rural areas within a region; facilitates local economic development; enhances social integrity; promotes environmental sustainability; and facilitates planned/guided urban growth and expansion of Metro Manila. To maximize the benefits of the transport investment, the network should be hierarchical, multimodal, disaster-resilient, intelligent and service-oriented.

(a) **Roads and Expressways**: Substantial magnitude of investments for roads and expressways is necessary, especially in Region III and Region IV-A to accommodate the spillover of population and urban activities of Metro Manila and to encourage socio-economic development in the regions effectively. Expressways strengthen main urban/growth centers with each other and with Metro Manila, while secondary roads will strengthen connectivity within the regions and encourage developments.

(b) **Rails:** Expected roles of rails in GCR are significant, though the current services are limited and substandard. There are three roles, including long distance passenger transport, suburban commuter service and urban service, which are interconnected. For this, existing PNR right-of-way and facilities should be utilized in the most effective manner. Expanding suburban connector services is most important. An opportunity for freight transport by rail is questionable due to the absence of connectivity with ports, level of demand, and competition with expressways.

(c) **Gateway Airports:** While NAIA's capacity is already saturated, the functions of two gateway airports of NAIA and Clark should be urgently strengthened and integrated by clarifying their roles and improving access to and between two airports. For medium to long term, existing NAIA will be replaced with New NAIA which will be developed in the vicinity of Metro Manila such as Cavite (Sangley). Upon opening of New NAIA as an internationally competitive regional airport, the existing one should be closed and converted for urban development. Clark airport will serve Metropolitan Clark and northern Luzon, which is expected to grow as independent significant regional centres (e.g., Clark Green City), as well as serve as an alternative to New NAIA (see Figure 4.5).

(d) **Gateway Seaports:** Increasing congestions at Manila ports are negatively affecting access of trucks to/from the ports and the overall urban traffic. For the short-term, incentives to encourage shippers to use the ports of Subic and Batangas as well as placing a capacity limit for future expansion of Manila ports are necessary. For medium to long-term, industrial development should be promoted in Region III and Region IV-A, in coordination with port functions, and at the same time, changing roles of Manila ports and port areas from simple cargo handling facilities to multi-purpose urban use should be pursued. It should also be considered that port and port areas be made attractive for more value added urban development (see Figure 4.6).

Kansai International Airport

Proposed New NAIA

Airport Terminal
(Dubai International, Dubai)

Personal Rapid Transit
(Heathrow International Airport, London)

Source: Airport Web-sites of Korea, Japan, Dubai and London

Figure 4.5 Gateway Airport

Docklands (London)

Minato Mirai 21 (Yokohama)

Source: STACIA CAPITAL, flickriver, Yokohama City

Figure 4.6 Port Area Development

5 TRANSPORT DREAM PLAN FOR MEGA MANILA

5.1 Proposed Transport System

1) Overall Network

5.1 Can we dream of a transport situation realizing five NOs? Isn't it too late to follow a dream plan for Metro Manila? Inasmuch as this is a challenge postulated in the study, the answer is - Yes, the dream can be realized and No, it is not late to follow the dream plan!

Transport Sector Goals with 5 NOs

- **NO** traffic congestion
- **NO** household living in high hazard risk areas
- **NO** barrier for seamless mobility
- **NO** excessive transport cost burden for low-income groups
- **NO** air pollution

5.2 There are five main components of the transport interventions for a better Mega Manila. The first component is comprised of urban roads. The second component is the construction of expressways both intercity and urban. The third component is comprised of urban and suburban rails. The fourth component is the improvement of bus and jeepney services. The last, but the most important component, is traffic management. These components are made up of the following (see Figure 5.1):

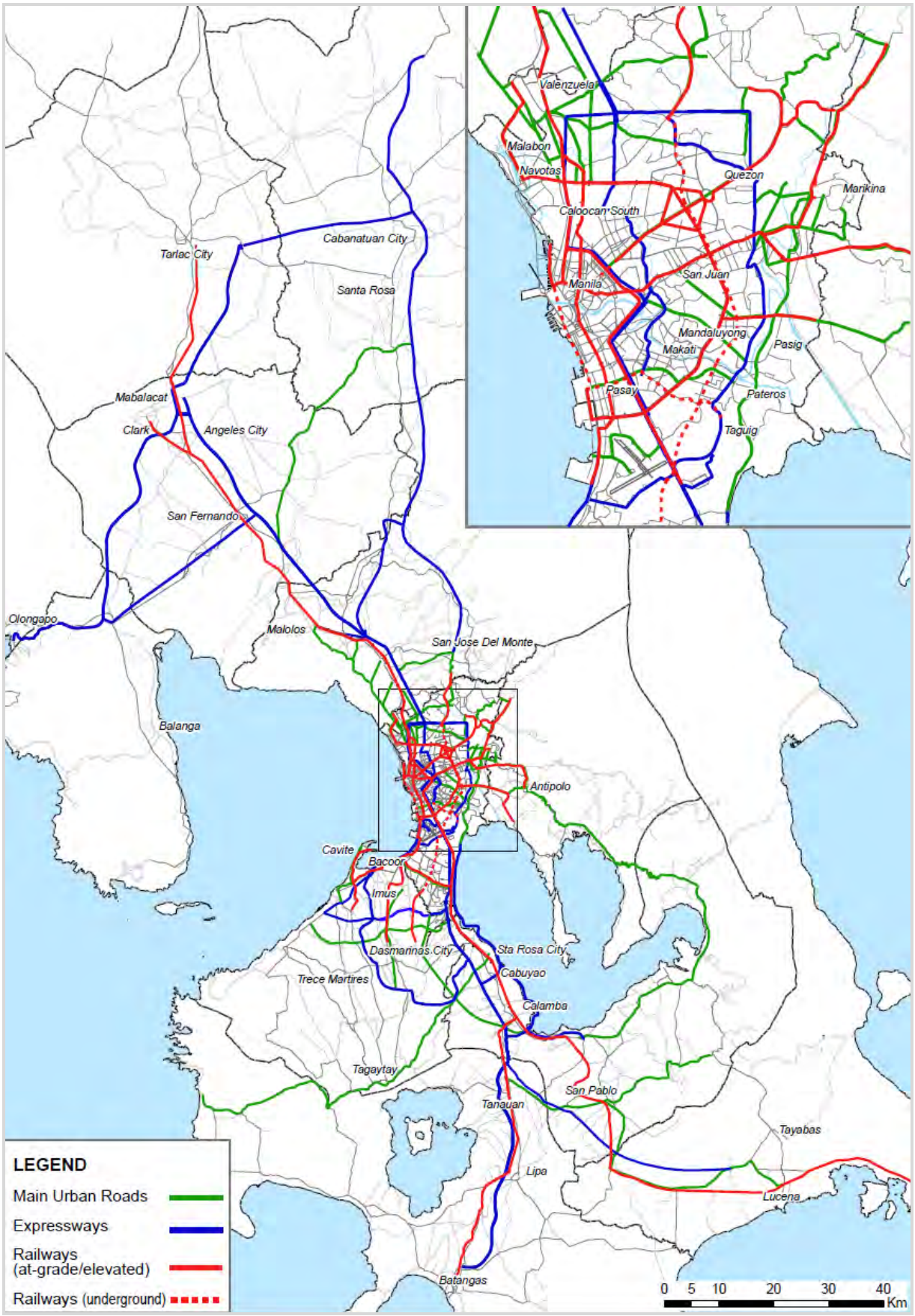
(a) **At-grade Roads**: includes missing links on C3, C5, bridges and others; 137 km of new roads; flyovers; sidewalks and pedestrian facilities.

(b) **Expressways**: compose of intercity expressway of 426 km and urban expressway network of 78 km.

(c) **Urban/Suburban Rail**: comprising 6 main lines with combined length of 246 km; 5 secondary lines measuring 72 km, and integration of lines for improved accessibility.

(d) **Bus/jeepneys**: includes modernized fleet and operation; rationalized route structure; and improved terminals and interchange facilities.

(e) **Traffic Management**: includes intelligent transportation systems (ITS) for different modes of transport, traffic signals, traffic safety, and traffic environment and education.



Source: JICA Study Team

Figure 5.1 Overall Transport Network Concept of Dream Plan for Mega Manila 2030

2) Mass Transit Network

5.3 The proposed mass transit network comprises the following (see Figure 5.2):

(i) North-South backbone: Two north-south rail lines can form the backbone of the future metropolitan area. One is the suburban commuter service using the PNR right-of-way between Malolos (Bulacan) and Calamba (Laguna) and the other is a subway line; the first ever for the country, connecting San Jose Del Monte in the north and Dasmariñas in the south touching part of EDSA and connecting CBDs of Cubao, Ortigas, Global City and Alabang along the way.

(ii) Expansion and extension of existing lines: The Line 1, Line 2 and Line 3 should be extended and their capacities expanded to serve the growing peri-urban areas in the BRLC provinces.

(iii) Other lines: In addition to these, other main and secondary corridors should be provided with adequate urban rail transit systems such as MRT, LRT, monorail, BRT, depending on their local conditions.

5.4 With this envisioned system, Mega Manila will be covered with a total of 318 km of modern mass-transit system. This will dramatically improve accessibility of the people. Moreover, because of the shift away from the use of road-based transport (i.e., bus/jeepney and cars), at grade roads will also be decongested.

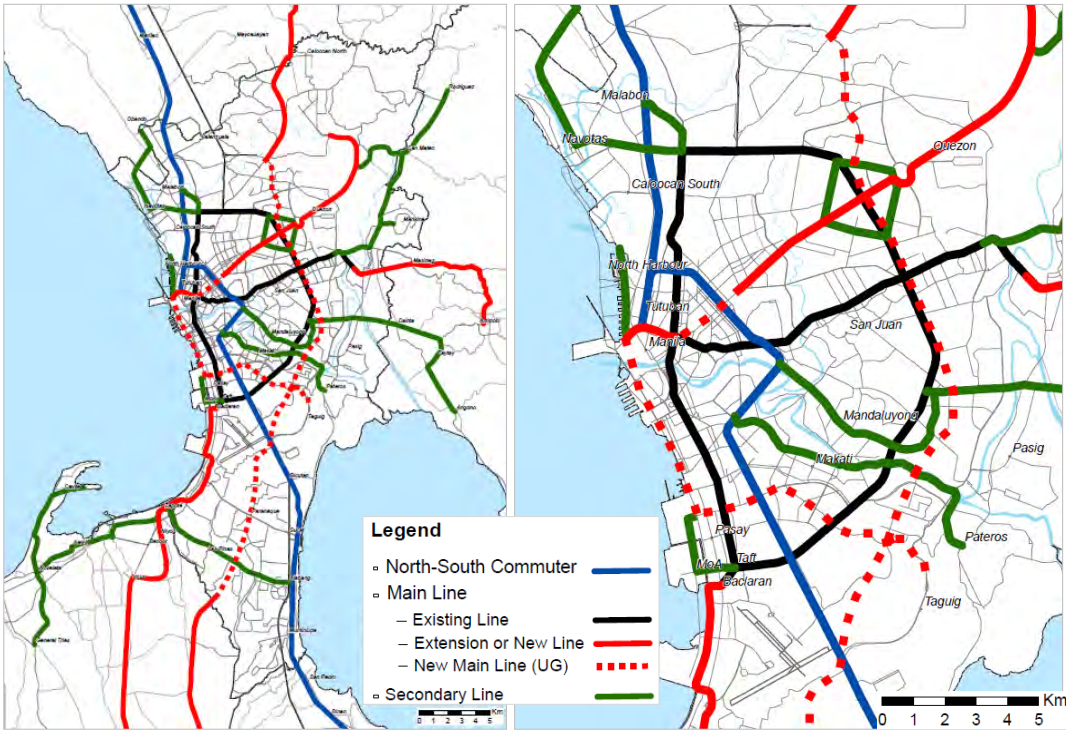
5.5 The impact of the proposed mass-transit network is indicated to be quite significant. Ridership will increase from 1.5 million in 2012 to 7.4 million in 2030 in Metro Manila. About 2.1 million passengers from BRLC provinces will be benefitting from this system. When all the lines are physically connected and a common fare is applied, ridership of the rail transit system will increase by 20% and the volume on road traffic will decrease by 4%. With the mass transit network, Metro Manila can address 41% of the total travel demand and become one of the successful mass-transit cities in the world.

5.6 In planning and development for a mass-transit, there are a number of important factors to consider. Firstly, urban rail transit should be developed as an integrated network. For example, in Tokyo, people can access a rail transit station well within walking distance and can reach their destinations using available lines. People do not have to use own vehicles. Secondly, there are different types of rail transit to choose from. Depending on the demand and prevailing local conditions, adequate type of system should be selected. Thirdly, the interface and transfer between different lines should be smooth. Fourthly, stations should be developed in integration with commercial, business and residential developments to enhance ridership and economic development. Transit oriented development or TOD is a key concept for sustaining the future urban development of Mega Manila (see Box 5.1).

5.7 Developing the north-south mass-transit backbone or the North South Commuter Railway (NSCR) using the PNR right-of-way is urgently needed. In fact, the PNR right-of-way is potentially the most valuable asset to realize the proposed Dream Plan. It is part of the priority proposal to develop a modern high-capacity rail transit connecting Malolos and Calamba with an elevated structure. By elevating the commuter rail, road traffic are free from present at-grade rail crossings and land uses on both sides then becomes connected. This proposed plan requires technical and institutional coordination because part of NLEX-SLEX connector expressway sections also uses the same right-of-way. In like manner, coordination is required between the NSCR and PNR since the former will

provide the commuter rail service for urban/suburban areas while PNR will provide the long distance rail service.

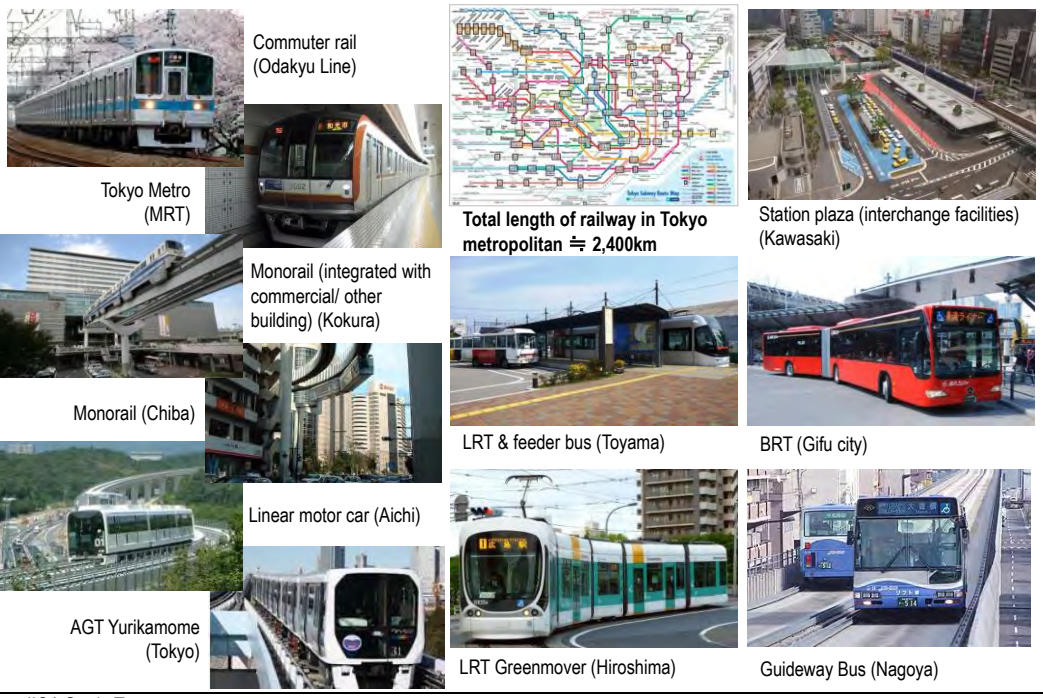
5.8 Opportunities to provide BRT in the appropriate corridors where public transport demand is high and space for introduction of BRT is available must be found. Possible corridors include C5, Commonwealth – Quezon Avenue for intra-urban services and Quezon – Clark for suburban and inter-city services.



Source: JICA Study Team

Figure 5.2 Proposed Mass-transit Network Concept for Mega Manila, 2030

Box 5.1 Examples of Mass-transit Systems and TOD for Improved Mobility



Source: JICA Study Team

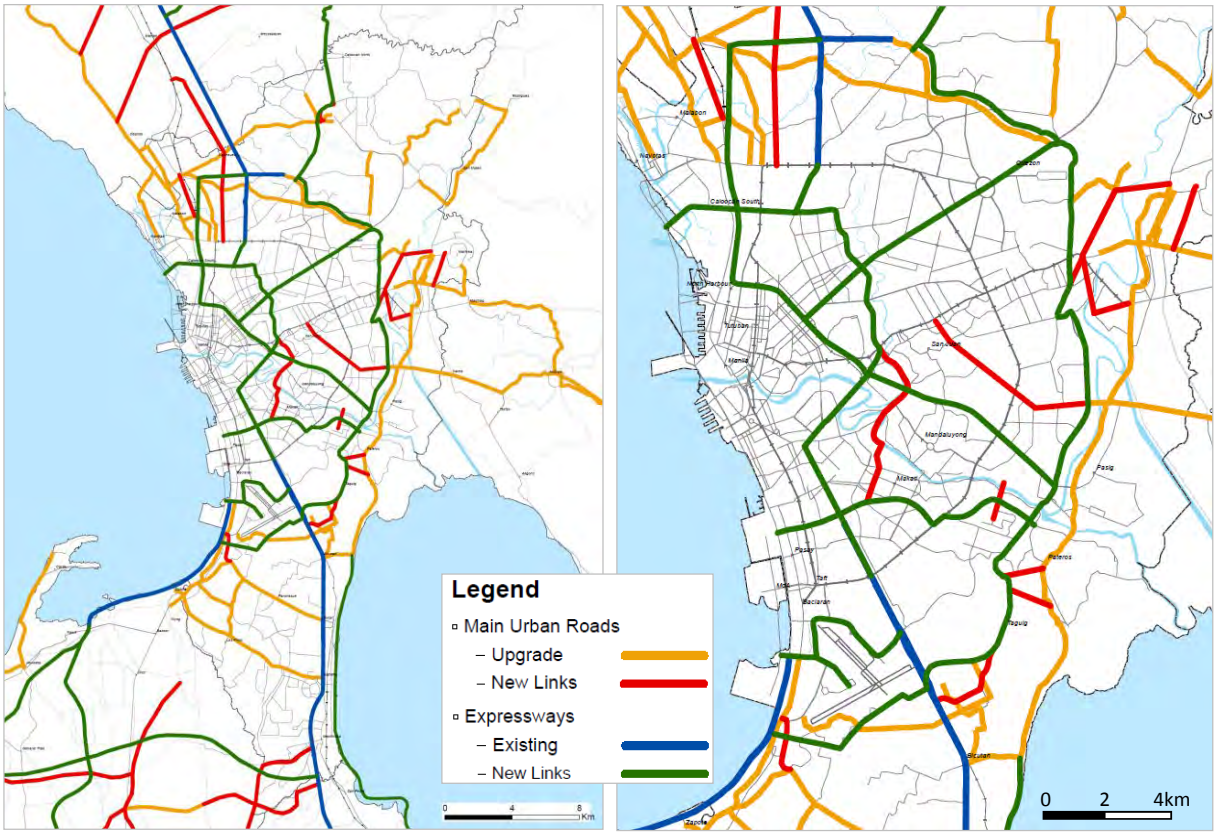
3) Main Urban Road and Expressway Network

5.9 The existing expressways are upgraded and new ones are proposed to form a network of integrated expressways from north to south in the GCR. The Do-maximum scenario would extend the current network of 300 km to over 800 km, which will provide high standard expressway from Batangas to San Jose (Nueva Ecija) on the east side of GCR, and from Cavite to Tarlac on the west of GCR with numerous east-west links between the two expressways.

5.10 Under the Do-maximum, the expressway network in Metro Manila would increase by almost threefold from the current 54 km to 173 km. Within Metro Manila, the committed expressways (i.e., SLEX-NLEX connector, Skyway stage 3, and NAIA expressway) would provide adequate capacity in the major north/south corridor. The radial corridor, especially R-4 and R-7 corridors, would need additional capacity and need to have elevated expressways. In addition, extension of skyway-3 to the north harbour, and NAIA Phase-II would enhance the expressway connectivity to the key traffic nodes in Metro Manila.

5.11 When the expressways network is in place, it will attract significant traffic demand along major corridors in Metro Manila and contribute to decongesting traffic on at-grade roads. In planning and development of urban expressways, it is also important to consider the integration of different expressway sections with each other as well as with urban roads and to apply charges for users to recover construction costs.

5.12 The patronage of the proposed expressways is quite attractive and can divert approximately 13.4 pcu-km of vehicle traffic away from at-grade roads or 20.6% of total pcu-km (see Figure 5.4).



Source: JICA Study Team

Figure 5.3 Primary Road/Expressway Network Concept for Mega Manila

ndanao Ave.

DOTC regarding the final location of MRT-3, LRT-1 extension and MRT-7 common
mplications on the proposed flyover project.

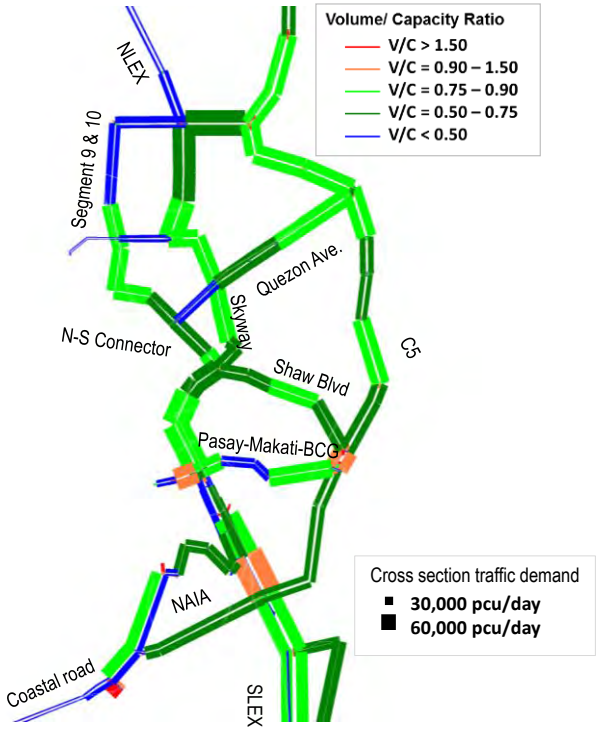


Figure 5.4 Estimated Traffic Demand of Expressways in Dream Plan, 2030

4) Road-based Public Transport

5.13 Construction and improvement of road and railway networks will be insufficient in solving traffic congestions in Metro Manila. About 71% of trips rely on buses and jeepneys at present while 30% will continue to rely on them in 2030. In order to improve road-based public transport, bus/jeepneys modernization and support programs are inevitable.

5.14 In totality, the number of buses for intra-city operations in GCR is about 5,000 buses based on LTFRB data. DOTC has estimated the number at 5,331 city buses. Inter-city (or provincial) buses servicing the northern regions and Metro Manila is approximately 3,300 units, and another 4,000 in the southern regions. There are quite a huge number of the bus companies and individual bus terminals. Moreover, bus fleet, route planning, fare setting and collection are all interrelated. Therefore, comprehensive approach is necessary to modernize the bus system and services. As a first step, a participatory study should be conducted as there are too many stakeholders on this issue.

5.15 One of the biggest problems of the jeepney is its safety and its emission. They are related to poor education level of the drivers and poor conditions of fleets. However, jeepeney is still one of the important transport modes, especially for the low income group of people. Jeepneys cannot just be eliminated from the roads. In order to modernize jeepneys, improvement of operation and management is important as well as a shift to low emission vehicles (e.g., electric jeepneys, electric minibus, etc.).

5.16 In some roads, bus routes overlap with those of the jeepney routes. This causes a race between both modes to pick up passengers as well as causes unnecessary traffic congestions at the terminals and bus stops. It is essential to rationalize bus and jeepney routes and to develop infrastructure such as terminals and interchange facilities to improve accessibility and mobility of road-based public transport modes and lessen the traffic congestions. However, all road-based public transport systems are operated by

private sector as their business; mostly on a small-scale level. So it is difficult to expect the private sector to improve their system without subsidy from the government.

Box 5.2 Selected Scenes of Road-based Public Transport

Traffic Accident: Jeepney and Motorbike

Traffic Congestion at Jeepney Terminals

Jeepneys and Buses on EDSA

Other Public Transport Modes

Source: JICA Study Team

5) Traffic Management

5.17 Traffic management is the fundamental action to maximize capacities and use of available infrastructure in the most efficient and effective manner. Increase in road traffic demand lessens the existing road infrastructures capacity, decreases traffic safety, increases air pollution, hampers smooth and comfortable movement and spoils the city image.

5.18 There are various measures of traffic management. These involve the so called 3Es, i.e., engineering, education and enforcement. Engineering measures include signalling, intersection improvement, safety facilities, pedestrian facilities, flyovers, parking facilities, and others. Education means safety education, safety campaign and others. Enforcement, aside from traffic enforcers, is composed of traffic surveillance, traffic control, vehicle inspection, and so on. In order to manage the traffic demand, color coding (number coding scheme), staggered work hours and pricing (e.g., road pricing) are effective. However, implementing a comprehensive traffic management study is advisable to clarify the effective and efficient traffic management for Metro Manila.

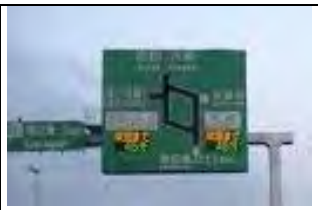
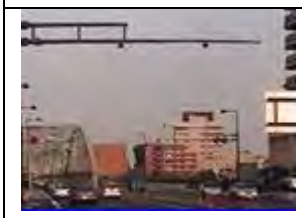
5.19 From the mid-1977 to 2000, a systematic plan to minimize delays and improve vehicular flows was implemented by DPWH – in several phases known as TEAM 1, TEAM 2, TEAM 3, and TEAM 4. The last one brought 435 intersections under a computer coordinated system. Instead of incremental improvements and further expansion like any modern metropolis do, the system went on a downhill course from 2001 to 2010.

5.20 The most urgent of business is to put more science and discipline into traffic management. This requires the re-engineering, upgrading and expansion of the computerized system of coordination of traffic signals, and the subsequent implementation of a phased-investment program to achieve a smart traffic system by

2016. A comprehensive technical assistance project is needed to provide this master plan as soon as possible, covering a large part of the urban area, and to assist MMDA in its rapid realization. In the process, the institutional capacities of MMDA and the 17 LGUs for traffic management and traffic engineering shall be built up[5]. In addition, the traffic engineering capability of the larger towns and cities in Central Luzon and CALABARZON shall also be recipients of the technical assistance.

5.21 There is also a need to develop a brain trust that will, inter alia: (i) back stop the more than 2,200 traffic enforcers, so that they can deliver their work more effectively that goes beyond application of raw force; (ii) review, analyse, and formulate countermeasures on traffic chokepoints in a continuous and sustained manner; and (iii) gather and analyse traffic data, update timing patterns of traffic signals, and formulate data-driven traffic mitigation measures under abnormal conditions.

Box 5.3 Example of Intelligent Transport System (ITS)

<table>
<tr><td> 
Signal Control System</td><td> 
Electric Road Pricing</td><td> 
Travel Time Prediction</td><td> 
Incident Detection</td></tr>
<tr><td> 
Intelligent Parking</td><td> 
Road Maintenance Scheduling & Monitoring</td><td> 
Transit Priority</td><td> 
Bus Scheduling Assistance</td></tr>
<tr><td> 
Traffic Count by Optical Fiber</td><td> 
AM Radio</td><td> 
Internet Network</td><td> 
Car Navigation System</td></tr>
</table>

Source: JICA Study Team

[5] Past initiatives such as the "Small-scale Traffic Improvement Measures for Metro Manila (SSTRIMM)" in 2001 can provide helpful reference as to the scope, manner of execution, results of the undertaking and next steps.

5.2 Main Projects of Dream Plan

5.22 In order to make the Dream Plan a reality, a number of projects of main transport sector are identified comprised of suburban/urban rails, roads/expressways, road-based public transport, traffic management, gateway airport and gateway seaports.

5.23 The “Dream Plan” components are soft- and hardware projects for attaining an ideal transport condition with implementation horizons spanning the immediate short term period (2014-2016), the medium term period (2017-2022) and the long term period (2022 beyond). Some of these projects are already in the committed list of the agencies and others are either proposed or in concept planning by the agencies themselves while others are proposed by the Study Team (see Table 3.1).

5.24 The rail projects are composed of main lines of the heavy mass transit type to serve the high traffic corridors and the secondary lines of mass transit to serve as feeders to the main lines. The planned backbone of the transport network is the Mega Manila North-South Commuter Railway, which will initially be from Malolos of Bulacan to Calamba of Laguna. This should be extended in the future from Malolos to Tarlac on the north and from Calamba to Batangas on the south.

5.25 Many of roads and expressways are already committed as they are either missing links or road sections to complete the road network. Road packages for neighbouring provinces and for Region III and Region IV-A are likewise included to increase accessibilities to these area.

5.26 Airport and port projects are part of the plan in terms of improving their current capacities. However, part of the long term action is to address the congestion at these facilities by moving them to larger grounds. For the NAIA, this would mean relocating the airport out of the metropolis but just to a nearby site. For the port, it is transferring the cargo movements to Batangas Port and Subic Port.

5.27 Traffic management projects require the re-engineering, upgrading and expansion of the computerized system of coordination of traffic signals, and the subsequent implementation of a phased-investment program to achieve a smart traffic system by 2016.

5.28 Road-based projects entails the modernization of the jeepneys and bus fleets as these still carry 30% of the trips well into the future. BRT lines are included as a precursor to converting to higher mass transit modes when needed.

Table 5.1 Main Projects Included in the Dream Plan

Project			Cost (Php mil.)	Status[1)]
Railway				
Sub-urban line	Mega Manila North-South Commuter Railway (Malolos – Calamba, *Elevated*)		24,800	P
	Malolos-Clark & Calamba-Batangas		47,680	P
Primary Lines	Line_1-3	Upgrades Existing Lines	16,422	P
	LRT 1	North (to Malabon)	9,960	P
		South (to Dasmarinas)	100,204	C/P
	LRT 2	East (to Antipolo)	59,086	C/P
		West (to MM North Harbor)	30,840	P
	MRT 3	Ext. (to Malabon & MoA)	68,600	P
	MRT-7 (Recto-Comm. Av.- Banaba)		180,230	C
	Mega Manila Subway		514,160	P
	Total Primary (Incl. Upgrade)		1,002,302	-
Total Main (Suburban and Primary)			1,051,982	-
Secondary Lines	Ortigas - Angono		31,720	P
	Marikina - Katipunan		31,480	P
	Alabang - Zapote		26,800	P
	Zapote – Cavite – Gen Trias		25,560	P
	Study on Secondary Lines		38,703	P
	Total Secondary		154,263	-
Sub-total (Rail: Main and secondary)			**1,206,245**	-
Road				
C3 Missing Link (San Juan - Makati)			24,000	P
C5 Missing Link Southern Section			696	C/P
Global City to Ortigas Center Link Road			8,120	P
Skyway-FTI-C5 Connector			17,880	C
Other Interchanges/Flyovers			7,953	C
Other Urban Roads			4,644	C
Mega Manila (Secondary Roads Package)			180,180	P
Region III (Sec Roads - Approx.)			46,000	P
Region IV-A (Sec Roads – Approx.)			96,360	P
Preparatory Study			5274	P
Sub-total (Road)			**391,107**	-

Project		Cost (Php mil.)	Status[1)]
Expressway			
SEG 9 & 10/ connection to R10		8,600	C
NLEX-SLEX Connector		25,556	C
Skyway Stage 3		26,500	C
NAIA Expressway, Phase II		15,860	C
Pasay - Makati – BGC		24,180	P
Sta. Mesa - Pasig (Shaw Boulevard)		23,430	P
Cavite Laguna Expressway (Bacoor - Sta. Rosa)		35,426	C
Other Expressways		196,733	C/P
Expressways Upgrade		33,040	P
Sub-total (Expressway)		**399,325**	-
Road-based Public Transport			
Integrated Provincial Bus Terminal System		6,300	C
2-BRT Lines in Metro Manila (Ortigas, C5 or R7)		7,000	P
Jeepney Fleet Modernization		30,000	P
Urban Bus Fleet Modernization		25,000	P
Road-based Public Transport Reform Study		60	P
Sub-total (Road-based Public Transport)		**68,360**	-
Traffic Management			
Modernization of traffic signaling system		3,309	C
ITS & Other Road safety Interventions		2,750	P
Comprehensive Traffic Management Study		50	P
Sub-total (Traffic Management)		**6,109**	-
Airports			
NAIA	a. NAIA Improvement– airside package	4,249	C
	b. NAIA improvements – landside package		C
Clark	a. Construction of a Budget/LCC Terminal	7,070	C
	b. Clark Future Development	40,000	P
New NAIA		435,900	P
Sub-total (Airports)		**486,951**	-
Ports			
Replacement of North Harbor		40,075	P
Other regional Ports		11,000	P
Other Port Program		1,010	P
Sub-total (Ports)		**52,085**	-
TOTAL		**2,610,450**	–

Source: JICA Study Team

1) C = committed project, P = proposed by JICA Study Team

5.3 Evaluation of Dream Plan

5.29 Can dream plan be justified? Dream Plan was evaluated of its feasibility preliminary from the economic, finance, social and environmental viewpoints by comparing the Do-Nothing situation and Dream Plan in 2030. If a set of proper interventions are made, traffic congestions can be removed from most of the road sections. Compared to the present situation, overall transport cost can be reduced by 13% and air quality improved in Metro Manila. The situation in adjoining provinces will also be improved (see Table 5.2). The results are more specifically as follows:

(a) **Economic Impact:** Economic impact of Dream Plan is significant. While the total investment cost of Dream Plan up to 2030 amounts roughly PHP2,600 billion or USD 65 billion, the economic benefit of Dream Plan vs "without intervention" scenario due to reduction in vehicle operating cost and travel time cost is expected to reach PHP4 billion (PHP1,200 billion a year) for the Mega Manila. This reflects well against the total infrastructure investment of the plan. The rest of Region III and Region IV-A will also be benefited.

(b) **Financial Aspect:** Revenues expected from tolls and fares will amount to PHP397 million/day or approximately PHP119 billion/year.

(c) **Social Impact:** Average public transport fare paid by a user today is PHP42 a day. This will be reduced to PHP 24 due to improved connectivity and common fare. Travel time reduction from 80 minutes per trip to 31minutes due to dream plan as compared to Do-Nothing situation is also significant. Reduced traffic congestion can widen the travel distance significantly (see Figure 5.6).

(d) **Environmental Impact:** Reduction in air pollutants such as PM and NOx, which are regarded as one of the major causes of respiratory diseases are expected to decrease significantly from 33.4 tons to 26.7 tons/day (i.e., 6.7 tons/day) for PM and 153 tons to 103 tons/day (i.e., 50 tons/day) for NOx. Moreover, GHG, specifically reduced by 10,233 tons per day from 34,033 ton to 23,800 tons per day, which will contribute to a low-carbon development trajectory.

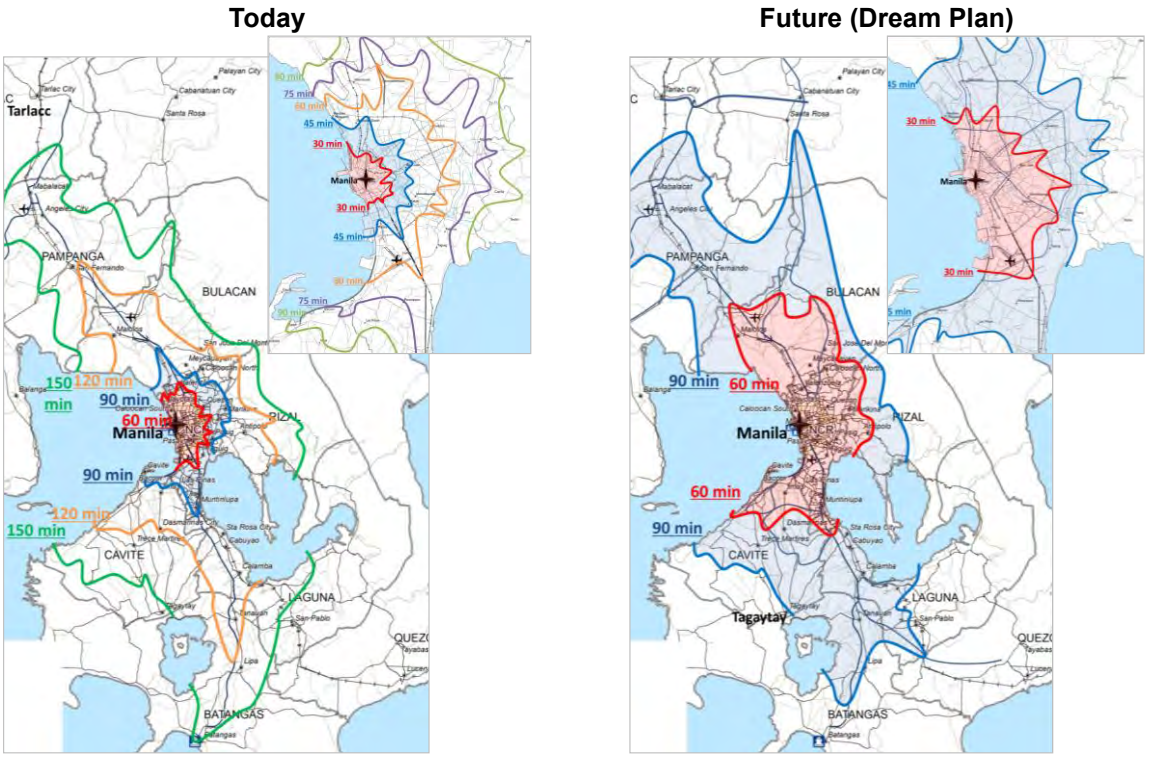
Table 5.2 Performance Indicators of Dream Plan

Indicators			2030	%Change from 2012
Metro Manila	Transport demand (mil. person-km/day)		152.3	15.40%
	Transport Cost (Php billion/day)		1.4	-41.50%
	Air quality	GHG (million Tons/year)	3.99	-16.70%
		PM (million Tons/year)	0.005	-64.30%
		NOx (million Tons/year)	0.04	-18.40%
Bulacan, Rizal, Laguna, Cavite	Transport demand (mil. person-km/day)		115.2	18.90%
	Transport Cost (Php billion/day)		0.8	-15.20%
	Air quality	GHG (million Tons/year)	3.15	-1.60%
		PM (million Tons/year)	0.003	-40.00%
		NOx (million Tons/year)	0.031	-3.10%

Source: JICA Study Team

Source: JICA Study Team

Figure 5.5 Dream Plan Impact on Network Performance



Source: JICA Study Team

Figure 5.6 Dream Plan Impact on Travel Time (to/from City Center of Manila)

6 TRANSPORT INVESTMENT PROGRAM

6.1 Transport Development Strategies

6.1 The goal is to move more people, not vehicles. Accordingly, the general strategy is to develop public transport to such a degree that makes car-based trips less attractive. Key strategies to realize the dream plan are as follows:

(a) Clear the backlogs, ramp up tendering

6.2 All the projects that had been studied and planned in the past, but which had so far eluded realization, should now be rushed into implementation. Local funding is available. This rare condition (convergence of many favorable factors) may not last long. For roads, this includes: (a) all the missing sections of C3, C4, and C-5; (b) several flyovers and interchanges; (c) at least one of the two NLEX-SLEX connector roads; and (d) frontloading by private sector concessionaires of their investment commitments on SLEX, CAVITEX, and NLEX. For railways, this includes: (a) LRT 1 Extension to Cavite; (b) LRT 2 extension to the East; (c) MRT-3 capacity expansion and system upgrade; (d) development of North-South Commuter Railway; (e) MRT-7. Similarly, the computerized traffic signalling system of Metro Manila should be expanded rapidly, and its system upgraded as part of an intelligent urban transport system. For airports, un-freeze and accelerate several landside and airside projects for NAIA and Clark airports.

(b) A strong bias for PPP

6.3 A key strategic thrust is to execute as much of the major transport infrastructure projects (expressways, railways, airports) on a public-private partnership. This will take advantage of the strong private sector interests. It will also sidestep the weakness of the bureaucracy, particularly in operations and maintenance as well as slow response to market. The newfound fiscal space within the public sector can also be used to provide financial support to these PPP projects – not only to cover viability gap, but more to kick start implementation and shorten financial closing. A concomitant by product of the PPP-thrust is to free up more budgetary resources to other regions of the country, which should lead – in the long-term – to a larger share of the economic pie. Impose timelines and clear all obstacles to the immediate implementation of projects that had previously been signed off to the private sector. This includes extension of Segment 10 of NLEX to improve port access, construction of the two Link Expressways, and construction of MRT-7 – all of which had already been greenlighted.

(c) Tap ODA for quick and targeted planning

6.4 Due to weak planning capacities among the transport agencies, reliance on outsourcing cannot be avoided – especially in getting the short term TRIP off the ground. (i) The renewal, expansion, and upgrading of the computerized signalling system is at the top of the list in dire need of technical assistance. It is a quick win with high payoffs. (ii)The suburban railway, or north-south commuter system, is another urgent project with vast data– but still short of a tender document. It is vital that the PNR Commuter service be transformed into a high-grade mass transit service. (iii) It will take more than a directive to divert more cargo movements away from the port of Manila. A comprehensive plan is needed that would lead to a transfer of key functions to Batangas, such as weaning domestic shipping away North Harbor and converting it into waterfront developments.

6.2 Short-term Transport Investment Program (TRIP)

1) Setting Priority

6.5 In an ideal world, priorities among projects competing for scarce fiscal resource can be determined by optimizing the combined benefits. Stated another way, this entails selection of a combination of projects over time that lead to the highest level of service in the transport network or maximizes the social welfare function. In practice, this is not possible due to many factors – such as social and institutional, not to mention information gaps for candidate projects. Particularly for the Philippines, the problem is compounded by lack of fidelity to a 'master plan' that is highly desirable for achieving a long-term vision of an integrated transport system.

6.6 Notwithstanding the preceding limitations, this Study attempted to put together an investment program that will be as close as possible to a coherent multi-modal transport development plan. Consistent with the country's planning cycle, the investment program is divided into three sequential tranches: short-term (2014-2016), medium-term (2017-2022), and long-term (beyond 2022).

6.7 The short-term program is focused on accelerating infrastructure development, rather than on achieving a desirable level of service in the transport network. This is dictated by practicality, that is, what is do-able in the next 3 years. It is made easier by the fact that there is a long back log of projects that should have been completed, but had been waylaid. The starting point is a review of agency proposals.

6.8 On the other hand, the medium to long-term investment program is aimed at moving the transport system into a less-congested and sustainable future. More specifically, the planning exercise formulated a set of dream projects that – if implemented - would lead to a congestion-free situation by 2030. This package was then calibrated against a notional budget envelope.

6.9 All the proposals from MMDA, DPWH, DOTC and its attached agencies were evaluated on the following criteria:

- Consistency with policies and strategies. The candidate project must be consistent with the chosen policy on the pivotal issues of gateway airports and seaports. Also, first priority shall be given to projects that optimize use of existing assets (such as traffic engineering and management, as well as new roads that improves overall network connectivity and efficiency). Projects that promote public transport usage take precedence over projects that encourage private cars.
- Do-ability, i.e., high possibility of being completed or of starting construction on or before 2016. This implies a high degree of project maturity, e.g., availability of feasibility studies, and a bias for clearing the backlog of unimplemented transport infrastructure.
- Robustness, i.e., the ability of the project in resolving present and future capacity constraints.

2) Review of Agency Investment Programs

(a) Airport Projects

6.10 The short-term investment program revolves on the future of NAIA and Clark Airports. Although initially entertained, a single gateway airport solution is simply not feasible in the short to medium term. Therefore, resources must be allocated towards enhancing the capacities of NAIA as well as that of Clark.

6.11 The 6-year total investment for NAIA is PHP6.3 billion, of which only 10% (or PHP608 million) is programmed for 2014-2016. The front-loading is justified, but may have to be rolled over to 2016 to take into account observed delays in tendering.

6.12 For Clark, the proposed investment is PHP7.5 billion, of which 90% (or PHP6.8 billion) is programmed for 2014-16. The investment profile is back-loaded, and should be green lighted.

6.13 All the proposals can be considered valid. However, decomposition into smaller packages or lots should be avoided as delays in one package could make the other components unusable, or also trigger delays in the others. Synchronization can be problematic. The decomposition can also lead to financial difficulties, as cost overrun in one package cannot utilize savings from another, without getting in conflict with budgetary regulations. Repairs should be excluded from the capital expenditure budget.

(b) Traffic Improvement Projects

6.14 The list of projects from MMDA included a varied mix ranging from road infrastructure, traffic engineering, mass transit to bus transport interventions. Some of the projects are also reflected in the project list of other agencies in terms of character and intent, with the exception of traffic improvements, which is clearly under MMDA. One such project is the Skybridge project of the agency to strengthen the road network. A similar project of DPWH on the NLEX-SLEX connector roads already assumes the same concept and addresses the same traffic demand. Another of MMDA's flagship projects is the provincial bus terminal projects. Following a decision handed out by the Supreme Court (GR#170656) in August 2007, the MMDA cannot be the implementing body. Although the effort of MMDA to put order in the bus transport services in the metropolis is laudable, it is doing so without the full range of tools to make the efforts successful and sustainable.

(c) Mass Transit Projects

6.15 Of the 14 identified projects being proposed for inclusion in the short-term TRIP, 13 are from DOTC. The indicative 6-year investment value is PHP297 billion. Of these, 5 are deemed committed, viz.,: (i) 3 ITS bus terminals, (ii) LRT-1 Cavite (Niog) Extension , (iii) LRT-2 East Extension, (iv) AFCS, and (v) MRT-7. Except for LRT-2 East Extension, all are on the PPP-track.

6.16 Three other big-ticket rail projects with an aggregate cost of PHP119.5 billion can be excluded from the short-term program because they are not do-able before 2016. Also, the subsidy (=PHP32.5 billion) to MRT-3 can also be excluded on the assumption that the government takeover of MRTC would be effected in 2013.

6.17 No figure is available as yet for a BRT Line. A feasibility study is currently on-going, thus it is possible to complete the first line by 2016.

(d) Ports Projects

6.18 The bulk of the investments in ports will come from the private concessionaires of PPA, and were therefore omitted from the PPA-proposed investments. These are plans for South Harbor by ATI, MICT by ICTSI, and North Harbor by MNHPI. For a complete picture, they should be quantified – if only to determine the 'foregone investments' that may result from a recent policy of capping capacity at the ports of Manila.

6.19 Investments in other small ports are being programmed for Central Luzon and CALABARZON by PPA. The amount (~PHP835 million) pales in comparison to MICT, South and North Harbor.

6.20 The DOTC is programming PHP546 million for the revival and expansion the Pasig Ferry, which has twice been tried and failed. This is unlikely to fan out before 2016.

(e) Road Projects from DPWH

6.21 The capital expenditure program submitted by DPWH has a total value north of PHP356 billion, or an annual average of nearly PHP60 billion for the NCR alone. This is a level of expenditures higher than the average for the entire country under the previous MTDP. Except for the C-6 expressway and 1 or 2 interchanges, the list could be considered do-able before 2016.

6.22 A desirable project that should be included in the short-term TRIP is the flood control dike expressway or the C6-section from Taguig to Calamba, which would arise from the Laguna Lake flood-control program. Depending on their readiness, two other projects could be considered: widening of Star Expressway from Lipa to Batangas, and the construction of the Calamba-Los Baños Expressway. The first would complement the port decongestion strategy, while the second would complement the South Commuter Railway improvement to Calamba. Implementation of these two projects should serve as a catalyst to the emergence of a new urban node – as suggested in the spatial development framework - on the Santo Tomas (Batangas) and Calamba (Laguna) corridor.

3) Recommended TRIP to 2016

6.23 The result is a proposed short-term transport investment program (TRIP) shown on Table 6.1. To the extent possible, cost estimates for the projects relied on agency proposals and available project documents. Where they are not available, the Study Team made indicative estimates based on unit cost for similar projects.

6.24 The short-term TRIP include projects (approximate cost of PHP116 billion) that are soft. They have been included because of the funding space, and on expectation that the foundational studies leading to tendering could be accelerated. Nearly 80% are deemed 'committed', i.e., with approvals to proceed with implementation.

6.25 Roads comprise about 60% of the total investment program for the next 3 years, with railways 34%, and airports 2%. Close to half (~51%) of the total amount could potentially come from the private sector through PPP.

Table 6.1 Consolidated Short-term Transport Investment 2014-2016

	Name of Project		Amount (PHP Million)	Public	Private	2014	2015	2016
A	**Roads**		**64,943**	**47,063**	**17,880**	**20,532**	**25,031**	**19,380**
1	C5 Missing Link Southern Section; 3 Packages	a	696	696		696		
2	Global City to Ortigas Center Link Road	b	8,120	8,120		2,030	4,060	2,030
3	Skyway – FTI - C5 Connector	↗	17,880		17,880	5,960	5,960	5,960
4	Missing Links of C-3 (S. Juan to Makati)	a	24,000	24,000		4,800	9,600	9,600
5	Rehabilitation of EDSA	↗	3,744	3,744		3,744		
6	Arterial Road Bypass Project Phase II, Plaridel Bypass	↗	3,341	3,341		2,227	1,114	
7	EDSA-Taft Flyover	↗a	3,033	3,033		455	1820	758
8	Metro Manila Interchanges Construction Phase IV; 7 Packages	↗a	4,129	4,129		620	2,477	1,032
B	**Expressways**		**164,662**	**38,578**	**126,084**	**32,433**	**72,741**	**49,948**
1	Daanghari–SLEX Link Project	↗	2,010		2,010	2,010		
2	NLEX–SLEX Connectors							
a	Link Expressway	↗	25,556		25,556		12,778	12,778
b	Skyway Stage 3	↗	26,500		26,500	6,600	13,250	6,650
c	Segment 9 & 10 and connection to R10	↗	8,600		8,600	4,300	4,300	
3	NAIA Expressway, phase II	↗	15,520		15,520	6,208	6,208	3,104
4	Cavite – Laguna Expressway Project	↗	35,420	17,710	17,710	7,084	14,168	14,168
5	CLLEx Phase I	↗d	14,936	7,468	7,468	4,491	6,416	1,925
6	Calamba–Los Baños Expressway		8,210	4,105	4,105		4,105	4,105
7	C6 Extension–Flood Control Dike Expressway	↗d	18,590	9,295	9,295		7,436	3,718
8	Segment 8.2 of NLEX to Commonwealth Ave.		7,000		7,000		3,500	3,500
9	STAR Stage II (Batangas-Lipa)	↗	2,320		2,320	1,740	580	
C	**Other Roads**		**75,860**	**75,860**	**-**	**21,347**	**29,377**	**25,136**
1	Secondary Road Packages	b	23,000	23,000		7,667	7,667	7,666
2	Prepared studies for several projects		500	500		250	250	
3	Other Central Luzon Road Projects	↗b	16,000	16,000		3,330	7,330	5,340
4	Other Southern Luzon Road Projects	↗b	36,360	36,360		10,100	14,130	12,130
D	**Railways**		**178,823**	**75,854**	**102,968**	**25,308**	**42,459**	**39,956**
1	LRT1 Cavite Extension and O&M	↗d	63,550	25,000	38,550	10,000	10,000	10,000
2	LRT2 East Extension	↗	9,759	9,759			4,879	4,879
3	MRT3 Capacity Expansion	↗	8,633	8,633		2,158	4,317	2,158
4	MRT 7 stage 1 (Quezon-Commonwealth)	↗d	62,698		62,698		15,675	15,675
5	Contactless Automatic Fare Collection System	↗	1,720		1,720	688	688	344
6	LRT Line 1 and Line 2 System Rehabilitation	↗	6,067	6,067		6,067		
7	Manila - Malolos Commuter Line	↗b d	24,800	24,800		6,200	6,200	6,200
8	Metro Manila CBD Transit System Study	c	75	75		75		
9	Mega Manila Subway Study	c	120	120		120		
10	Common Station for LRT 1, MRT 3 and MRT 7	↗	1,400	1,400			700	700
E	**Road-based Public Transport**		**8,340**	**4,200**	**4,140**	**6,287**	**2,053**	**-**
1	Integrated Provincial Bus Terminal System (3 Terminals)	↗d	5,080	2,540	2,540	5,080		
2	Road-based Public Transport Service Modernization Study	c	60	60		40	20	
3	BRT System 1 (Quezon Avenue, C5, Ortigas)	b	3,200	1,600	1,600	1,167	2,033	
F	**Traffic Management Projects**		**4,359**	**4,359**	**-**	**1,550**	**2,000**	**809**
1	Modernization of Traffic Signaling System	↗	3,309	3,309		1,500	1,500	309
2	Systematic Road Safety Interventions	c	1,000	1,000			500	500
3.	Comprehensive Traffic Management Study	c	50	50		50		
G	**Airport Infrastructure**		**11,368**	**8,248**	**3,121**	**5,240**	**3,773**	**2,357**
1	NAIA Improvement– airside and landside packages	↗	4,249	4,249		2,833	1,416	
2	Clark International Airport Construction of a Budget/LCC Terminal	↗	7,070	3,949	3,121	2,357	2,357	2,357
3	Feasibility Study of a New NAIA	c	50	50		50		
H	**Port Projects**		**12,085**	**75**	**12,010**	**2,812**	**3,537**	**4,137**
1	Projects for North Harbor	↗	6,000		6,000	2,000	2,000	2,000
2	Projects for South Harbor	↗	1,000		1,000	400	400	200
3	MICT	↗	4,000		4,000		800	1,600
4	Feasibility Study of NH Redevelopment	c	75	75		75		
5	Other Ports, Pasig River Water Transport		1,010		1,010	337	337	337
	Total Investment Program for Transport1		**520,440**	**254,237**	**266,203**	**115,509**	**180,971**	**141,723**

↗	*Committed, or with approval to proceed to implementation*
a	*Availability of local funding provides fiscal space to execute as many as these (mostly, backlog) projects*
b	*F/S and/or engineering works are incomplete, but can be fast-tracked for tender before 2016. Can be deferred if funding is not available.*
c	*Necessary project preparations/studies, to facilitate subsequent investments or courses of actions. Can be deferred if funding falls short.*
d	*Portions of the project cost occur outside the budget period, i.e., before 2014 or after 2016*

Source: JICA Study Team

6.3 Indicative TRIP till 2030

6.26 The transport investment program for the next 6-year Philippine Development Plan 2017-2022 is comprised mostly of projects derived from the 'Dream Plan'. There are other projects till 2030 but these are relegated to the long-term TRIP[6]. The focus is on future problems, so that systemic traffic congestion disappears by 2030. Understandably, nearly all the projects in this set have no project studies. Some would likely be dropped from the program, due to probable oppositions and/or right-of-way obstacles. The tendering for projects in 2017 will be dependent on studies conducted on or before 2016.

Table 6.2 Medium and Long-Term TRIP

	Project	Length (km)	Cost (PHP M)	Remarks
A	**Expressways**		**225,480**	
1	2017-2022	333.1	140,600	Compose of 10 different expressways
2	Beyond 2022 till 2030	206.0	84,880	Compose of 6 expressways
B	**National Roads**		**205,854**	*Total of PHP201,080 without the prep. studies*
1	9 Road Packages in GCR (2017-2022)	353.2	78,040	
2	5 Road Packages in GCR (2023-2030)	145.4	33,040	
3	Other road package in CALABARZON		60,000	*Conditional on prior road network analysis*
4	Other road package in Central Luzon		30,000	*Conditional on prior road network analysis*
5	Preparatory studies		4,774	
C	**Mass Transit System**	323.1	**935,188**	*Total PHP1,020,840 without the F/S cost*
1	Main Lines Railways (2017-2022)	78.2	452,680	
2	Main Lines Railways (2023-2030)	60.7	294,160	
3	Secondary Lines (2017-2022) Metro Manila	39.8	76,600	
4	Secondary Lines(2023-2030) Mega Manila	20.6	25,640	
5	Suburban Railway, Phase 2 (Malolos-Tarlac)	81.1	28,800	
4	Suburban Railway, South Upgrading	47.7	18,800	*Critical intersections are elevated*
7	Railway preparatory studies		38,508	*Indicative amounts for rail feasibility studies*
D	**Road-based Public Land Transport**		**58,500**	
1	Bus Re-structuring and Modernization		25,000	*Low-emission buses under ITS, to replace old PUB*
2	Jeepney Modernization		30,000	*New-gen jeepneys under ITS, to replace old PUJ*
3	BRT System Line2		3,500	*Assume BRT1 is successful*
E	**TEAM 6**		**5,250**	*Expansion of the computerized system*
	Traffic Signalization, phase 6		3,500	
	ITS: Traffic Management		1,000	*Wider applications of ITS in traffic management*
	ITS: Public Transport		750	*Central Control system for bus and jeepneys*
F	**Airports/Ports**		**515,900**	
	New NAIA Airport		435,900	*Assumes successful F/S in previous period*
	Clark Passenger Terminal 2		40,000	*New international passenger terminal building*
	NH Port conversion/re-development		40,000	*Assumes domestic shipping is moved to Batangas*
	Grand Total		**1,877,672**	

Source: JICA Study Team

[6] Refer to Report Volume "Roadmap Projects" for listing of medium-term and long-term projects (till 2030).

6.4 Financing Strategy

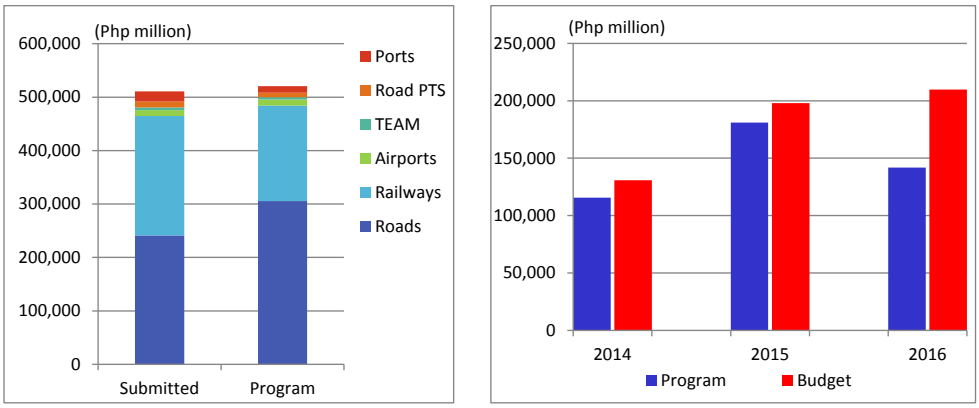
1) Short-Term Outlook

6.27 For the period 2014-2016, the Philippine economy is expected to sustain its previous years' growth – given the sovereign credit rating upgrades, gains in public governance, modest revival of manufacturing in economic zones, and increased business process outsourcing contracts. GDP growth stays robust and inflation remains moderate.

6.28 From 2015 to 2022, the spending target for all types of infrastructure is set at 5.0% of GDP. This is more than double the historical average of 2.0% of GDP.

6.29 The 6% growth rate for 2013 is likely to be exceeded, as the 1st quarter already recorded a high of 7.8%. Analysts foresee the Philippine economy to post higher than 6% in 2014 and 2015. Since 2016 would be an election year, the 2016 level could be higher than 2015 due to the stimulus resulting from election-related spending. Accordingly, the budget envelope for transport infrastructure should hit PHP538 billion, or an annual average PHP180 billion from 2014-2016.

6.30 On the other hand, the demand side showed total transport investments of about PHP520 billion (see Table 6.1), which already included a soft package of PHP116 billion and the likelihood of several rail projects not happening. This implies that funding will not be a problem. Figure 6.1 shows the investment supply-demand outlook for transport infrastructure.



Source: JICA Study Team

Figure 6.1 Investment Requirements and Funding Availability, 2014-16

2) Medium-Term Outlook, 2017-2022

6.31 Two scenarios were hypothesized for the medium-term period:

- Best Case Scenario (optimistic case) - where a high growth rate of 7.5% is sustained over the next six years, and a 5% ratio of investment for infrastructure to GDP is realized;
- Worst Case Scenario (pessimistic case) – where the economy is at 4.0% per annum and the infrastructure investment ratio also dips to 3%.

6.32 In both cases, transport gets 50% of the total investment for infrastructure. In the optimistic scenario, the dominance of the three regions in the Study Area is assumed to decline by 1.0% a year. This means that regional growth rates would be lower than the country as a whole by 2.0% per year, at 5.5%. On the other hand, under a pessimistic scenario, the GRDP of the 3 regions remain static at 60.2% of the Philippines.

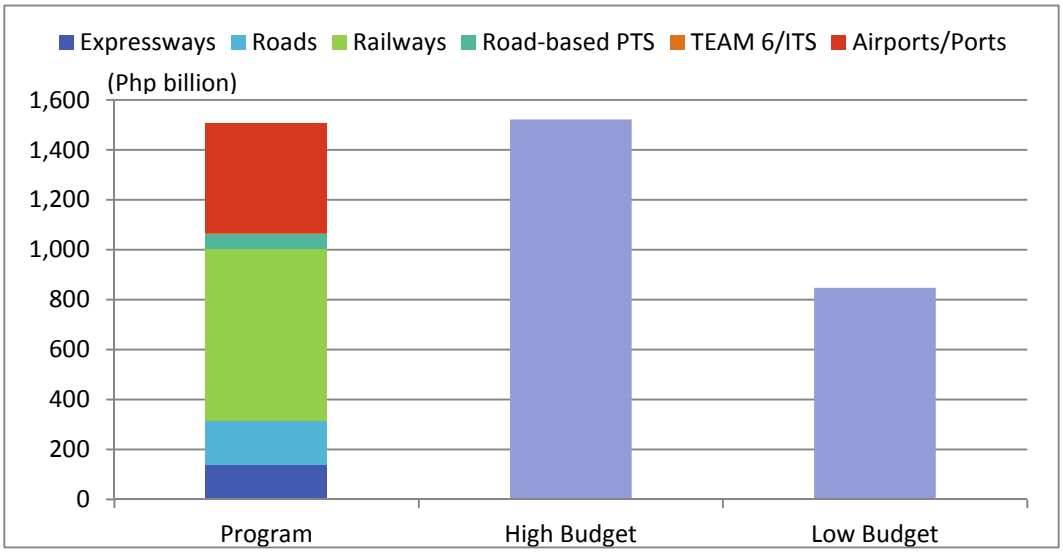
6.33 The annual average growth rate (AAGR) for GDP from 1992 to 2012 was 4.24%. Hence, the low case scenario is slightly worse off. The optimistic scenario falls within the target range (7% to 8%) of the current Philippine Development Plan to 2016

6.34 The 5% ratio was retained for the optimistic case or high budget envelope, and 3% for the pessimistic case or low budget envelope. The resulting budget envelopes for these two scenarios are shown on Figure 6.2 below.

6.35 The estimated demand of PHP1,509 billion can therefore be afforded under high budget envelope (=PHP1,523B), but has to be scaled down under the low budget envelope (=PHP847B). It should be noted that the medium term TRIP already include a soft package worth PHP724 billion. The soft package encompasses projects that are deferrable, or can be cancelled depending on the results of preparatory studies. It is therefore safe to say that financing will not be a constraint.

6.36 The short-term TRIP has the potential of 48% funding from the private investors. That represents about PHP 250 Billion that can be re-allocated to other regions of the country. It can be argued that a region that accounts for 60% of the country's economic output can make do with less than 50% of the available investment money from the national treasury.

6.37 A similar prognosis can be made about the medium-term TRIP. Private capital can share 1/3 of the proposed investments.



Source: JICA Study Team

Figure 6.2 Medium Term TRIP vs Budget Envelope

7 CONCLUSIONS AND RECOMMENDATIONS

1) The Roadmap Context

(a) Spatial Development Orientation

7.1 The NCR, Central Luzon, and CALABARZON are the three leading regions of the country, accounting for more than 60% of the country's GRDP. The concentration of economic activities have brought with it the ills of rapid urbanization – such as housing shortages for the low-income households, traffic congestion, environmental degradation, and a general inadequacy of transport infrastructure. It is considered bad, at present. By 2030, it could be worse when population would be1.3 times larger and the GRDP pie 2.8 times bigger. Unless these problems are addressed appropriately, the engine of growth could falter and drag down the country's economic development.

7.2 Managing the distribution and spatial allocations of social and economic activities will go a long way in mitigating the ills of uncontrolled urban expansion. Hazard maps have pinpointed areas to avoid, but land use controls have not been effectively wielded to achieve a sustainable path to the future. Nevertheless, the goal of re-shaping the spatial orientation towards the north and south, and less to the east and in hazardous and protected zones, must remain. The provision (or non-provision) of transport infrastructure over the next 15 years shall promote this orientation, the nurturing of new development nodes for new housing, as well as meet the mobility needs of a growing – and demanding - population. By 2030, the travel demand would be 1.13 times for Metro Manila and 1.33 times for the 4 adjoining provinces compared to 2012 level.

(b) Road Transport

7.3 To solve current problems, the focus of road development will be to clear backlogs of un-implemented (but still valid) road projects. For Metro Manila, this means completing the missing links of C-2, C-3, C-4, and C-5, as well as building the flyovers/interchanges on or before 2016. To ride on the momentum of other infrastructure initiatives, public and private, key road projects should also be implemented as soon as possible; these include the C6 Extension Flood Control Dike Expressway as a co-product of the Laguna flood protection program, the port access improvements on the back of committed projects (i.e., Segment 10 of NLEX, Link Expressway, and Skyway 3), and the C-5 to FTI Link on the redevelopment of FTI.

7.4 The major arterial roads for Central Luzon (e.g., SCTEX) and CALABARZON (Star Expressway) are already in place, To complement these and other DPWH projects, the resources of LGUs should be harnessed in articulating the many secondary roads that had to be built to improve network efficiency and reach.

7.5 Improvement in public finances suggests that it is possible to erase road capacity deficits by 2030, and thereby reduce traffic congestion drastically. This will require building about 136 km of new at-grade roads plus 426 km of inter-city expressways and 78 km of urban expressways from 2016 to 2030.

(c) Mass Transit System

7.6 The expansion of the mass transit network – consisting of a mix of HRT, LRT, Monorail, BRT and subway will entail a more massive investment than roads. A total of 246 km of main lines (in 6 corridors) and 72 km of secondary lines (in 5 corridors) have to

be provided as an integrated system. When fully built, these lines would capture as much as 9.1 million person trips per day compared to the current level of 1.5 million. It will be an institutional challenge– delivering mass transit projects at 8 times the speed of the last 30 years.

7.7 Hence, the urgency of clearing the backlog of railway projects by 2016, such as LRT-1 Cavite extension (12 km), LRT-2 east extension (4 km), rehabilitation and improvements of PNR south commuter service (30 km), reconstructing PNR North commuter service (32 km), and much-delayed MRT-7 (22 km). Delays would cascade into non-realization of the medium-term program.

7.8 To compensate for the long gestation for railways, developing the BRT mass transit ahead of the rail line in specific corridors should be pursued. The choice of the first line is critical to success. This Study prefers the Quezon Boulevard corridor and MRT-7 corridor via Quezon City Circle, due to lower hurdles to overcome on the corridor. The 2nd and 3rd BRT lines can follow thereafter.

(d) Other Public Transport System

7.9 Even if all the railway and proposed roads are built, they will be insufficient unless the operations of buses and jeepneys are rationalized. Latter mode would still carry more than 30% of daily trips by 2030. Doubling their productivity is now feasible with the advent of low-cost ICT systems. However, this would require a parallel change in the archaic business model (where every driver and unit competes against each other on crowded streets), towards a collaborative service model (where each unit cooperates to serve the public).

(e) Intelligent Traffic System

7.10 More capacities can be extracted from the existing road network with better traffic management and engineering. This means installing coordinated traffic signals to more intersections on a wider area of Metro Manila, including geometric improvements, pedestrian facilities, traffic surveillance, accident prevention, and traffic enforcement. The current signalling system, therefore, has to be upgraded into a true intelligent traffic system. In the long-term, Metro Manila may have to adopt road pricing as a means to ration demand on scarce roads. Other cities in the study area would need to install their respective ITS, albeit on a smaller scale than Metro Manila.

2) Can the Investment be Funded?

7.11 For the first time in three decades, the funding outlook has become positive. The estimated budget envelope from 2014 to 2016, is PHP539 billion while the proposed investment program for the same period only reaches PHP520 billion, of which about PHP116 billion is soft or tentative. Clearly, the problem in the short-term is capacity to execute.

7.12 For the medium-term period (2017-2022), the budget envelope ranged from a low of PHP847 billion to a high of PHP1,523 billion. In comparison, the indicative transport investment program is PHP1,509 billion – of which more than 40% are soft. At the worst case, therefore, the firm investments can be supported. The bottleneck in the medium-term is the institutional capacity for planning and project preparation.

3) Sector Governance

7.13 To implement the short-term TRIP, the capacity of the infrastructure agencies for tendering – in accordance with the Government Procurement Reform Act and the BOT Law must be ramped up.

7.14 Despite a decade of capacity-building efforts by ODA entities, the infrastructure agencies have little to show in planning and execution. Prescribing a re-arrangement of organizational boxes, mergers, or the creation of new ones, would not remedy the personnel problem. For the short to medium-term, project selection, packaging and priority-setting for the Study Area will remain donor-driven and, unfortunately dependent on external consultants. That being the case, trainings should probably focus on the effective management of outsourcing.

7.15 Without policy coherence, coordination will be an elusive goal. Therefore, there should be a re-affirmation of policies so that the statements converge with the actuals. At present, there is huge disconnect between the two.

7.16 In support of the PPP-biased strategy, three institutional reforms are recommended: two on the road sub-sector and one the railways sub-sector. With regard to roads, the role of TRB should be delimited to a toll regulator and its occasional venture as a toll road authority should be curtailed. It is a matter of good economic policy, notwithstanding a broad interpretation of the charter of TRB. The second reform revolves on the franchise of PNCC under Presidential Decree No.1894. Doubts persist about its broad privilege. While it would be ideal to pass a law to remove doubts, the government can choose to not exercise what is contrary to policy: a government-owned and controlled corporation (GOCC) in competition with private enterprise. The policy on urban rail is still unclear. Privatization is being pursued on LRT 1 but not in the other lines. In MRT-7, the situation is even in reverse. Despite policy prescription on cost recovery, fares on the 3 urban rail lines have been kept stagnant since 2003. And contrary to the policy of separating regulation from operation, DOTC continues to be both. For the rapid expansion of the urban rail network envisaged in the medium-term TRIP, it is imperative that clear policy framework be put in place. Privatization of the three rail lines into three separate concessions would avoid a monopoly and extricate government from direct involvement in rail operations.

7.17 This study is of the view that “re-merger” of DPWH and DOTC will not solve the alleged problem of non-integrated plans. Re-drawing the organizational map will be futile unless it ushers in a more hospitable climate for trained professionals in the public sector and the de-politicization of appointments of the heads of the infrastructure agencies. Many infrastructure projects entail long gestation periods and therefore needs leaders with long-term horizon. In contrast, political appointees are “sprinters” rather than “marathoners”. Cognizant of the Philippines context and the failures of previous capacity-building programs, a new tack may be in order - establishing a pool of experts in a Transport Research Institute. Structured as an autonomous think tank, this body can offer Filipino expatriates with transport experience a home to come back to and serve the public sector, without being a hostage to changes in political winds. The infrastructure agencies can “borrow” or engaged specific experts for assignments within their organizations, and return them to the Institute afterward. Members are available on secondments – without diminution of pay or rank. Current mid-level officials harassed by new appointees can also take a ‘sabbatical’ at the Institute. In this manner, experience

and institutional memories can be retained.

7.18 Another action, which always has to be given attention, is the continuous stream of capacity building for technical personnel within the agencies. This is a requisite for government to lead private sectors' initiatives and capacities for more balanced benefit sharing between public and private sectors. In this connection, the coordinating mechanism and capacity of NEDA and planning sections of the Departments would need to be enhanced. In like manner and on the local scene, capacity building of LGUs for urban planning and management always warrant learnings.

4) Preparatory Studies

7.19 A few of the proposed projects in the short-term period are lacking in the preparatory studies to move them into tendering process. The information gaps can be narrowed considerably, and rapidly, if the following studies can be made as soon as possible:

(a) **Traffic Engineering and Management V:** The current system is the product of 4 phases of systematic upgrading that widen area coverage and expanded the number of intersections (435 at end of TEAM 4). It has not been widened or upgraded since then. The MMDA needs technical assistance to ramp up this important component. Economic analysis would show that traffic engineering measures would positively benefit any new road project.

(b) **Suburban Railway System:** Many studies in the past have argued on the strategic importance of the PNR commuter line, but little has been done to make it so. The most recent one (~USD65 million, in 2008) was supposed to improve the South Commuter line from Tutuban to Alabang, but fell short of its goal. A subsequent proposal from PNR (already modest, by the standards of a high-capacity urban rail service) to double-track the line to Calamba was not acted upon. On the other hand, the construction works under Northrail, which would have re-opened the PNR north commuter service from Caloocan to Malolos, was frozen since mid-2010. Accordingly, the most practical option is for the government to revive the PNR north commuter line, remedy the deficiencies of the old North-South Railway linkage, as well as rehabilitate and double-track up to Calamba, but at a higher level of commuter service more at par with the LRT. That means high frequency, faster travel, and grade separations in many road-rail crossings.

(c) **Articulation of a Secondary Road Network Program:** The proposed expressways, trunk roads, and extensive railway lines will be ineffective without a supporting system of secondary roads. However, the LGUs in the GCR, as well as the regional and provincial units of national agencies, do not have the capability to identify and design the appropriate road links.

7.20 Less urgent but important studies (for the Medium-Term TRIP) are the following:

(a) Re-study of the Gateway Airport Options for Metro Manila: This issue should have been settled when the "Study on Airport Strategy for the Greater Capital Region" was completed in 4th quarter of 2011. It has not. A major deficiency was the lack to conduct a full-cost comparison of the competing sites. While the expansion of NAIA would entail major right-of-way cost, the time and cost would be small in comparison to the DMIA alternative which would entail an expensive rapid railway system (~USD8.5 billion), the construction of passenger terminal building and other facilities

(>USD1 billion), aside from the added commuting cost for passengers due to the 100-km distance of Clark from Metro Manila. It is proposed therefore, that a new study be initiated to find a replacement for NAIA within a short radius of 50 km and to examine the full range of costs. Re-developing Sangley with combined with an access system may turn out to be cheaper.

(b) Feasibility of a Mega Manila Subway System: This study will explore the viability of an underground mass transit system for Metro Manila, given the densification of urban activities, the limits to road buildings, and the positive prospects on funding. The time may have come to address the growing commuting requirements of major CBDs (such as Bay Area, Makati, BGC, Ortigas, North Triangle, FTI, Alabang) with an underground mass transit solution for a large conurbation like Metro Manila.

(c) Reform of the Road-based Public Transport System: The atomized operations of more than 35,000 jeepneys and 5,000 buses in Metro Manila[7] are ill-suited to the requirements of a modern metropolis. They are, however, necessary modes of public transport now and in the future – notwithstanding the massive expansion of the railway network. This study shall formulate a comprehensive plan of action to make their operations more efficient, lower their carbon footprints, and attractive to car users, without losing their role as big employment generators. The MMDA has attempted to put some sanity and order in the operations of buses on EDSA, but is hindered by many factors outside its control. There are many cases of public transport reforms in other countries, of which Seoul in Korea provides the most recent (and closer to home) model of what Metro Manila can be. In July 2004, the Seoul Metropolitan Government completely reorganized bus services, installed Bus Rapid Transit (BRT) corridors, improved coordination of bus and metro services, and fully integrated the fare structure and ticketing system between routes as well as modes.

(d) Feasibility of Secondary MTS Lines: Several mass transit lines have been proposed in the medium-term TRIP. None of them have pre-existing studies. Therefore, their realization would hinge on line-specific feasibility studies. To ensure that they do not emerge into fragmented lines, a railway network development plan should be articulated with particular focus on common stations.

(e) Feasibility of North Harbor Redevelopment: Since domestic shipping is primarily from the south of Manila, there would be savings in ship operating cost if they dock at Batangas rather than at North Harbor. This would also trigger a shift of cargo movements away from Manila and provide a volume of exportable TEUs that may entice foreign vessels to call at Batangas Port. Thus would free up North Harbor, which has an area of about 600 hectares, for possible conversion into a mixed-use waterfront property development. For the City of Manila, it represents an opportunity to revitalize a city and regain its old glory.

[7] LTFRB 2012 records of operational and expired franchises.