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

MAIN TEXT

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ABBREVIATIONS

µg/NcM	Micro Grams Per Normal Cubic Meter
AAGR	Annual Average Growth Rate
AFCS	Automatic Fare Collection System
AGT	Automated Guided Transport
ATI	Asian Terminals Inc
AQMS	Air Quality Monitoring Section
AUVs	Asian Utility Vehicle
BAU	Business As Usual
BRLC	Bulacan, Rizal, Laguna and Cavite
CAAP	Civil Aviation Authority of the Philippines
CAIT	Climate Analysis Indicators Tool
CAVITEX	Cavite Expressway
CBUs	Completely Built Units
CCW	Center/Cluster-Corridor-Wedge
CEnergy	Climate Change and Clean Energy Project
CGC	Clark Green City
CIAC	Clark International Airport
CLK	Clark
CLUP	Comprehensive Land Use Plans
CO	Carbon Monoxide
DBM	Department of Budget and Management
DMIA	Diosdado Macapagal International Airport
DOF	Department of Finance
DOTC	Department of Transportation and Communications
DPWH	Department of Public Works and Highways
FTI	Food Terminal, Inc
GA	General Aviation
GCR	Greater Capital Region
GHG	Greenhouse Gases
GIS	Geographic Information Systems
HSH	High Standard Highway
ICTSI	International Container Terminal Service, Inc.
INFRACOM	Infrastructure Committee
IPBTS	Integrated Provincial Bus Terminal System
IT	Information Technology
ITS	Integrated Transport System
JICA	Japan International Cooperation Agency
LCC	Low Cost Carriers
LGU	Local Government Unit
LRT	Light Rail Transit
LTFRB	Land Transportation Franchising Regulatory Board
LTO	Land Transportation Office
MC/TC	Motorcycles and Tricycles
MICT	Manila International Container Terminal
MLIT	Ministry of Land, Infrastructure, Transport and Tourism
MM	Metro Manila
MMDA	Metro Manila Development Authority

MMPTPSS	Mega Manila Public Transport Planning Support System
MMUTIS	Metro Manila Urban Transportation Integration Study
MNHPI	Manila North Harbour Port Inc
MNL	Manila North Line
MPPA	Million Passengers Per Annum
MRO	Maintenance, Repair and Overhaul Facilities
MSEZs	Manufacturing Special Economic Zones
MSL	Manila South Line
MTPDP	Philippine National Philippines Development Plan
MTS	Mass Transit Lines
MWSS	Manila Waterworks an Sewerage System
NAIA	Ninoy Aquino International Airport
NCR	National Capital Region
NEDA	National Economic and Development Authority
NFSCC	National Framework Strategy on Climate Change
NLEX	North Luzon Expressway
NOx	Nitrogen Oxides
NSCB	National Statistical Coordination Board
NSO	National Statistics Office
PCU-km	Passenger Car Unit Km
PEZA	Philippines Economic Zone
PhP	Philippine Peso
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PM	Particulate Matters
PNR	Philippine National Railway
PPA	Philippine Ports Authority
PRRC	Pasig River Rehabilitation Commission
PSA	Public Service Act.
PTB	Passenger Terminal Building
PUBs	Public Utility Bus
QOL	Quality Of Life
PUJ	Public Utility Jeepney
RDP	Regional Development Plan
RET	Rapid Exit Taxiways
SBF	Subic Bay Freeport
SBMA	Subic Bay Metropolitan Development Authority
SCMB	Subic-Clark-Manila-Batangas
SCTEX	Subic-Clark-Tarlac Expressway
SEZ	Special Economic Zone
SLEX	South Luzon Expressways
SRTM	Shuttle Radar Topographic Mission
TEZs	Tourism Economic Zones
TOD	Transit oriented development
TRIP	transport investment program
UV	Utility Vehicle
V/C	Volume/Capacity
VFR	Visual Flight Rules
VOC	Volatile Organic Compounds

MAIN TEXT

1 INTRODUCTION

1.1 Background and Objective

1) Background

1.1 The Philippine Government has adopted an inclusive development and poverty reduction stance to aggressively pursue rapid and sustainable development for the nation. This is well pointed out in the Philippine Development Plan for 2011 to 2016. Investing massively in infrastructure is one of the five key strategies to achieve this Plan. However, what is evident is that infrastructure development is lagging behind the pace of population growth and urbanization of Metro Manila and its neighboring regions. The current state of infrastructure is not only insufficient in quantity but also in quality. Therefore, in order to achieve sustainable economic growth, there is a need to fulfill the current gap across subsectors in a coordinated and integrated manner.

1.2 Given this situation, President Benigno Aquino III is aware that infrastructure development in the country should be reviewed and carefully structured to ensure sustainable development in all areas. This is particularly true for the Metro Manila, as the premier urban area, and its surrounding regions. Sharing this view, the Infrastructure Committee (INFRACOM), which is composed of the Director-General of the National Economic and Development Authority (NEDA), as chairman; Secretary of the Department of Public Works and Highways (DPWH), as co-chairman; and the secretaries of the Department of Transportation and Communications (DOTC), Department of Finance (DOF), and Department of Budget and Management (DBM), as members, has commenced discussions on the “Roadmap for Transport Infrastructure Development for Metro Manila and its Surrounding Areas (Region III and Region IV-A)”. The issues being discussed are as follows: (i) international donors including Japan have made great efforts in the past for Metro Manila’s development and sectoral master plans and these are already formulated, (ii) the Philippine Government has not yet integrated these plans into one inter-sectoral comprehensive policy, hence this is obstructing the implementation of proposed projects and policies in the sectoral master plans, (iii) it is significant for the Philippine Government to take action to formulate a long-term inter-sectoral comprehensive master plan to make actual change. This situation underlies the request of the NEDA to JICA for a formulation of a transportation roadmap for a sustainable development of Metro Manila; this project.

2) Objective and Outputs of the Study

1.3 The objective of this project is to conduct necessary studies in order to formulate the “Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas (Region III & Region IV-A)” as requested by the Philippine Government. In this connection, an integrated priority program coinciding with the medium-term development plans (2011–2016) of agencies was defined and considerations for projects beyond 2016 were made.

3) The Study Area

1.4 The study focuses on three levels of the study area (see Figure 1.1.1). These are the following:

(i) Greater Capital Region (GCR), which is the grand scale of the study area covering the three regions of the National Capital Region or Metro Manila, Region III, and Region IV-A;

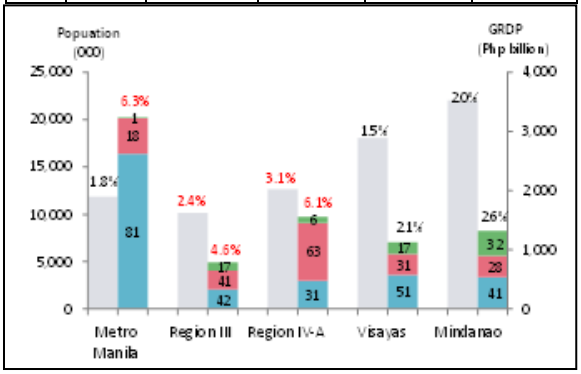
(ii) Mega Manila, which is composed of Metro Manila plus the immediate adjoining provinces of Bulacan, Rizal, Cavite and Laguna; and

(iii) Metro Manila with its core 17 local government units (16 cities and 1 municipality).

1.5 GCR is regarded as the engine for economic growth of the nation. It is located in the center of the Luzon Island in the Philippines. As of the 2010 population census, GCR is home to a population of 34 million or 37.2% to national total. In terms of GRDP, it posted PHP6 billion in 2011, which accounted for 61.7% of the national total. Metro Manila is especially strong in leading this growth, and Region IV-A, with its abundant land suitable for development, has been the destination of migrants and investments in recent years. Region III, on the other hand, has undergone rapid development since the restoration of Subic Bay Naval Base and Clark Air Base in 1992. However, its results have yet to show up. It is apparent that the development of GCR plays a large role in the nation's overall development, and given the expansion and functional degradation Metro Manila, integrated regional development strategies are crucial for its sustainable development.

Table 1.1.1 Profile of the Study Area

Item			GCR	Mega Manila	Metro Manila
Area	km^2		39,508	20,289	620
	% of Total Phils.		11.5	6.0	0.2
Population	In thousands		34,604	27,392	11,856
	% of Total Phils.		37.5	29.7	12.8
	Ave. Growth Rate (2000–2010: %)		2.34	2.53	1.79
GDRP	PHP billion (2011: current)		6,007	n.a1/	3,460
	% of Total Phils.		61.7	n.a1/	35.8
	% by Sector	Primary	4.5	n.a1/	0.5
		Secondary	33.0	n.a1/	17.0
		Tertiary	62.5	n.a1/	82.5



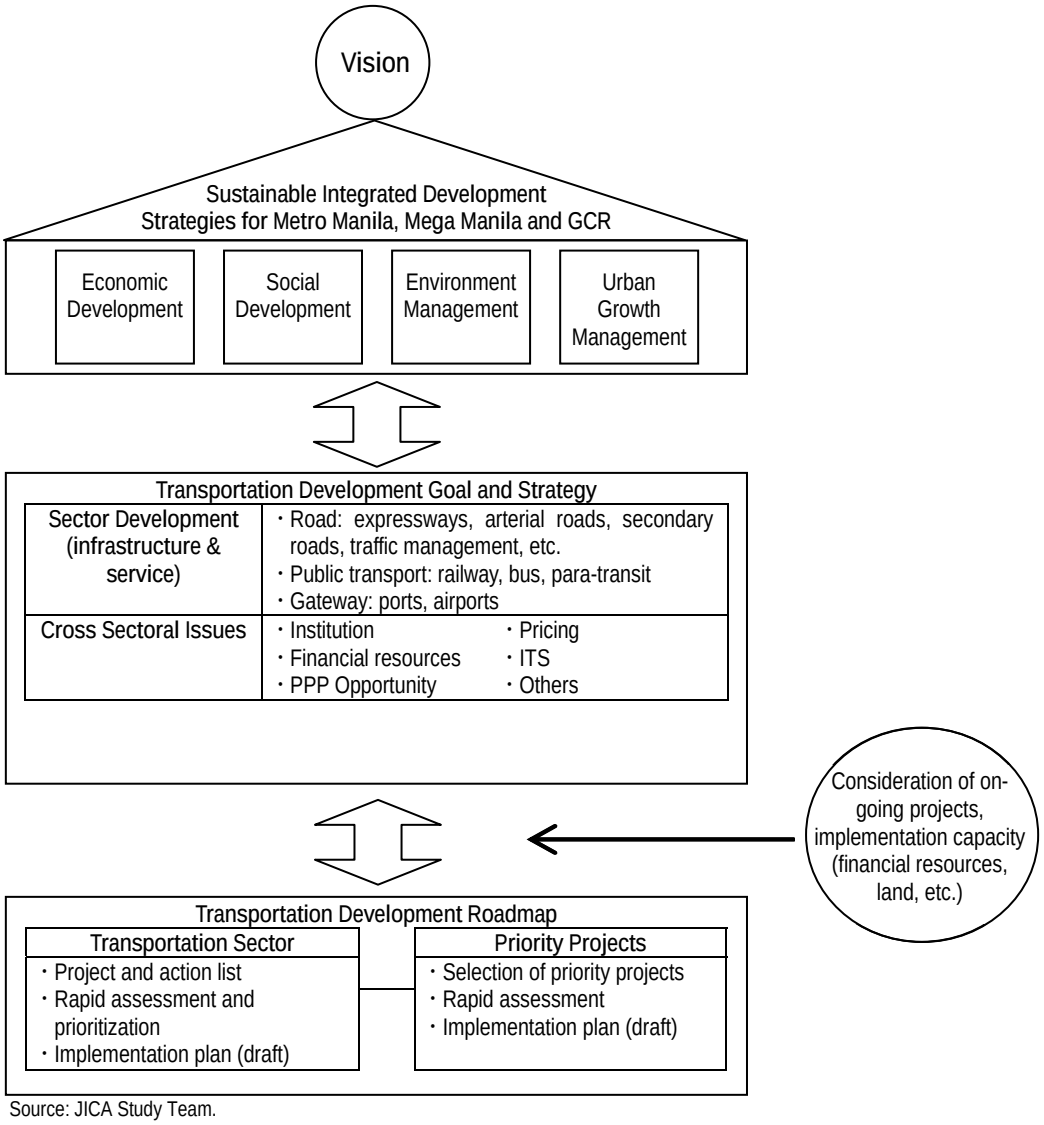
Source: JICA Study Team based on NSO 2010 and NSCB 2012.
1/ n.a. = no available data

Source: JICA Study Team.

Figure 1.1.1 Study Area

1.2 Study Approach

1.6 For a pragmatic approach to ensure the sustainable development for Metro Manila, vision and growth strategies at the regional levels of GCR were clarified, and actions to be taken were reflected unto a roadmap which will lead to inter-sectoral coordination. At the same time, the roadmap will serve as the overall guideline for policies of individual sectors. Needless to say, urban development must be done taking well into consideration outcomes of past practices and the current situation. Actions borne from the agreed vision must be compatible with reality otherwise this will not be realized. In addition, the future development strategies were also clarified in order for this to be acceptable by relevant bodies. (See Figure 1.2.1 for the basic approach of the study)



Source: JICA Study Team.

Figure 1.2.1 Basic Approach for the Study

(a) Review of Past Studies

1.7 In Metro Manila, the transportation sector alone has received much technical assistance and funds since 1970 from JICA (former OTCA and JBIC). Integrated transportation master plans were formulated as well in 1972, 1980, and 1994. Much achievement has been made for individual subsectors already, and considering assistance from other donors, there is a bulk of studies done for the transportation sector already. This can be said for the other sectors as well. Review of such past studies for Metro Manila provided a good chance to reflect on the past and consider on-going and future actions/ projects.

(b) Perception of Urban Issues in Metro Manila

1.8 Urban issues in Metro Manila are strongly interrelated, and in order to consider transportation development policies, this must be considered in relation to sustainable urban development as a whole, understanding both its current issues and potential issues in the future. This task could not be done in detail in this study, however past studies were thoroughly reviewed considering also inputs from local consultants on these matters.

(c) Establishment of Vision and Urban Development Strategies

1.9 The overall strategy for Metro Manila including transport and directions for sustainable urban development was identified. This includes the following four key aspects: economic development, social development, environmental management, and urban management. Inter-sectoral coordination was initiated by NEDA.

(d) Formulation of Transportation Development Strategies

1.10 Based on the overall vision and urban development strategies, transportation development strategies were formulated. Key points include, among others, overall transport network, various transport modes, and inter-sectoral issues.

(e) Development of Transportation Roadmap

1.11 Based on the above, the Transportation Roadmap was formulated. The Roadmap is then composed of transport development programs and priority projects. Projects and actions were arranged according to those that can commence or be completed by 2016 and those beyond this short-term time frame of government plans. This contains basic concepts and implementation plan (draft/indicative). Priority projects are strategic, meeting the following conditions:

(i) They should fundamentally change the current spatial structure of Metro Manila, and promote sustainable development and growth. Connectivity of expanding urban areas should be ensured, and this should induce the development of subsectors, leading to balanced urban development.

(ii) They should take a comprehensive approach, being inclusive of not only transportation but also social, economic, and environmental improvements. This would improve accessibility, increase integrated urban development opportunities, reduce vulnerability towards natural disasters, and relieve land issues.

(iii) They should be projects that step-by-step approach can be taken. Positive effects can be generated in all short, medium, and long terms.

(f) Proposal of Strategic Projects and Programs

1.12 Strategic projects and programs were proposed to meet the following conditions:

(i) They are abstracted by backcasting from the proposed vision. Simultaneously, they are something that can be realized given the current conditions (policy, institution, project implementation conditions), i.e., those that can be commenced within the current President's administration term.

(ii) They are strategic towards the promotion of the proposed vision, in other words, they are strategic enough to have strong impacts to realize the optimal urban structure, promote economic development, and improve social and environmental issues (e.g., resettlement of slums and squatter households in flood hazard areas).

(iii) They are projects and programs which will be initiated by the Government, and also urge the involvement of the private sector and communities.

(g) Ensuring Sustainability of the Proposed Transportation Roadmap

1.13 In order to have a shared understanding of the above mentioned points, the role of NEDA is quite significant, keeping in mind that this will be one of the main agenda of the INFRACOM, and to avoid the proposed Transportation Roadmap from being merely be a transitory exercise.

1.3 Study Implementation

1.14 The study was implemented from March 2013 to March 2014. The following coordination activities and consultations ensued during the study (see Table 1.3.1):

(1) Coordination with the Philippine Government

1.15 Coordination with NEDA as counterpart agency was closely conducted during the study period, study process and outputs shared, and necessary support provided to NEDA to ensure smooth coordination with other agencies.

1.16 Moreover, several key consultations were held with leaders of NEDA, DPWH, DOTC, MMDA as well as other relevant national government agencies and local government units.

(2) Consultations with Other Stakeholders

1.17 A wide reach of presentations and discussions were also done with relevant institutions and entities such as project implementers, business organizations and associations, and international donor agencies.

(3) Coordination with JICA

1.18 Necessary coordination activities were made with JICA as well, which will continue to monitor and follow-up the process after this study. Substantial exchange of opinions and information were made, along with periodic and timely report of the study's progress.

Table 1.3.1 Main Meetings held during the Study

Date	Meetings and Seminars	Agenda	Participation
2013			
5 April	1st Inter-Agency Meeting	Inception Report and matters regarding State of the Nation Address (SONA)	Secretaries of NEDA, DPWH, and DOTC; DDG of NEDA; Undersecretary of DOTC; Asst. Secretaries of DPWH and DOTC; Directors of MMDA; and JICA representatives and officers. (approx. 25 persons)
9 May	Meeting at JICA HQ	Coordination meeting and study update	JICA officers (5 persons)
21 May	NEDA Infrastructure Staff Meeting	Consultation meeting on infrastructure projects	NEDA counterpart team (8 persons)
23 May	2nd Inter-agency Meeting	Interim Report: Framework for Integrated Development of the Transport System	NEDA Secretary, DDG, ADG; officers from the Office of the President; PPP Center director; DOTC planning director; DPWH planning division chief, MMDA Asst. GM; and representatives from other agencies. (approx. 34 persons)
24 May	JICA Advisory Committee Meeting	Interim Report: Framework for Integrated Development of the Transport System	JICA Advisory Committee Chairman and members, JICA representatives and officers. (approx. 27 persons)
11 June	Meeting with DPWH Secretary	Presentation of Draft Roadmap and Short-term Program	Secretary, Undersecretary, Asst. Secretaries, officers of DPWH and JICA representatives and officers. (approx. 16 persons)
13 June	Meeting with DOTC Secretary	Presentation of Draft Roadmap and Short-term Program	Secretary and Undersecretaries of DOTC; GM of PPA; President of Northrail; directors and officers of DOTC; and JICA representatives and officers. (approx. 19 persons)
13 June	Meeting with MMDA Chairman	Presentation of Draft Roadmap and Short-term Program	Chairman, Asst. GM, directors, and officers of MMDA, and JICA representatives and officers (approx. 17 persons)
24 June	NEDA Infrastructure Staff Meeting	Updates on the Roadmap integrating the comments of	NEDA counterpart team (8 persons)

Date	Meetings and Seminars	Agenda	Participation
		DPWH, DOTC and MMDA	
5 July	Meeting with Donor Agencies	Presentation of Study Outputs for appreciation	Representatives from WB, ADB, French Agency for Development (AFD), consultants, and JICA representatives and officers. (approx. 17 persons)
17 July	WB and JICA Meeting	Coordination Meeting on WB Roadmap Study for the Philippines	WB consultants; and JICA representatives and officers (approx. 7 persons)
30 July	NEDA Infrastructure Committee (INFRACOM) Meeting	Presentation of Study Outputs	Secretaries of NEDA and DPWH; NEDA DDG; DOTC Undersecretary and Asst. Secretary; PNR Gen. Manager; and JICA representatives and officers. (approx. 26 persons)
5 August	Meeting with PNR General Manager	Consultation Meeting regarding PNR	PNR Gen. Manager and JICA representative. (2 persons)
7 August	Meeting with DOTC Secretary	Mega Manila North-South Transport Backbone	Secretary, Undersecretary and officers of DOTC; and JICA representatives and officers. (approx. 13 persons)
15 August	Meeting with DPWH Secretary	Mega Manila North-South Transport Backbone	Secretary, Undersecretary, officers of DPWH, and JICA representatives and officers (approx. 8 persons)
6 September	DOTC Technical Working Group Meeting	Technical Working Group Discussion on Railways	Asst. Secretary and officers of DOTC; President of Northrail; Gen. Manager and officers of PNR; BCDA officers; PPP Center officers; DPWH officers; consultants; and JICA representatives and officers. (approx.33 persons)
12 September	National Competitiveness Council of the Phils./ Export Development Council	Presentation on Study Outputs	NCCP/EDC Chairman and members; DOTC officers; NEDA Officers; and JICA officers. (approx. 20 persons)
27 September	Meeting with Manila City Mayor	Presentation of Study Outputs	Mayor of Manila City; Philippine Ambassador to Japan; DPWH Secretary; former DOF Secretary; former NEDA Secretary; other government officers; and JICA officers. (10 persons)
4 October	Meeting with PNR General Manager	Consultation Meeting regarding PNR	Newly appointed Gen. Manager of PNR and former Gen. Manager of PNR.
9 October	Meeting with DOTC Secretary	Presentation on Study Outputs	Secretary, Undersecretary, Asst. Secretary and officers of DOTC; and JICA officers (approx. 11 persons)
30 October	Meeting of the Joint Foreign Chambers of Commerce	Presentation on the Study Outputs	Members of the JFC Infrastructure and Logistics Committee, Development Bank of the Philippines, NEDA officers, consultants, and JICA officers. (approx. 40 persons)
30 October	Presentation at the Embassy of Japan in the Philippines	Presentation on the Study Outputs	Ambassador, embassy officers and JICA officers (7 persons)
5 November	Meeting at JICA HQ	Presentation on Study Outputs	JICA Officers
12 November	Management Association of the Philippines (MAP) Seminar	Special General Membership Meeting on "Solving the Traffic Problems in Metro Manila"	Life and Regular Members of the MAP, guests, media people, academe, and JICA officers. (approx. 60 persons)
14 November	Economic Development Cluster Meeting of Departments (EDC)	Cabinet Meeting	NEDA Secretary and officers; DPWH Secretary and officers; DOT Secretary and officers; GCG Secretary and officers; DOF Undersecretary and officers; DTI Undersecretary and officers; DOTC Undersecretary; BSP Director; DOJ Senior State Counsel; DA Undersecretary; OSG State Solicitor; and JICA representative. (approx. 34 persons)
5 December	Meeting with BCDA Management Board	Presentation of the Main Points of the Study on Metro Manila Transport Roadmap	BCDA President, Exec. Vice President, Vice President, and officers; JICA representative and officers. (approx.35 persons)

Date	Meetings and Seminars	Agenda	Participation
2014			
27 January	Philippines-Japan Urban Transportation Seminar	Seminar on Urban Transportation	Seminar participants (approx. 60 persons)
30 January	Meeting with former Prime Minister of the Philippines	Consultation Meeting regarding the Roadmap	Former Prime Minister of the Philippines and private sector representatives. (3 persons)
5 February	WB Workshop for Philippine CDS Cities	Roadmap Study Output Presentation at the Workshop on Transport and Traffic Management	Mayors and officers (planners, engineers, administrators, traffic managers, etc.) of 7 cities in Luzon, 3 in Visayas and 6 in Mindanao. (approx. 70 persons)
21 February	Philippine Energy and Infrastructure Development Seminar	Roadmap Study Output Presentation at the Seminar	Seminar participants (approx. 100 persons)
27 February	NEDA Infrastructure Committee (INFRACOM) Meeting	Presentation of the Roadmap Supplemental Study for Mega Manila Subway and New NAIA and Short Audio-Visual showing	Secretaries of NEDA and DPWH; NEDA DDG and ADG and officers; PPP officers; DOTC officers; DOT officers, DBM officers; DOF officers; and JICA representatives and officers. (approx. 50 persons)
3 March	Meeting at the Embassy of Japan	Presentation of the Roadmap Supplemental Study for Mega Manila Subway and New NAIA and Short Audio-Visual showing	Embassy officers and JICA officers. (5 persons)

2 DEVELOPMENT OF THE METRO REGION

2.1 Greater Capital Region (GCR)

1) Trends of Population Growth

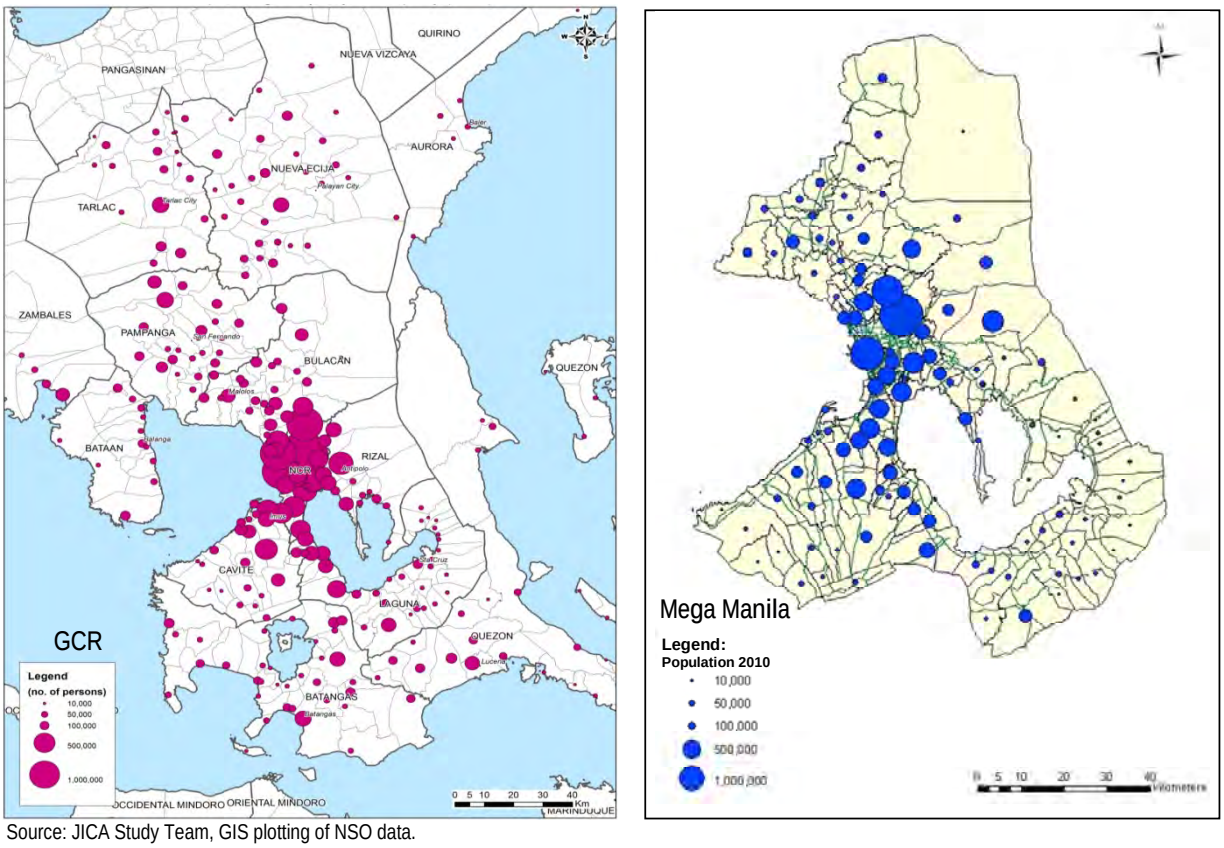
2.1 The demographics of the Greater Capital Region (GCR) are given in Table 2.1.1, with the growth rates depicted in Figure 2.1.1. While the population growth has slowed down for Metro Manila, that for Regions III and IV-A have persisted at rates higher than the national average.

2.2 The relative shift in trends can be explained by Figure 2.1.2, which showed population densities of the cities and municipalities in Metro Manila and nearby provinces. The densification meant higher cost of land and fewer living spaces to accommodate new migrants. Thus, the spill over in to nearby municipalities and provinces. Outside Metro Manila, some cities and municipalities in Cavite adjacent to the metropolis showed population density higher than 100 persons/ ha.

Table 2.1.1 Population Growth in GCR from 1980 to 2010

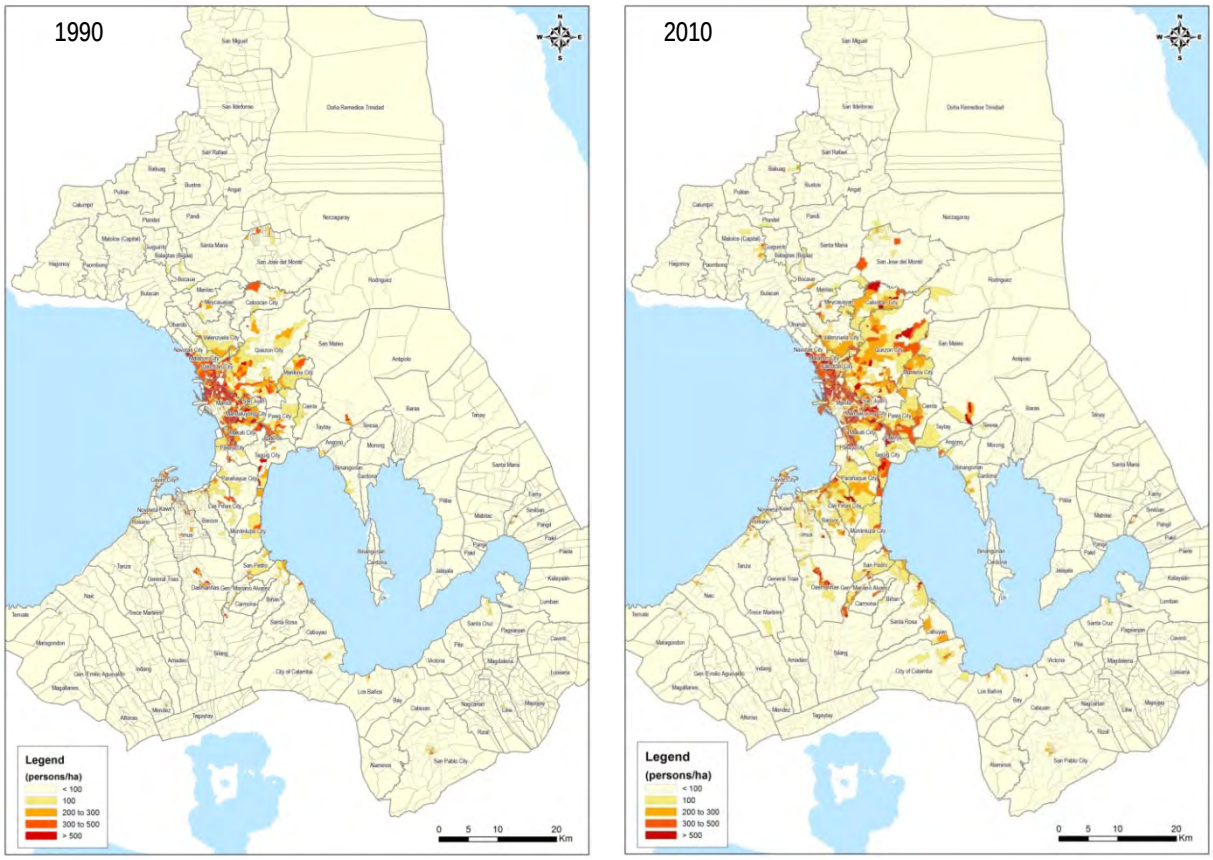
Region/ Province	Area (km^2)	Population (000)				Average Population Growth Rate, (%/year)			Population Density 2010 (persons/ha)
		1980	1990	2000	2010	1980–1990	1990–2000	2000–2010	
Metro Manila Total	620	5,926	7,929	9,933	11,858	2.95	2.28	1.79	191.3
% of Philippine	0.2	12.3	13.1	13.0	12.8	-	-	-	-
Bulacan	2,796	1,096	1,505	2,234	2,924	3.22	4.03	2.73	10.5
Pampanga	2,063	1,182	1,533	1,883	2,340	2.64	2.08	2.20	11.3
Aurora	3,147	107	140	174	201	2.68	2.22	1.48	0.6
Bataan	1,373	323	426	558	688	2.79	2.73	2.11	5.0
Nueva Ecija	5,751	1,069	1,313	1,660	1,955	2.07	2.37	1.65	3.4
Tarlac	3,054	689	860	1,069	1,273	2.25	2.20	1.77	4.2
Zambales	3,831	444	563	628	756	2.40	1.10	1.87	2.0
Region III Total	22,015	4,910	6,339	8,205	10,138	2.59	2.61	2.14	4.6
% of Philippine	6.4	10.2	10.4	10.7	11.0	-	-	-	-
Cavite	1,574	771	1,153	2,063	3,091	4.10	6.00	4.12	19.6
Laguna	1,918	973	1,370	1,966	2,670	3.48	3.68	3.11	13.9
Rizal	1,192	556	977	1,707	2,485	5.81	5.74	3.82	20.8
Batangas	3,120	1,174	1,477	1,905	2,377	2.32	2.58	2.24	7.6
Quezon	9,070	1,129	1,373	1,679	1,987	1.97	2.04	1.70	2.2
Region IV-A Total	16,873	4,603	6,350	9,321	12,610	3.27	3.91	3.07	7.5
% of Philippine	4.9	9.6	10.5	12.2	13.7	-	-	-	-
GCR Total	39,508	15,439	20,636	27,458	34,604	2.94	2.90	2.34	8.8
% of Philippine	11.5	32.1	34.0	35.9	37.5	-	-	-	-
Philippines	343,448	48,099	60,703	76,507	92,338	2.35	2.34	1.90	2.7

Source: National Statistics Office (NSO), 2010.



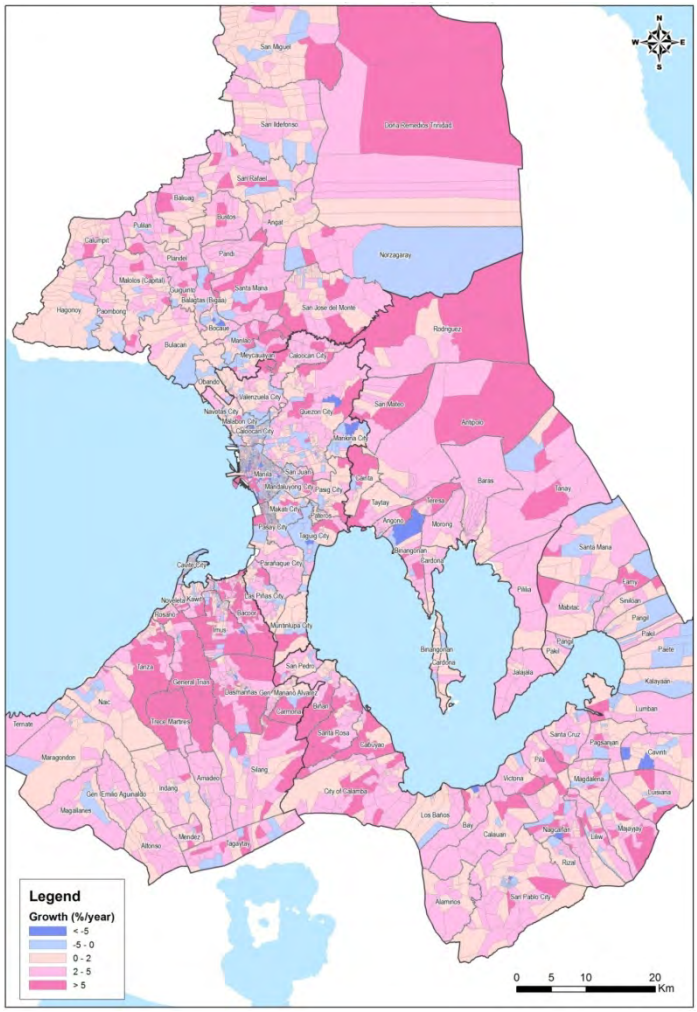
Source: JICA Study Team, GIS plotting of NSO data.

Figure 2.1.1 Population of GCR and Mega Manila (by City and Municipality) in 2010



Source: JICA Study Team, GIS plotting of NSO data.

Figure 2.1.2 Population Densities of Mega Manila by Barangay from 1990 to 2010



Source: JICA Study Team, GIS plotting of NSO data.

Figure 2.1.3 Annual Population Growth Rates of Mega Manila from 2000 to 2010

2) Economic Base of GCR

2.3 As of 2011, the GRDP of GCR stood at PHP6.0 trillion (61.7% of the national total) with an annual average growth of 5.0% over the last decade. It is an economic dominance that drives the country's overall growth pace.

2.4 Translated into per capita, the value for Metro Manila was PHP175,000, almost three times the national average and 1.6 times the GCR average (see Table 2.1.2). On the other hand, Central Luzon's GRDP per capita of PHP53,300 was still lower than the national average, despite its strong growth in recent years. As a whole, the 3 regions accounted for 61.7% of the country's GRDP.

2.5 Decomposed into industry class, GCR contributed 25% of the economic output of the agriculture sector, 65% of industry, and 68% of services (see Table 2.1.3). As to be expected, over three-fifths (62%) of the GCR economy comes from the services sector, and one-third (34%) comes from industry. Metro Manila, being the center of financial, legal and other high-value services, saw 82% of its output coming from the services sector. CALABARZON, which has a large share of the country's manufacturing activities, had 62% of its output coming from industry.

Table 2.1.2 Gross Regional Domestic Product by Region

Study Area		1990	2000	2010	2011	AGR (%)		
						90–00	00–10	10–11
GRDP (PHP million @ 2000 price)	Metro Manila	830,141	1,112,957	2,043,007	2,114,840	3.0	6.3	3.5
	Region III	260,315	326,798	514,244	552,769	2.3	4.6	7.5
	Region IV-A	400,948	556,761	1,004,315	1,030,165	3.3	6.1	2.6
	GCR	1,491,404	1,996,516	3,561,566	3,697,774	3.0	6.0	3.8
Per Capita GRDP (PHP/ person @ 2000 price)	Metro Manila	104,697	112,046	172,318	175,064	0.7	4.4	1.6
	Region III	41,079	39,829	52,266	53,339	-0.3	2.8	2.1
	Region IV-A	63,122	59,732	81,236	79,283	-0.6	3.1	-2.4
	GCR	72,335	72,712	104,574	104,347	0.1	3.7	-0.2
National Figures @ 2000 price	GRDP (PHP million)	2,690,257	3,916,461	5,701,539	5,924,409	3.8	3.8	3.9
	Per Capita GRDP (PHP/ person)	44,321	51,206	61,748	62,902	1.5	1.9	1.9

Source: 1990, 2000, and 2010 data: National Statistical Office, 2011 data: National Statistical Coordination Board (NSCB).

Table 2.1.3 Gross Value Added by Region and Major Industry in 2011 (current price)

By Industry	Metro Manila			Region III (Central Luzon)			Region IV-A (CALABARZON)		
	(PHP million)	Share to GRDP (%)	Share to GDP (%)	(PHP million)	Share to GRDP (%)	Share to GDP (%)	(PHP million)	Share to GRDP (%)	Share to GDP (%)
Primary	17,891	0.5	1.4	145,975	16.5	11.7	108,940	6.6	8.7
Agri., Hunting & Forestry	10,316	0.3	1.0	124,581	14.1	11.7	88,721	5.4	8.4
Fishing	7,574	0.2	4.1	21,394	2.4	11.7	20,220	1.2	11.0
Industry	591,035	17.0	19.3	373,250	42.3	12.2	1,015,501	61.7	33.2
Mining & Quarrying	-	0.0	0.0	2,488	0.3	1.7	1,813	0.1	1.3
Manufacturing	349,295	10.0	17.1	294,482	33.4	14.4	868,486	52.8	42.4
Construction	131,745	3.8	24.6	57,650	6.5	10.8	80,054	4.9	15.0
Electricity, Gas & Water Supply	109,995	3.2	33.3	18,629	2.1	5.6	65,149	4.0	19.7
Services	2,870,979	82.5	52.8	363,580	41.2	6.7	520,401	31.6	9.6
Transport	174,497	5.0	27.8	85,798	9.7	13.7	88,788	5.4	14.2
Trade And Repair of Motor Vehicles, Motorcycles, Personal &HH Goods	1 ,060,278	30.5	62.5	9,246	9.0	4.7	138,721	8.4	8.2
Financial Intermediation	74,258	10.8	54.7	54,625	6.2	8.0	57,811	3.5	8.5
R. Estate, Renting & Business Activities	629,148	18.1	56.4	68,294	7.7	6.1	146,089	8.9	13.1
Public Administration & Defense; Compulsory Social Security	206,303	5.9	52.5	19,739	2.2	5.0	19,525	1.2	5.0
Others	426,494	12.3	46.4	55,879	6.3	6.1	69,467	4.2	7.6
Total	3,479,905	100.0	35.7	882,806	100.0	9.1	1,644,843	100.0	16.9

Source: NSCB.

2.6 The three regions of GCR have distinctive compositions of industry in accordance with their respective regional advantages. In Metro Manila, 80.2% of employed persons were engaged in the tertiary sector in 2011, reflecting a concentration of financial resources and economic activities as the national capital. The tertiary sector also provided nearly 60% of employment in Central Luzon and CALABARZON. About 25% of employed persons in CALABARZON worked in the secondary sector and accounted for 21.7% of total employment of the sector in the Philippines, owing to the development of special economic zones which host many manufacturing businesses. The primary sector provided 21.8% of employment in Central Luzon, which supplies the bulk of the nation's rice supply. The number of employment in the tertiary sector increased in all regions in the last two decades. The shift of employment from the primary sector is observable outside Metro Manila, though at a declining rate.

2.7 In per capita terms, the workforce in GCR can be seen as 3 times more productive than workers in other parts of the Philippines (see Table 2.1.4). Metro Manila workers, who produced high valued service and industry products, were five times as productive. CALABARZON workers were 2.3 times as productive. The workforce in Central Luzon, which had a greater share in agriculture and a smaller share in industry, was 1.5 times as productive. Service workers in Metro Manila were five times as productive as those outside GCR. Manufacturing workers in CALABARZON were nearly three times as productive as those outside GCR.

Table 2.1.4 Employment by Industry Sector

Region	Economic Sector	No. of Employment (000)			AGR (%/year)		Share by Sector (%)		
		1990	2000	2010	'90–'00	'00–'10	1990	2000	2010
Metro Manila	Primary	39	35	25	-1.1	-3.3	1.4	1.0	0.6
	Secondary	761	872	843	1.4	-0.3	28.0	24.6	19.3
	Tertiary	1,918	2,636	3,505	3.2	2.9	70.6	74.4	80.2
	Total	2,718	3,543	4,373	2.7	2.1	100.0	100.0	100.0
Region III	Primary	759	683	802	-1.0	1.6	35.1	25.0	21.6
	Secondary	412	634	715	4.4	1.2	19.1	23.2	19.2
	Tertiary	990	1,413	2,200	3.6	4.5	45.8	51.8	59.2
	Total	2,161	2,730	3,717	2.4	3.1	100.0	100.0	100.0
Region IV-A	Primary	1,128	1,062	1,377	-0.6	2.6	38.4	26.0	24.2
	Secondary	619	987	1,252	4.8	2.4	21.1	24.2	22.0
	Tertiary	1,193	2,035	3,059	5.5	4.2	40.6	49.8	53.8
	Total	2,940	4,084	5,688	3.3	3.4	100.0	100.0	100.0

Source: National Statistical Coordination Board (NSCB).

Table 2.1.5 Employment by Region and Major Industry Group[1/ 2/]

Major Industry Group	GCR				No. of Employment (000)					
	Employment (000)		Average Annual Growth 2007–2011		Metro Manila		Region III		Region IV-A	
	2007	2011	(000)	(%)	2007	2011	2007	2011	2007	2011
Agriculture	1,573	1,603	7.5	0.47	36	31	780	830	757	742
Agriculture, Hunting and Forestry	1,353	1,391	9.5	0.69	19	15	721	768	613	608
Fishing	220	212	-2.0	-0.92	17	16	59	62	144	134
Industry	2,621	2,737	29.0	1.09	839	852	682	728	1,100	1,157
Mining and Quarrying	12	10	-0.5	-4.46	1	1	6	6	5	3
Manufacturing	1,724	1,690	-8.5	-0.50	530	484	415	417	779	789
Electricity, Gas and Water Supply	62	67	1.3	1.96	21	22	19	20	22	25
Construction	823	970	36.8	4.19	287	345	242	285	294	340
Services	7,438	8,614	294.0	3.74	3,194	3,578	1,949	2,272	2,295	2,764
Wholesale and Retail Trade; Repair of MVs, MCs and Personal & HH Goods	2,702	3,086	96.0	3.38	1,065	1,216	768	871	869	999
Hotels and Restaurants	507	622	28.8	5.24	248	298	123	141	136	183
Transport, Storage and Communications	1,254	1,289	8.8	0.69	500	436	366	418	388	435
Financial Intermediation	205	244	9.8	4.45	110	115	42	53	53	76
Real Estate, Renting and Business Activities	587	828	60.3	8.98	333	491	90	112	164	225
Public Administration and Defense; Compulsory Social Security	484	620	34.0	6.39	186	240	134	171	164	209
Education	350	412	15.5	4.16	113	129	112	132	125	151
Health and Social Work	190	211	5.3	2.66	94	97	43	49	53	65
Other Community, Social and Personal Service Activities	399	460	15.3	3.62	170	174	107	133	122	153
Private Households with Employed Persons	760	842	20.5	2.59	375	382	164	192	221	268
Extra-Territorial Organizations and Bodies	2	1	-0.3	-15.91	1	1	*	*	1	*
Total	11,634	12,960	331.5	2.74	4,070	4,463	3,410	3,831	4,154	4,666

Source: Estimated based on National Statistics Office, Labor Force Survey, Public Use Files.
Notes:
1/ The employment data may not add up to totals due to rounding.
2/ Employment data were averages of four survey rounds (January, April, July and October).

Table 2.1.6 GRDP per Worker by Region in 2011

Region		GRDP/Worker (in PHP 000)	Ratio of GRDP/worker in GCR		
			Total	Services	Manufacturing
GCR		464	1.8	1.6	1.4
	Metro Manila	780	3.0	2.9	1.1
	Central Luzon	230	0.9	0.6	1.1
	CALABARZON	353	1.4	0.7	1.7
Outside GCR		154	0.6	0.6	0.6
Philippines		262	1.0	1.0	1.0

Source: Estimated based on National Statistical Coordination Board (NSCB) data.

(1) Primary Sector

2.8 To a greater extent, the food requirements of the region are also produced within. The farm lands are concentrated in certain provinces, such as Nueva Ecija, Tarlac, Quezon, Batangas (17%) and Laguna (16%). Farm lands grew in response to demand, except in the provinces adjacent to Metro Manila – due to the spill over effects of urbanization.

Table 2.1.7 Change of Farm Land Area from 2006 to 2011

Region/ Province/ Municipality	Area (km^2)	Farm Lands (Crop Production Lands)				% Change from 2006 to 2011
		Area (km^2)		Total to Total Area (%)		
		2006	2011	2006	2011	
Aurora	3,147	526	541	16.7	17.2	2.8
Bataan	1,373	350	373	25.5	27.2	6.6
Bulacan	2,796	865	746	30.9	26.7	-13.8
Nueva Ecija	5,751	2,856	3,219	49.7	56.0	12.7
Pampanga	2,063	994	896	48.2	43.4	-9.9
Tarlac	3,054	1,562	1,627	51.2	53.3	4.1
Zambales	3,831	390	418	10.2	10.9	7.2
Region III Total	22,015	7,543	7,819	34.3	35.5	3.7
Batangas	3,120	1,210	1,235	38.8	39.6	2.1
Cavite	1,574	466	465	29.6	29.5	-0.4
Laguna	1,918	1,080	1,133	56.3	59.1	5.0
Quezon	9,070	3,284	4,245	36.2	46.8	29.3
Rizal	1,192	138	124	11.6	10.4	-9.8
Region IV-A Total	16,873	6,178	7,202	36.6	42.7	16.6
Philippines	343,448	22,209	129,928	35.6	37.8	6.3

Source: Estimated based on the data from Bureau of Agricultural Statistics. Available from Country STAT Philippines. http://countrystat.bas.gov.ph/.

(2) Industry Sector

2.9 Industrial output in Region III and IV-A grew from 1990 to 2010 (see Table 2.1.8). Due to the existence of a strong industry base, especially manufacturing, the industry sector in Region IV-A achieved more than 10% annual growth rate in the last decade, while that of Region III grew at a slower rate of 4.4%. Metro Manila, on the other hand, showed a negative growth. Manufacturing in Region IV-A further expanded, growing at 12.4% of the annual growth rate.

2.10 The manufacturing subsector contributed nearly three-fourths of GCR's economic output in 2010. In particular, CALABARZON had the largest share (54%) of this manufacturing output to GRDP. The manufacturing subsector is also the biggest

contributor to employment, accounting for 55% of total employment in GCR (see Table 2.1.9).

Table 2.1.8 Gross Value Added of Industry Sector by Region and Sub-Sector in 1990, 2000 and 2010

Industry Group		Value Added (PHP billion at 2000 price)			AGR (%/year)	
		1990	2000	2010	'90–'00	'00–'10
Metro Manila	Mining and Quarrying	-	-	-	-	-
	Manufacturing	279	347	223	2.2	-4.4
	Construction	64	51	93	-2.2	6.2
	Electricity, Gas and Water	18	34	68	6.3	7.2
	Sub-total	361	432	384	1.8	-1.2
Region III	Mining and Quarrying	5	0	2	-22.2	14.8
	Manufacturing	85	102	161	1.8	4.7
	Construction	16	19	30	1.4	4.7
	Electricity, Gas and Water	5	13	12	8.9	-0.4
	Sub-total	112	134	205	1.8	4.4
Region IV-A	Mining and Quarrying	3	3	25	2.3	22.6
	Manufacturing	129	171	551	2.9	12.4
	Construction	13	31	50	9.0	4.9
	Electricity, Gas and Water	23	30	38	2.8	2.4
	Sub-total	168	236	664	3.5	10.9

Source: National Statistical Coordination Board (NSCB).

Table 2.1.9 Sectoral GRDP and Employment of Industry and Manufacturing in 2011

Region	Manufacturing		
	Sector Share to Philippines	Sector Share in Region	
		Value	Employment
GCR	73.3%	26.3%	54.9%
Central Luzon	14.2%	34.1%	13.5%
Metro Manila	17.4%	10.9%	15.7%
CALABARZON	41.7%	53.6%	25.6%
Non-GCR	26.7%	15.9%	45.1%

Source: Estimated based on NSCB data.

2.11 Export-oriented industries are mostly located in Special Economic Zones. In GCR, there are 125 IT centers/parks, 46 manufacturing special economic zones (MSEZs), two medical tourism centers/parks, and 6 tourism economic zones (TEZs). The number and locations of economic zones are shown in Table 2.1.10 and Figure 2.1.4. While 94% of IT centers/parks locate in NCR, 65% of MSEZs locate in Region IV-A. The average area size of an IT center/park in NCR is very small since it usually occupies only one building.

2.12 A majority of the economic zones, except IT centers/parks, is concentrated in CALABARZON particularly the areas of Cavite and Laguna along highways of SLEX and STAR. Economic zones exist also in Batangas City, as well as in Angeles, Tarlac and Olongapo in Central Luzon. The cities and provinces where economic zones are located experienced high population growths especially from 1990 to 2000.

2.13 The biggest SEZs are Subic Freeport and Clark Special Economic Zone which are both in Region III.

Table 2.1.10 Special Economic Zones in Greater Capital Region in 2012

Region/Province		IT Center/ IT Park		MSEZ		MTC/MTP		TEZ		Total			
		No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	Area (ha)	No.	%	Area (ha)	%.
Operating													
NCR		112	262	6	218	1	2	4	139	123	69.1	621	1.9
Region III	Bataan			2	168					2	1.1	168	0.5
	Bulacan	2	23	1	63					3	1.7	86	0.3
	Nueva Ecija									0	0.0	0	0.0
	Pampanga	1	32	5	29,604					6	3.4	29,636	88.5
	Tarlac	2	6	1	29					3	1.7	35	0.1
	Zambales			1	77					1	0.6	77	0.2
	Sub-total	5	60	10	29,940					15	8.4	30,000	89.6
Region IV-A	Batangas	1	7	8	979	1	1	1	27	11	6.2	1,014	3.0
	Cavite			8	684					8	4.5	684	2.0
	Laguna	5	56	14	1,087					19	10.7	1,143	3.4
	Rizal	1	2							1	0.6	2	0.0
	Sub-total	8	68	30	2,752	1	1	1	27	40	22.5	2,848	8.5
Total		125	390	46	32,910	2	3	5	166	178		33,469	
		70.2%	1.2%	25.8%	98.3%	1.1%	0.0%	2.8%	0.5%	100.0%	100.0%	100.0%	100.0%
Proclaimed													
NCR		22	38	1	63	0		1	7	24	49.0	108	7.5
Region III	Bataan			2	230					2	4.1	230	15.9
	Bulacan	1	1							1	2.0	1	0.1
	Nueva Ecija	1	2							1	2.0	2	0.1
	Pampanga	2								2	4.1	0	0.0
	Tarlac	2	7	1	300					3	6.1	307	21.3
	Zambales									0	0.0	0	0.0
	Sub-total	6	11	3	530					9	18.4	541	37.4
Region IV-A	Batangas	1	10	3	337	1	17			5	10.2	364	25.2
	Cavite	3	38	3	302			2	68	8	16.3	408	28.2
	Laguna	2	17					1	8	3	6.1	25	1.7
	Rizal									0	0.0	0	0.0
	Sub-total	6	65	6	639	1	17	3	76	16	32.7	797	55.1
Total		34	114	10	1,232	1	17	4	83	49		1,446	
		69.4%	7.9%	20.4%	85.2%	2.0%	1.2%	8.2%	5.7%	100.0%	100.0%	100.0%	100.0%

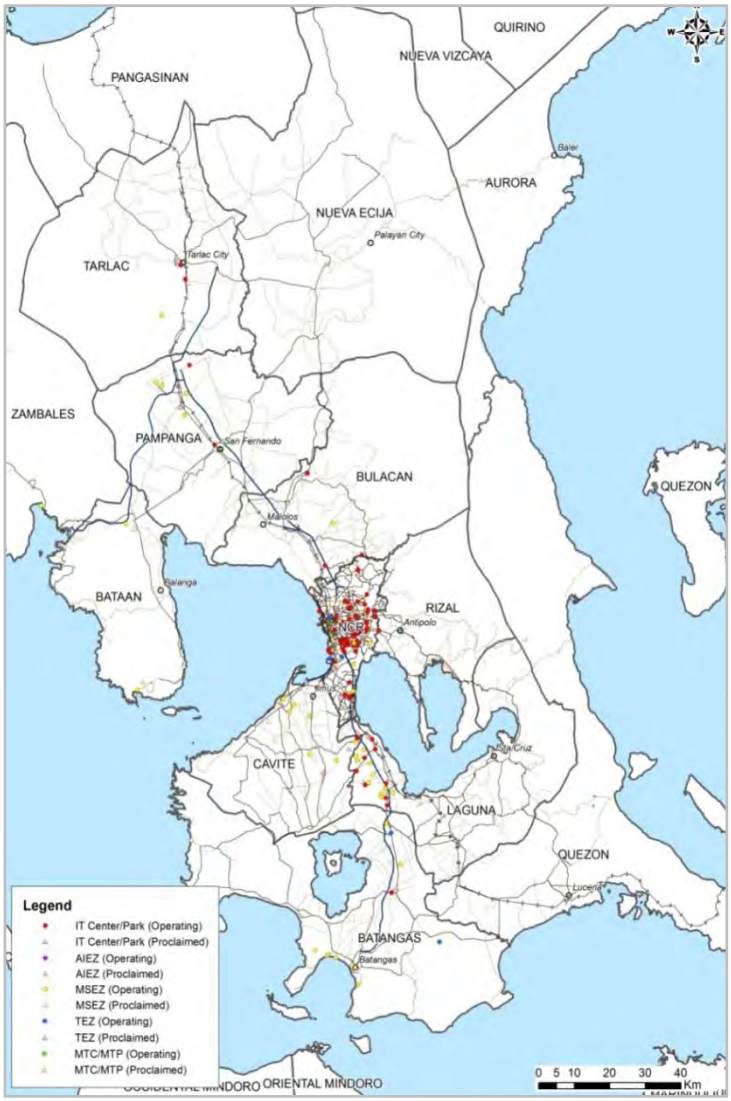
Source: Philippine Economic Zone Authority (PEZA). Note: MSEZ = Manufacturing Special Economic Zone, MTP = Medical Tourism Park, MTC = Medical Tourism Center, TEZ = Tourism Economic Zone, AIEZ = Agricultural Industry Economic Zone.

2.14 The number of employment in PEZAs is shown in 2.1.11. Since practically all the PEZA zones in Metro Manila are IT parks and buildings, the Table reflects the major contribution of this industry to the employment base of GCR.

Table 2.1.11 Number of Workers in Economic Zones, by Province from 2010 to 2012

Region	Number of Workers of in Economic Zones			Share of Provincial Workers to GCR Workers (2012)
	2010	2011	2012	
Central Luzon				
Bulacan	2,232	2,272	3,073	0.5%
Pampanga	3,239	4,571	5,779	0.9%
(1) Bulacan + Pampanga	5,471	6,843	8,852	1.3%
(2) Metro Manila[1/]	226,979	286,940	293,572	43.6%
CALABARZON				
Cavite	107,230	115,344	125,832	18.7%
Laguna	178,154	175,615	193,534	28.7%
Batangas	33,601	41,373	51,756	7.7%
(3) Cavite + Laguna + Batangas	318,985	332,332	371,122	55.1%
Total	551,435	626,115	673,546	
Share of workers in GCR ecozones[2/] to all ecozones	94.4%	95.8%	95.5%	

Source: Estimated based on PEZA data.
[1/] These are mostly IT parks and buildings.
[2/] This is the sum of (1) + (2) + (3).



Source: JICA Study Team, developed based on data from Philippines Economic Zone Authority (PEZA)

Figure 2.1.4 Locations of Economic Zones

(3) Services

2.15 Tourism is one of the drivers of economic growth in the region – mostly domestic. Domestic tourists accounted for 83% in 2012 in Region III, and 86% in Region IV-A. Table 2.1.12 shows the statistics for 2011 and 2012 by provinces.

Table 2.1.12 Tourist Arrivals in GCR

Regions and Provinces		2007				2012				AGR (%/yr)
		Domestic	Overseas Filipinos	Foreign	Total	Domestic	Overseas Filipinos	Foreign	Total	
NCR[1/]		97,089	-	262,364	359,453	N/A	N/A	N/A	N/A	N/A
Region III	Aurora	N/A	-	N/A	N/A	68,046	-	1,208	69,254	N/A
	Bataan	17,551	-	2,818	20,369	37,768	-	46	37,814	13.2
	Bulacan	50,491	-	3,225	53,716	56,410	442	1,675	58,527	1.7
	Nueva Ecija	11,693	-	1,628	13,321	8,099	201	2,147	10,447	-4.7
	Pampanga	83,850	-	80,705	164,555	291,281	7,927	271,923	571,131	28.3
	Tarlac	13,229	-	5,063	18,292	9,374	1,663	4,776	15,813	-2.9
	Zambales	105,625	-	43,760	149,385	1,240,797	-	62,552	1,303,349	54.2
Region III Total		282,439	-	137,199	419,638	1,711,775	10,233	344,327	2,066,335	37.6
Region IV-A[2/]	Batangas	440,890	5,646	102,020	548,556	160,000	-	49,000	209,000	-38.3
	Cavite	88,202	-	30,518	118,720	44,920	16,160	771	61,851	-27.8
	Laguna	1,684,164	4,115	214,613	1,902,892	1,666,000	-	92,000	1,758,000	-3.9
	Quezon	528,761	10	94,615	623,386	462,000	-	7,000	469,000	-13.3
	Rizal	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Region IV-A Total		2,742,017	9,771	441,766	3,193,554	2,332,920	16,160	148,771	2,497,851	-11.6

Source: Department of Tourism. Available from http://www.visitmyphilippines.com/index.php.

1/ NCR data is of 2006

2/ Region IV-A's 2009 data from Central Luzon Regional Development Plan 2011–2016, except Cavite data. Cavite datais adopted from Cavite Province Socio-economic profile 2009.

3) Poverty Incidence

2.16 Poverty levels have barely changed over the last decade. The extent is least in the three regions, but is still a major problem despite the better economic status relative to the country. As of 1st Semester of 2012, the poverty incidence of families in Metro Manila was 3.8%, compared with 22.3% of the national average, 11.2% of Region III and 12.2% of Region IV-A. The absolute number, however, is significant; 64,400 families in Metro Manila, 244,300 in Central Luzon, and 248,200 in CALABARZON.

2.17 The poor account for the large number of informal settlers, or those without decent housing. Because there is hardly any space left to resettle them within Metro Manila, they can only be absorbed in the other two regions.

Table 2.1.13 Poverty Incidence and Magnitude of Poor Families in GCR

Region/ Province		Poverty Incidence Estimates (%)						Estimated Magnitude of Poor					
		Among Families (%)			Among Population (%)			Families (000)			Population (000)		
		2003	2006	2009	2003	2006	2009	2003	2006	2009	2003	2006	2009
Philippines		20.0	21.1	20.9	24.9	26.4	26.5	3,293	3,671	3,856	19,797	22,173	23,142
NCR		2.1	3.4	2.6	3.2	5.4	4.0	49	81	64	347	594	448
NCR	1st District	1.1	3.1	3.8	1.4	5.5	5.9	4	12	11	23	99	84
NCR	2nd District	2.6	3.8	2.4	3.8	5.7	3.6	13	32	22	89	221	148
NCR	3rd District	2.6	3.7	3.8	4.1	5.0	5.5	21	20	19	157	128	128
NCR	4th District	1.8	2.9	1.6	2.7	5.0	2.5	11	18	12	79	146	89
Region III		9.4	12.0	12.0	12.4	15.2	15.3	170	229	244	1,084	1,407	1,457
Region III	Aurora	21.1	27.7	19.5	30.5	33.1	24.2	8	11	6	52	60	32
Region III	Bataan	8.1	7.2	7.4	11.4	11.5	10.3	10	9	11	65	68	71
Region III	Bulacan	4.3	5.1	4.8	6.7	7.6	7.0	23	29	29	169	202	197
Region III	Nueva Ecija	17.7	24.8	26.3	22.6	30.5	31.1	65	94	112	403	536	611
Region III	Pampanga	4.9	3.8	6.7	6.9	5.2	9.1	19	16	29	136	114	194
Region III	Tarlac	11.6	16.8	15.6	14.3	21.2	19.8	27	40	40	162	252	239
Region III	Zambales	13.4	19.5	13.0	15.1	25.1	18.3	19	29	18	98	175	112
Region IV-A		9.2	9.4	10.3	12.1	12.3	13.9	202	211	248	1,245	1,303	1,566
Region IV-A	Batangas	13.8	12.7	14.0	18.5	16.4	18.8	56	54	64	367	330	409
Region IV-A	Cavite	4.8	4.2	4.5	6.7	6.2	6.4	25	22	26	163	160	176
Region IV-A	Laguna	5.2	4.5	5.9	6.8	5.7	8.0	24	22	29	151	129	185
Region IV-A	Quezon	23.2	26.7	24.5	28.8	35.2	32.5	84	101	98	477	612	583
Region IV-A	Rizal	2.9	2.7	6.5	4.3	3.6	9.5	13	11	30	87	73	213

Source: National Statistical Coordination Board, Poverty Stats.

4) Physical Characteristics

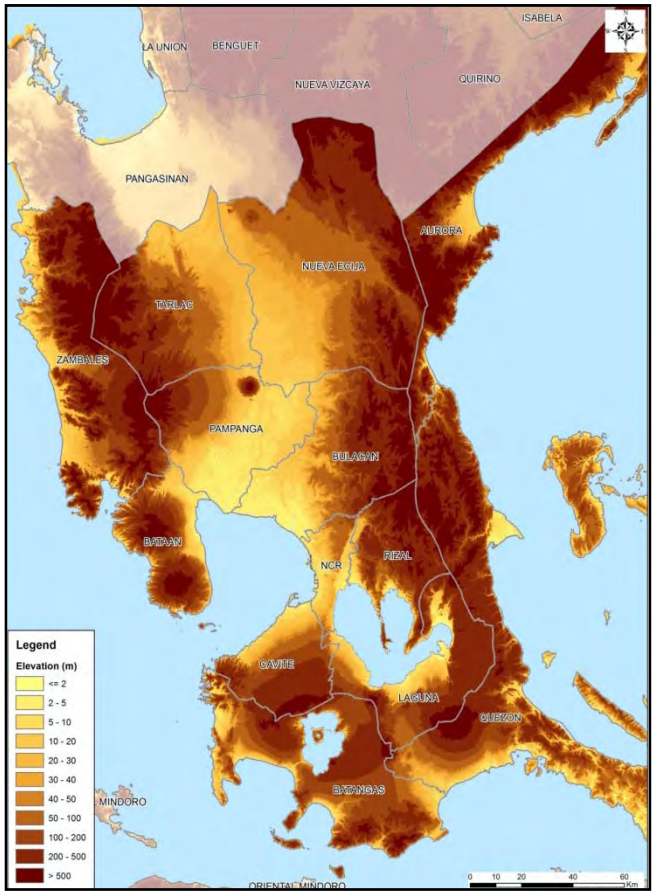
(1) Topography

2.18 The topography of GCR can be divided into coastal lowlands, plain, plateaus, valleys and mountains. Metropolitan Manila consists of coastal lowlands, central plateau and Marikina Valley. The coastal lowlands ranging from zero to five meters are from the Manila Bay coastal area such as the City of Manila to Mandaluyong and Makati (see Figure 2.1.5). The central plateau, elevation of which falls between 20 to 40 meters, is primarily used for residential areas such as those in San Juan, Makati and Quezon, though the northwest part of Metro Manila reaches from 70 to 100 meters. Marikina Valley is located along the Marikina River from the western area of Rizal province at 30 meters above sea level to the Laguna de Bay at 2 meters elevation. The slope of Metro Manila ranges from 10 to 40%.

2.19 In Region III, the central plain is located between the two mountain ranges of Sierra Madre in the east and Zambales Range, including Mt. Pinatubo, in the west. The plain, which is the largest plain in the country covering four provinces of Pampanga, Nueva Ecija, Tarlac, and Bulacan, is fertile ground for agriculture, particularly for rice production. The Pampanga River basin covers 10,500 km^2 including most of the provinces. The downstream of the basin, the lowlands of Pampanga and Bulacan elevation of which is around one meter, are flood-prone areas and often used for fishponds. Nearly 25% of the region is classified as more than 30% slope (see Figure 2.1.6). In particular, 56% and 45% of the areas of Aurora and Zambales provinces, respectively, are more than 30% of steep slope. Tarlac and Nueva Ecija are inland provinces. Two provinces of Aurora and Zambales have the longest coastal lines. Bataan is a peninsula, 81% of which lands are mountainous and uplands.

2.20 Region IV-A or CALABARZON has a more diverse topography consisting of coastal area, upland and mountains. The Sierra Madre range stretches through Rizal to Quezon and Laguna provinces, on the east side of Laguna de Bay. Hilly and mountainous areas are also found in Batangas where Taal Volcano and Taal Lake are located. A relatively large plateau is located in the middle of Cavite province. Lowlands are found in the coastal areas facing Manila Bay in Cavite, Laguna de Bay of Laguna and Rizal, and Tayabas Bay in Quezon. Lowlands of Rizal and Cavite are flood-prone areas. Some 37% of the region is steep hilly areas characterized by more than 30% of slopes. Such steep hill areas occupied 67% and 40% of the areas of Rizal and Quezon respectively. Flat or less than 8% of slope areas account for 44% and 41% of Cavite and Laguna.

2.21 Figure 2.1.7 shows the water systems of GCR, which explains the fertility of the land for agriculture as well as its vulnerability to flooding.



Source: Shuttle Radar Topographic Mission (SRTM) version 4, 2008.

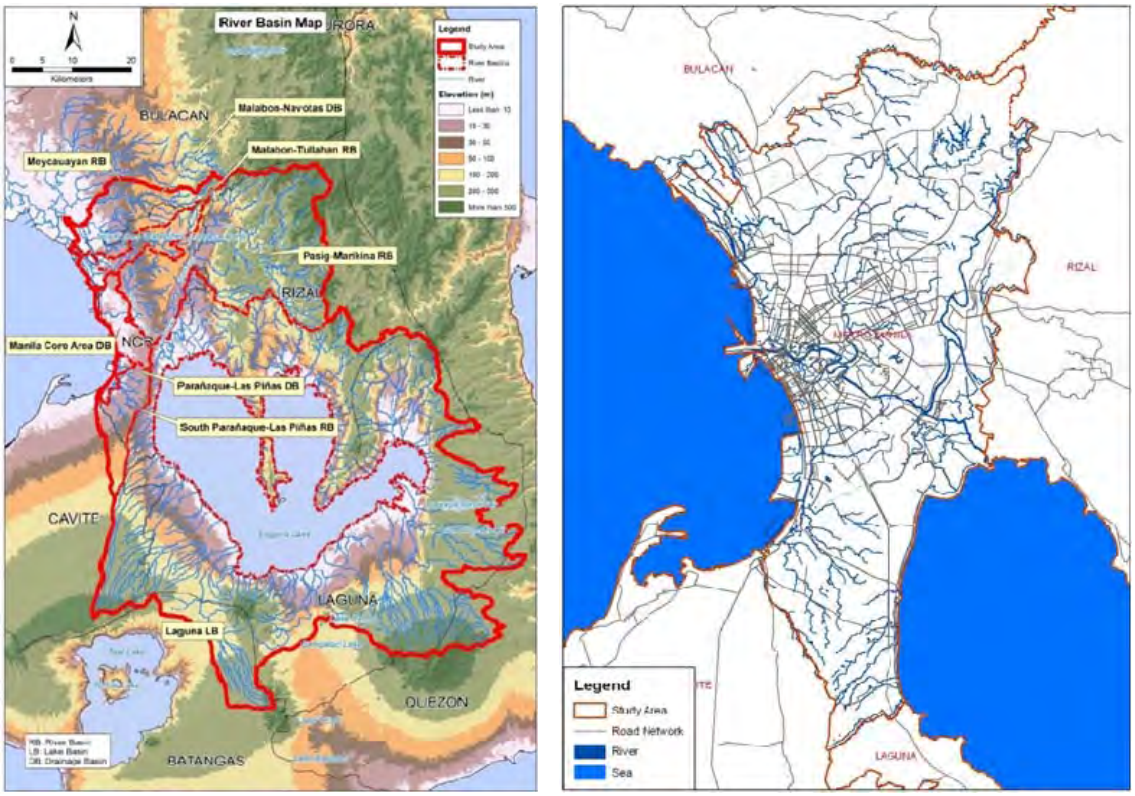
Figure 2.1.5 Elevation of GCR

Source: Shuttle Radar Topographic Mission (SRTM) version 4, 2008.

Figure 2.1.6 Slope of GCR

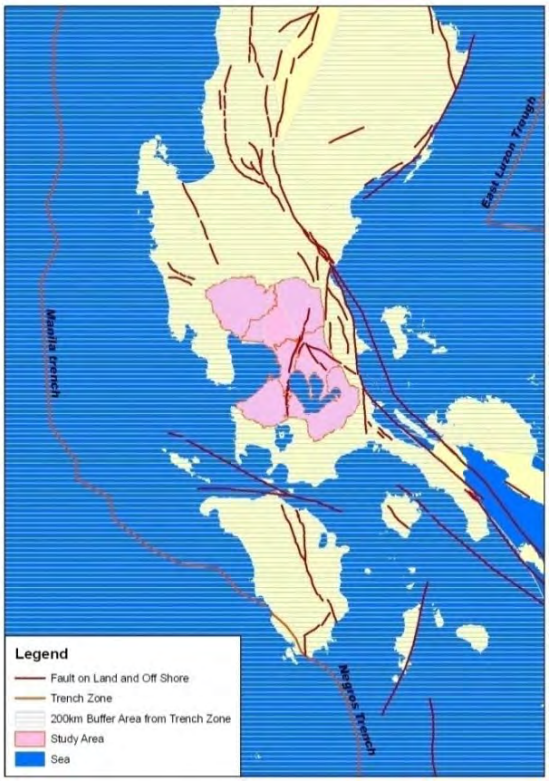
(2) Seismology

2.22 The GCR is crisscrossed by fault lines that could be the source of a major earthquake (see Figure 2.1.8). The Valley Fault System is the most worrisome as it transects the study area and could potentially generate a large earthquake. Many research studies indicate that active phases of the Valley Fault may recur with a magnitude of 7 or more on the Richter scale. Figure 2.1.9 shows the distribution of potential earthquake sources vis-a-vis the existing transport system.



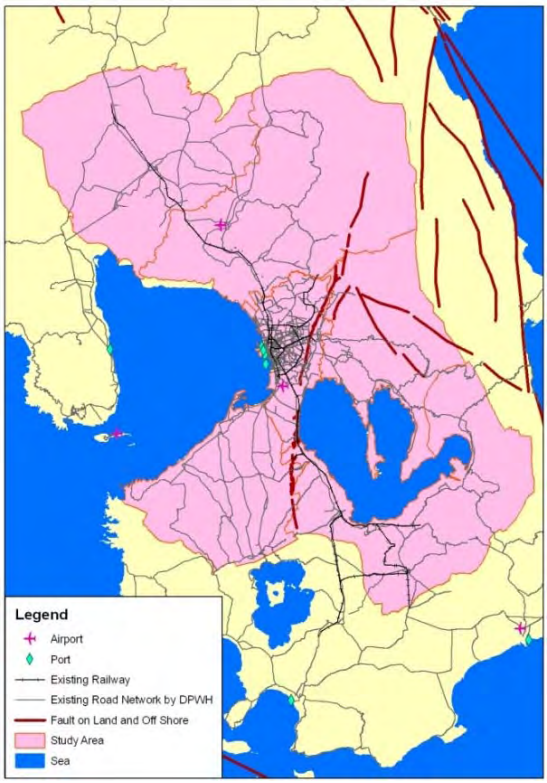
Source: Map of Mega Manila: World Bank. 2012, Master Plan for Flood Management in Metro Manila and Surrounding Areas; Metro Manila Map: MEIRS (JICA, 2004).

Figure 2.1.7 Water Systems in GCR



Source: MMEIRS (JICA, 2004).

Figure 2.1.8 Distribution of Faults and Trenches in Luzon



Source: MMEIRS (JICA, 2004).

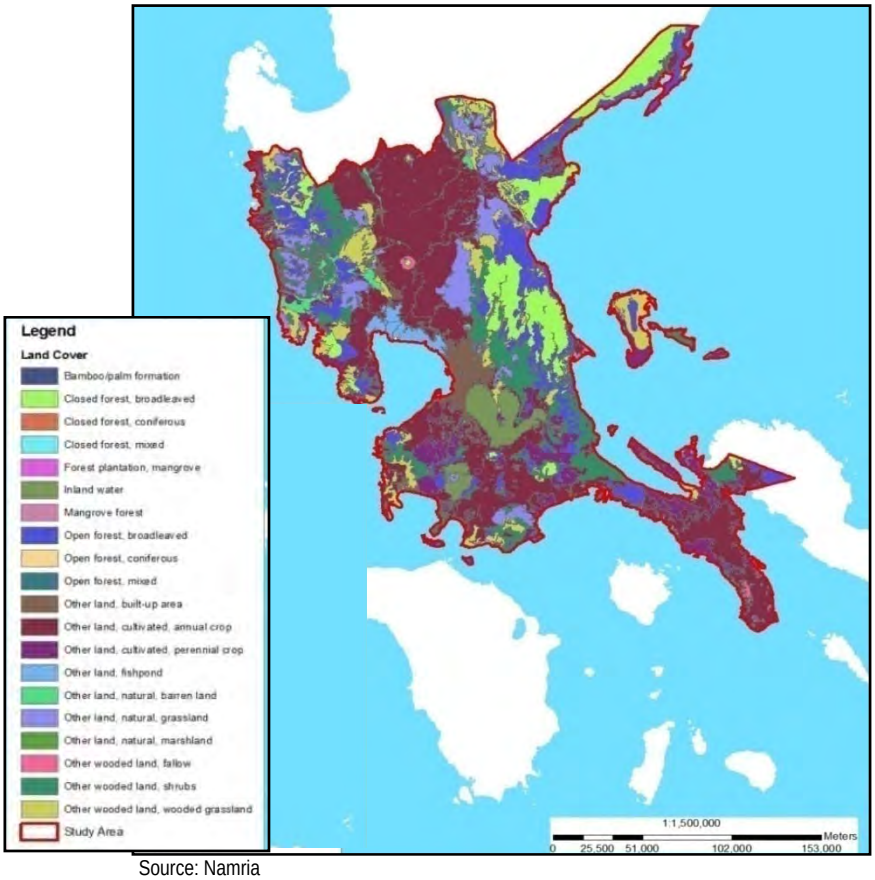
Figure 2.1.9 Distribution of Faults and Trenches In GCR

(3) Land Cover and Protected Areas

2.23 Land cover of Region III and Region IV-A is shown in Figure 2.1.10. In Region III, vast areas of lands are used for agriculture. Primarily the central plain including Tarlac, Pampanga and Nueva Ecija, are cultivated for annual crops, in addition to the eastern part of Bataan. Eastern Batangas, the lowland of Laguna, Bondoc Peninsula of Quezon province, and the plateau of Cavite are mostly used for cultivation of annual crops, and partially for perennial crops.

2.24 The two mountain ranges of Sierra Madre and Zambales are mostly covered by forest. The Sierra Madre Range from Aurora to Quezon and Rizal of Region IV-A is mainly covered by both closed and open broadleaved forests, while the Zambales Range is coved by a mix of open forest, natural grassland, and other woodlands. Grasslands are found in the areas between the central plain and Sierra Madre Range in Rizal, the southern tip of Sierra Madre Range in Quezon, and a certain part of Batangas.

2.25 The coastal areas of Pampanga and Bulacan are used for fishponds. The land cover of the western provinces of Region III (i.e., Zambales and Bataan) has more diversity than the eastern provinces. Built-up areas are the entire area of Metro Manila and encroaching on the arable lands in Bulacan, Cavite and Laguna.



Source: Namria

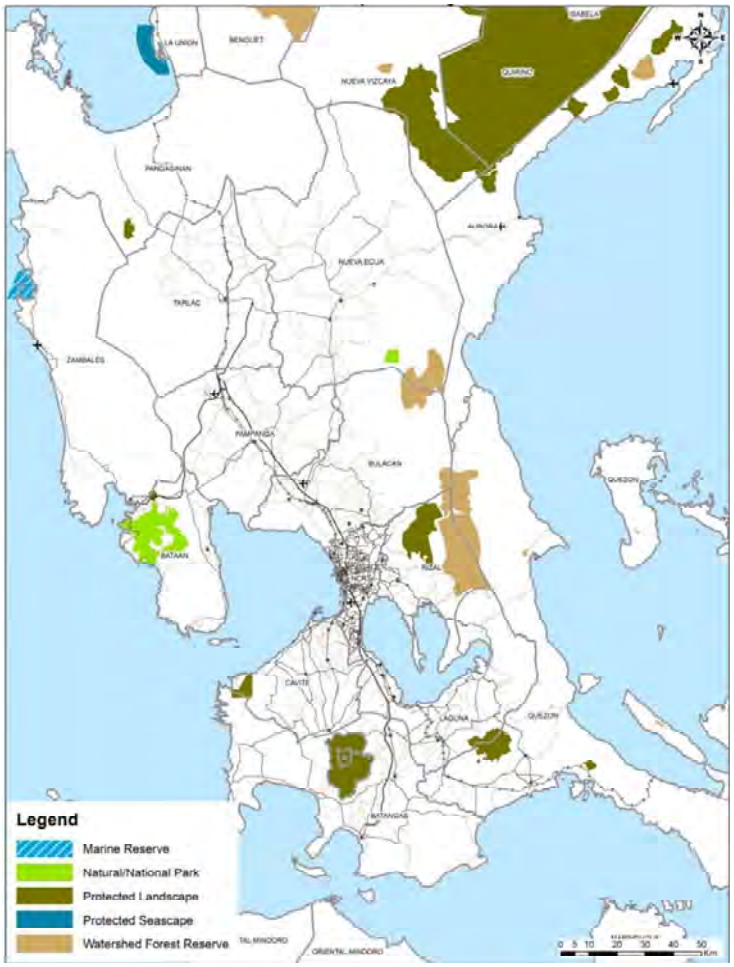
Figure 2.1.10 Land Cover in GCR

2.26 There are 24 protected areas (with a total area of 284,295.95 has.)in Region III (see Figure 2.1.11). According to the Protected Areas and Wildlife Bureau of DENR, there are 24 protected areas totaling including: (i) 6 National Parks, 37,223.27 ha; (ii) 1 Game Refuge and Bird Sanctuary, 12.35 ha; (iii) 11 Watershed Forest Reserves,

223,071.10 ha; (iv) 5 Protected Landscapes, 16,421.23 ha; and (v) 1 Marine Reserve, 7,568.00 ha.

2.27 On the other hand, Region IV-A has a total of 23 protected areas covering 154,992.62 ha, including: (i) 2 National Parks, 46,362.00 ha; (ii) 1 Wilderness Area, 430.00 ha; (iii) 9 Watershed Forest Reserves, 2,719.00 ha; (iv) 3 Mangrove Swamp Forest Reserves, undetermined area; and (v) 7 Protected Landscapes, 104,665.98 ha.

2.28 There are three protected areas of 503.6 ha in NCR.[1]



Source: Protected Areas and Wildlife.

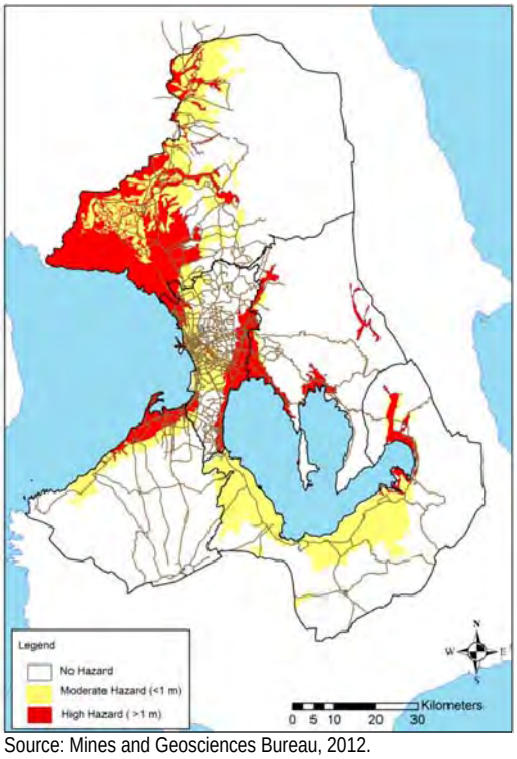
Figure 2.1.11 Protected Areas in GCR

2.29 The land cover, topography and water system creates two natural hazard risks: flooding and landslide. These are indicated on Figure 2.1.12 and Figure 2.1.13. The flood-prone areas are shown in red in the map and are found in the low elevation zones. The high risk areas in Bulacan are mostly used for fish ponds which are also losing ground to urbanization.

2.30 On the other hand, the landslide-prone areas (see Figure 2.1.13) are in the mountainous areas of the Sierra Madre Range in Bulacan and Rizal. The other high hazard risk area is found in the western tip of Cavite and Batangas. Viewed against the slope map (Figure 2.1.6), these areas are characterized by very steep slope of over 30%.The encroachment of built-up areas to the east (such as Antipolo) increases

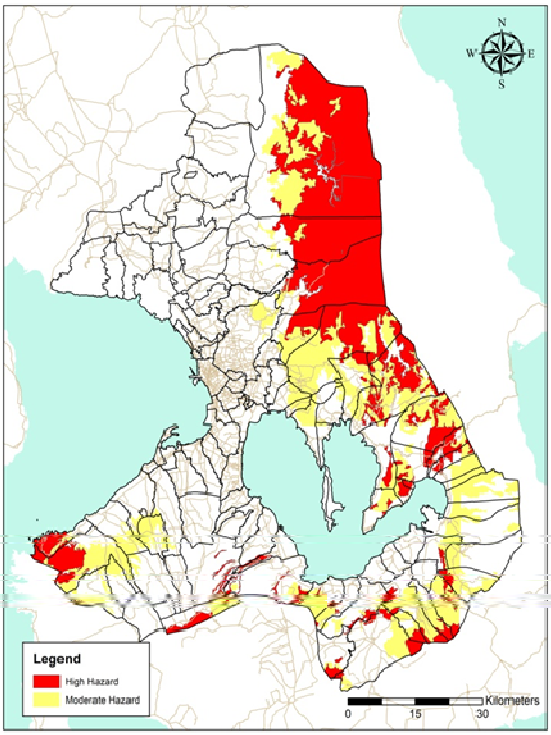
[1] Protected Areas and Wildlife Bureau of DENR. Available from http://www.pawb.gov.ph

this kind of hazard risk.



Source: Mines and Geosciences Bureau, 2012.

Figure 2.1.12 Flood Hazard in Mega Manila



Source: Mines and Geosciences Bureau, 2012.

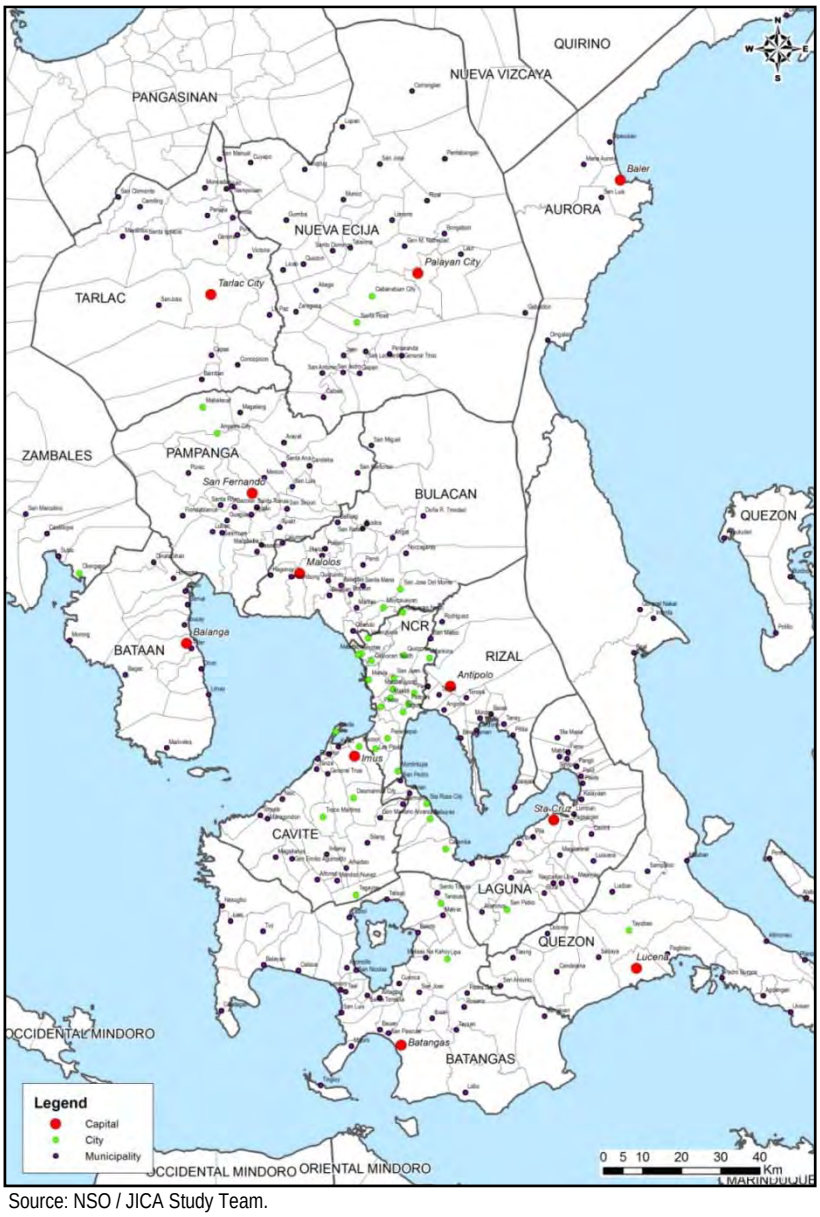
Figure 2.1.13 Landslide Hazard in Mega Manila

5) Urban Centers and Human Settlements

2.31 The administrative delineation as well as location of existing urban centers and human settlements in GCR are shown on Figure 2.1.14. The relative hierarchy of these urban nodes have been mapped by NEDA regional offices (shown in Figure 2.1.15).

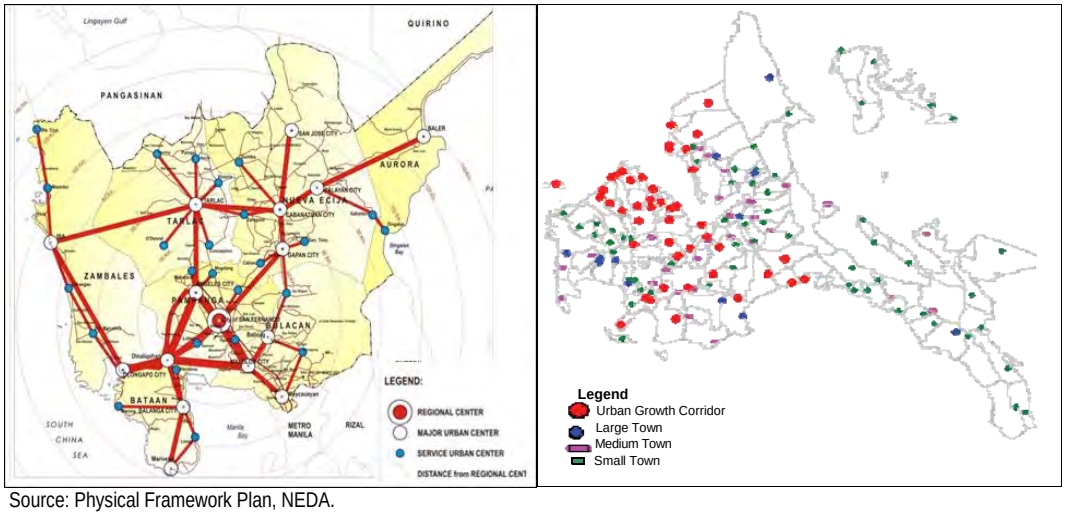
2.32 The regional center of Central Luzon is the City of San Fernando, the provincial capital of Pampanga, located at the junctions of major highways and roads. The rise of Angeles City, and Olongapo City in the urban hierarchy have become apparent in recent years – primarily because of the Clark SEZ and Subic SEZ.

2.33 Urbanization of the CALABARZON region has been more pronounced than Region III. The regional center is Calamba, in Laguna province. Urban growth clusters consisting of several municipalities and cities have become palpable with the spread of built-up areas. Eight clusters can be identified: Northern Rizal Cluster, Western Laguna Cluster, Northern Cavite Cluster, Tagaytay-Silang Cluster, Central Cavite Cluster, Metro Batangas, Metro Lipa, and San Pablo City-Metro Lucena.



Source: NSO / JICA Study Team.

Figure 2.1.14 Distribution of Capitals, Cities and Municipalities in Greater Capital Region



Source: Physical Framework Plan, NEDA.

Figure 2.1.15 Urban Hierarchy in Regions III and IV-A

6) Transport System

(1) Roads

2.34 Urban centers in GCR are connected by expressways and arterial roads originating from Metro Manila. Two expressways, the North Luzon Expressway (NLEX) and South Luzon Expressway (SLEX) were the first toll roads built in the country in the mid-70s and upgraded with more lanes in the last 10 years. They provided the north-south backbone that encouraged the suburbanization to the south of Metro Manila. The suburban sprawl to the north, however, was tempered by the rice lands of Bulacan. In Region III, the Subic-Clark-Tarlac Expressway (SCTEX) was opened in 2008 to connect the industrial estates in Tarlac with the special economic zones of Clark and Subic; it is connected to NLEX near Clark. In Region IV-A, the STAR Expressway connects Batangas to SLEX at the Sto.Tomas/Calamba junction. Another expressway radiating from Manila is the Cavite Expressway that runs along the coast of Manila Bay towards Bacoor and Imus in Cavite.

2.35 The urban centers ranked high in hierarchy (from the preceding Figure 2.1.15) are located along the aforementioned expressways. The cities and municipalities connected by expressways are primary growth centers in the two regions. Subdivision developments have sprung up along SLEX and NLEX, much earlier for the former than latter. There are a number of PEZAs in CALABARZON found along SLEX. The other urban centers are linked by arterial roads, including those in Nueva Ecija, Zambales, Bataan, and the north of Bulacan in Region III, and the western parts of Cavite and Batangas, the eastern Laguna, Quezon and Rizal in Region IV-A.

2.36 The higher densities in the urbanized cores get manifested in larger number of person trips and more severe congestion compared to areas outside Metro Manila. Outside Metro Manila, the number of person trips is half of that in Metro Manila and consequently, transport cost is less than half also. Generally, air quality is much better outside Metro Manila (see Table 2.2.14).

Table 2.1.14 Broad Indicators on Transport Outcomes in 2012

Indicators			2012
Metro Manila	No. of person trips (mil./day)		12.8
	Transport Cost (PHP bil./day)		2.36
	Air quality	GHG (mil. Tons/year)	4.79
		PM (mil. Tons/year)	0.014
		NOx (mil. Tons/year)	0.049
Bulacan, Rizal, Laguna, Cavite	No. of person trips (mil./day)		6.0
	Transport Cost (PHP bil./day)		0.99
	Air quality	GHG (mil. Tons/year)	3.20
		PM (mil. Tons/year)	0.005
		NOx (mil. Tons/year)	0.032

Source: JICA Study Team.

2.37 Most of Metro Manila roads are operating at or near their saturation level, wherein about 50% of the study area's road network operates at volume/capacity (V/C) ratio of 0.80 and average speed below 20kph. The traffic situation outside Metro Manila is slightly better than in Metro Manila, as the average V/C ratio of Bulacan, Laguna, Rizal, and Cavite is estimated at 0.53. The older expressways (NLEX, SLEX and CAVITEX) are also nearing their capacity limits. Car travel accounts for 30% of person-km, but constitutes 72% of the road traffic in terms of PCU-km. In the adjoining

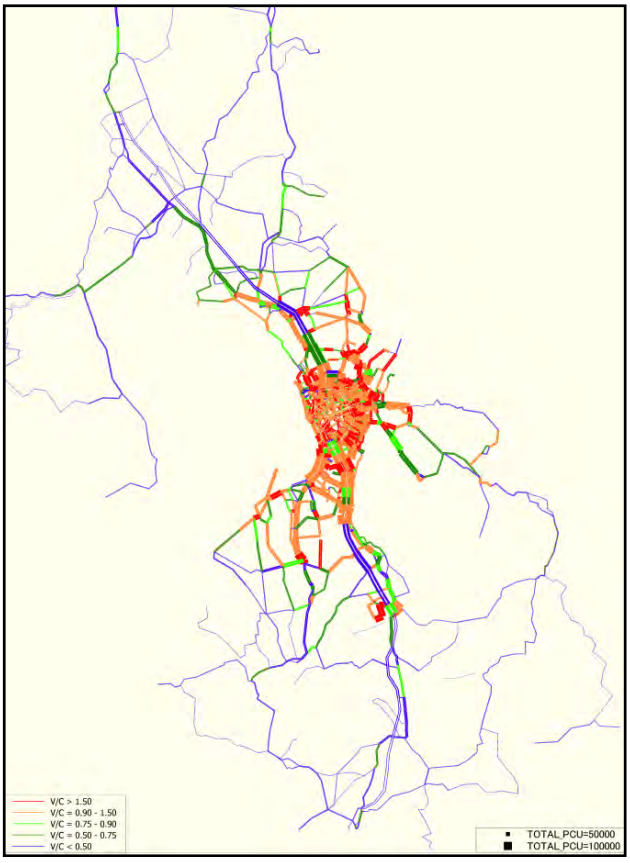
provinces, the use of road space is slightly more efficient at 26% car-based person trips and cars occupying 69% of the road space.

Table 2.1.15 Road Traffic Volume and Network Performance

Road Description	Road Length (km)	Av. V/C	Rd. Section (km) with Speed		PCU (000)		Pax (000)		Pax*km('000)			
			< 10 kph	< 20 kph	kms	hrs.	kms	hrs.	Car	PUJ	PUB	Total
CAVITEX	10.9	0.81	-	-	903	39	3,434	132	848	,075	1,511	3,434
Skyway	17.5	0.90	-	-	1,795	64	8,814	307	2,436	-	6,378	8,814
SLEX	92.6	0.58	2.7	12.2	5,007	232	20,686	764	5,727	,585	10,373	20,686
NLEX	80.3	0.40	-	2.9	3,330	77	16,538	357	3,115	,732	10,691	16,538

Area	Road Length (km)	Av. V/C	Rd. Section (km) with Speed		PCU (000)		Pax (000)		Pax*km('000)			
			< 10 kph	< 20 kph	kms	hrs.	kms	hrs.	Car	PUJ	PUB	Total
Metro Manila	805	1.25	495.2	656.2	39,266	4,905	122,347	14,672	40,723	43,853	37,771	122,347
Bulacan	458	0.61	62.8	134.9	9,814	627	31,523	1,888	8,329	8,214	14,980	31,523
Laguna	392	0.37	19.3	33.6	5,102	298	15,940	842	4,733	3,454	7,753	15,940
Rizal	182	0.68	16.9	49.3	4,056	273	13,365	857	3,753	5,577	4,034	13,365
Cavite	447	0.55	56.3	114.6	8,785	606	36,056	2,425	8,569	10,555	16,932	36,056
Sub-Total Adj. Prov.	1,478	0.53	155.3	332.3	27,757	1,804	96,884	6,012	16,815	17,245	26,768	60,828
Total - Mega Manila	2,284	0.80	650.5	988.5	67,024	6,709	219,231	20,683	57,539	61,098	64,539	183,176

Source: JICA Team Estimate.



Source: Study Area Traffic Model, Network Image from CUBE Software.

Figure 2.1.16 Road Traffic Volume and V/C Ratio based on Traffic Assignment Model in 2012

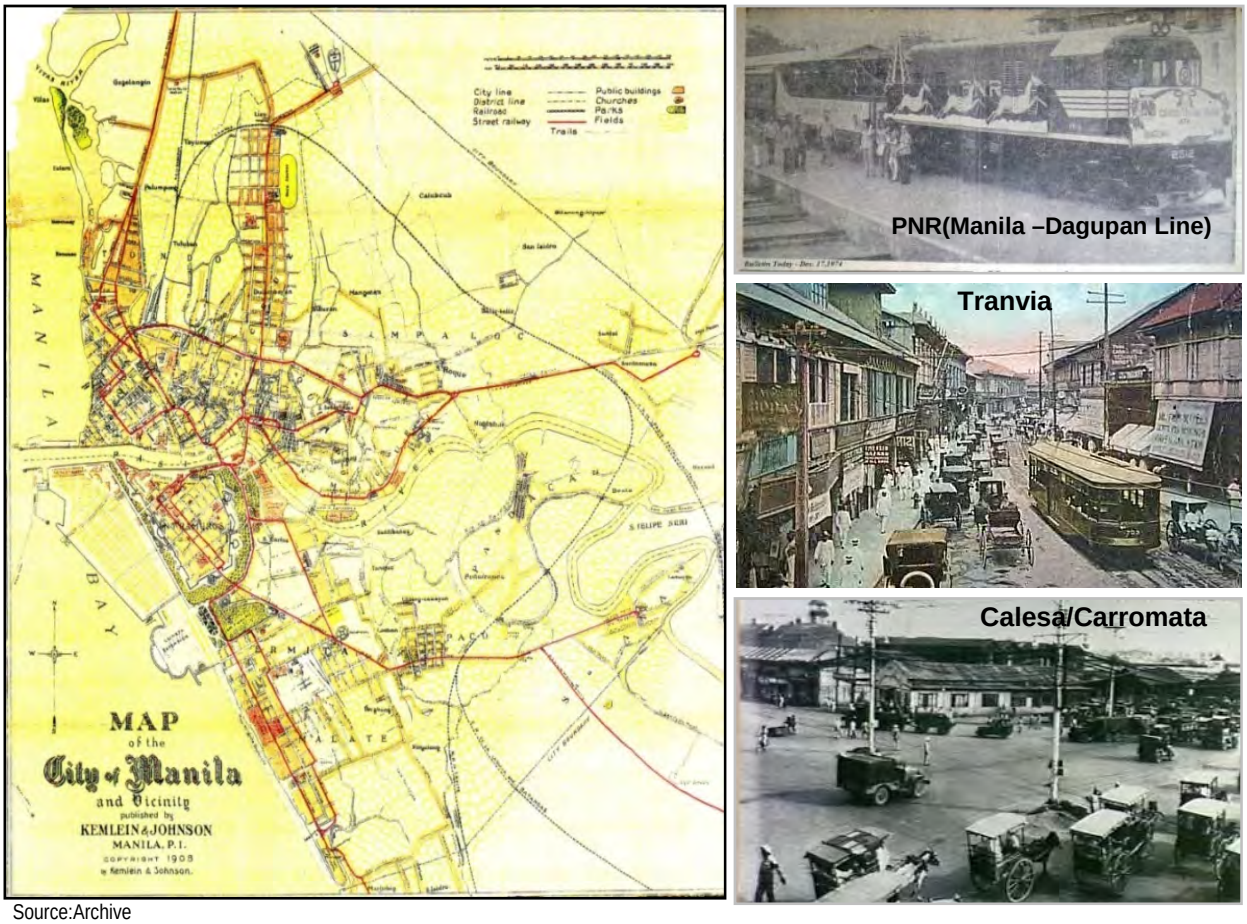
Source: Study Area Traffic Model, Network Image from CUBE Software

Figure 2.1.17 Travel Demand Distribution by Mode based on Traffic Assignment Model in 2012

(2) Railways

2.38 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 85 km and covered the CBD and suburban areas. New housing estates were developed along the routes by the Tranvia developer. Tranvias 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, the war damaged Tranvias ceased its operation.

2.39 Today, railway service is primarily intra-urban, on 3 LRT rail lines within Metro Manila carrying more than 1 million passengers a day. The inter-urban service is very limited - the Rail Commuter South operated by the Philippine National Railways with about 45 thousand passengers a day on 28-km track. Nearly all the rail projects envisaged In the 1998 MMUTIS plan have not been implemented.



Source:Archive

Figure 2.1.18 Manila in 1908 covered by Tranvia Network and Suburban Rail

(3) Airports

2.40 There are two gateway international airports in GCR, the Ninoy Aquino International Airport (NAIA) located within Metro Manila and the Clark International Airport (CIAC) located about 80kms north.

2.41 NAIA has reached its runway capacity limits as far back as 2006. However, plans to relieve congestion and move other aviation traffic to Clark got derailed at the

implementation stage. The low-cost carriers that emerged in the Asian region during the last decade found Clark as a natural jump off point. Traffic grew rapidly to 1.3 million passengers in 2012. The plan to build a budget airport terminal on PPP mode, however, was put on hold by DOTC in 2011 and maybe re-started in 2014.

(4) Ports

2.42 The port of Manila is the principal gateway seaport of the country for more than 50 years. In 2012, the Manila port handled 84% of the 3.15 million TEUs of foreign cargo and 51% of the total domestic cargo. To provide the region with additional capacity, and overcome some of the limitations of the port of Manila, two new ports were built. These were in Batangas (southern edge of Region IV-A) and in Subic (western edge of Region III). The two new ports have a combined capacity of 1.0 million TEUs per year, but their current utilization is less than 5%.

2.2 Development Issues Facing Metro Manila

1) Uncontrolled Urbanization

2.43 Urban population growth in Metro Manila continues at a very high rate in terms of both internal growth and in-migration. As a result, this growth has spilled over to the towns and cities within a 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 2 million and 6 million by 2030, respectively.

2.44 Despite the spill over to the periphery, population density of Metro Manila is quite high. More than half of the 17 LGUs showed density of more than 200 persons/ha (see Table 2.2.1). The cities of Manila and Mandaluyong were most dense, with 650 persons/ha and 350 persons/ha, respectively. At the barangay level, about 50% of the people live in high-density barangays (> 300 persons/ha population density). If the population growth trend continues, Metro Manila's density will increase from 191 persons/ha to 224 persons/ha.

Table 2.2.1 Population Growth from 1980 to 2010 in Metro Manila

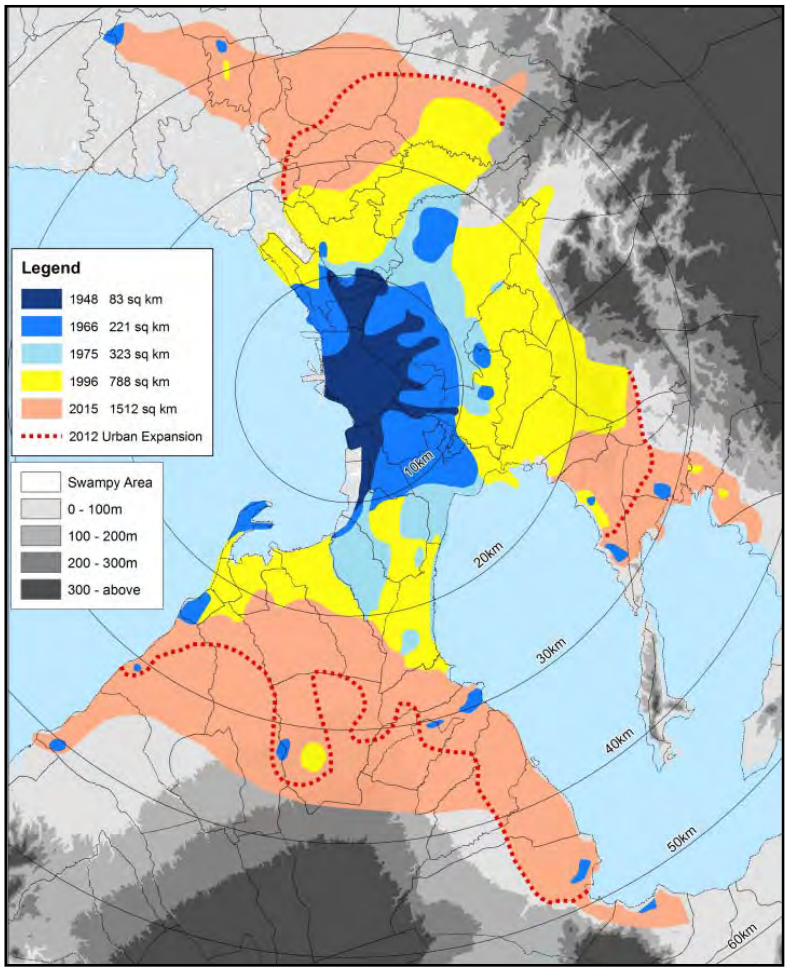
Metro Manila	Area (km^2)	Population (000)				Average Population Growth Rate, (%/yr.)			Population Density 2010 (persons/ha)
		1980	1990	2000	2010	1980–1990	1990–2000	2000–2010	
Caloocan	56	468	761	1178	1489	4.99	4.46	2.37	267
Las Pinas	33	137	297	473	553	8.08	4.76	1.57	169
Makati	22	373	453	471	529	1.97	0.40	1.16	245
Malabon	16	191	278	339	353	3.84	1.99	0.42	225
Mandaluyong	9	205	245	279	329	1.76	1.31	1.67	353
Manila	25	1631	1599	1581	1654	-0.20	-0.11	0.45	662
Marikina	22	212	310	391	424	3.89	2.35	0.81	197
Muntinlupa	40	137	277	379	460	7.32	3.19	1.95	116
Navotas	9	126	187	230	249	4.00	2.12	0.78	280
Paranaque	47	209	308	450	588	3.97	3.87	2.72	126
Pasay	14	288	367	355	393	2.45	-0.32	1.02	281
Pasig	49	269	397	505	670	3.99	2.43	2.86	138
Pateros	10	40	51	57	64	2.47	1.11	1.12	62
Quezon	172	1166	1667	2174	2762	3.64	2.69	2.42	161
San Juan	6	130	127	118	121	-0.26	-0.74	0.31	202
Taguig	45	134	266	467	645	7.09	5.80	3.27	143
Valenzuela	47	212	340	485	575	4.82	3.62	1.71	122
Total	620	5926	7929	9933	11858	2.95	2.28	1.79	191

Source: National Statistics Office (NSO), 2010.

2.45 Densification accelerates the expansion of the existing urban areas unto the outer areas beyond Metro Manila. 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 areas in the world with total population of 30 million.

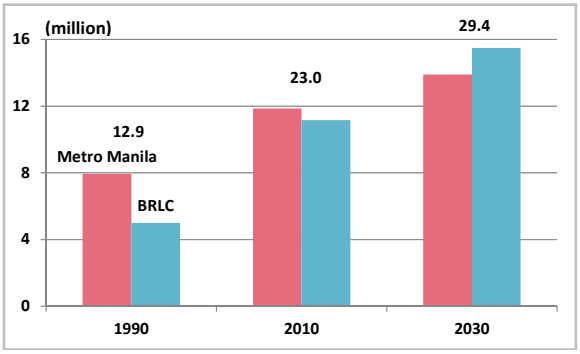
2.46 The combination of high population density and rapid urbanization resulted in environmental degradation and poor quality of life. A lack of affordable housing and poverty force many to live in poor environment, if not settle in areas where disaster risk is high, such as along waterways. In these blighted areas, access to public facilities and

social services (open spaces, education and health care) are also inadequate. LGUs, on the other hand, are unable to cope with the burden of providing for their needs.



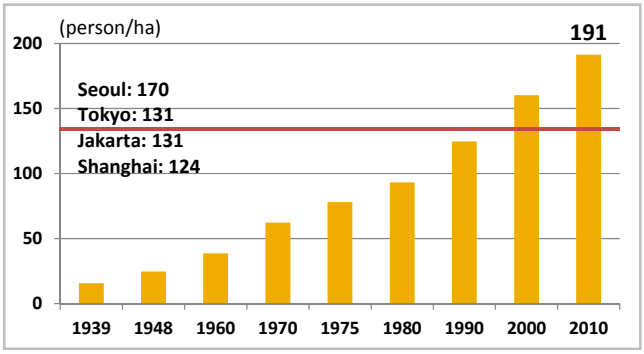
Source: MMUTIS.

Figure 2.2.1 Trend in Urban Area Expansion of Metro Manila



Source: JICA Study Team

Figure 2.2.2 Population Growth of Mega Manila



Source: JICA Study Team

Figure 2.2.3 Population Density of Metro Manila as Compared to Other Asian Countries

2.47 Uncontrolled urbanization is a by-product of weak land use policy and urban management. While there are laws and regulations leading to Comprehensive Land Use Plans (CLUP) in every municipality, in practice they remain as paper plans. Instead of serving as guide to development, developers and property owners generally ignore CLUP and rarely get penalized for violations.

2) Environmental Decay and Increasing Hazard Risk

2.48 The informal settlements referred to in the preceding section is compounded by weak land use control on the activities of the formal sectors – particularly, property developments by land owners who are predisposed to externalize their impacts on traffic.

2.49 Traffic congestion has become the number one concern of the rich and poor alike, followed by air pollution, flood control, and peace-and-order.

(1) Air Pollution

2.50 Among the major Asian cities, the air quality of Metro Manila is worse than those of other major capitals of the ASEAN members (see Table 2.2.2), with the exception of Beijing's.

Table 2.2.2 Air Pollution Status of Major Cities in Asia[1/ 2/]

City	Country/Area	PM	SO_2	CO	NO_2	O_3	Pb
Tokyo	Japan	B	A	A	B	B	A
Beijing	China	E	D	D	D	C	B
Seoul	South Korea	D	B	A	C	B	A
Taipei	Taiwan	D	B	B	B	B	B
Bangkok	Thailand	E	B	B	B	B	C
Kuala Lumpur	Malaysia	B	B	C	C	C	C
Jakarta	Indonesia	E	C	C	B	C	D
Manila	Philippines	E	B	C	D	D	C

Source: N. Hayashi (2004) http://mee.k.u-tokyo.ac.jp/siee/eeip/2004fy/20041025hayashiC.pdf (in Japanese).

1/ Concentration level of respective materials in the atmosphere is:
A: Very low pollution: Less than half of the WHO guideline value
B: Low pollution: Within the level of WHO guideline value
C: Moderate pollution: Exceeded WHO guideline value by less than two-fold
D: Heavy pollution: Exceeded WHO guideline value by less than three-fold
E: Serious pollution: Exceeded WHO guideline value by more than three-fold

2/ PM: Particulate Matter, SO2: Sulphur Dioxide, CO: Carbon Monoxide, NO2: Nitrogen Dioxide, O3: Ozone, Pb: Lead

2.51 The Philippine National Emission Inventory in 2008 showed that 65% of the total emission comes from mobile sources, followed by stationary sources at 21%, and 14% coming from area sources.2 This points to transport as the principal culprit, which would not change even if more current data becomes available.

2.52 Motor vehicles are the dominant source of air pollutants in the urban area. Emissions from mobile sources contribute significantly to total emissions of particulate matters (PM), volatile organic compounds (VOC), carbon monoxide (CO), and nitrogen oxides (NOx). According to the EMB-DENR, the share of mobile sources to the total amount of VOC, CO, NOx, and PM10 in Metro Manila are 95.6%, 99.4%,89% and 17%, respectively (see Table 2.2.3). In terms of vehicle class, jeepneys (powered mostly by 2nd-hand diesel engines), motorcycles and tricycles (MC/TC) are the major sources of PM. Other pollutants from jeepneys, such as NOx and SOx, also show a high proportion of the total mobile source emissions.

2.53 Among the pollutants, it has been established that PM has the most adverse impact on the health of the populace. Its level, while decreasing in recent years, is still above acceptable standards. Increasing motorization can only worsen the risk from Carbon monoxide (CO) emission.

[2] `EMB, National Air Quality Status Report (2005–2007).

Table 2.2.3 Motor Vehicle Emissions by Vehicle Type in Metro Manila in 2008 and 2010 (tons/year)

Vehicle Type	Fuel Used	TOG		CO		NO_x		SO_x		PM_{10}	
		2008	2010	2008	2010	2008	2010	2008	2010	2008	2010
Cars	Gasoline	32,450	32,640	267,715	269,281	14,603	14,688	647	626	535	538
	Diesel	312	85	912	247	960	260	64	17	276	75
UV	Gasoline	68,793	63,934	515,948	479,502	25,797	23,975	411	384	1,023	951
	Diesel	11,655	12,551	41,626	44,825	23,310	25,102	1,657	1,775	14,386	15,492
Buses	Gasoline	1,108	1,126	1,108	1,126	120	122	1	1	1	1
	Diesel	6,122	8,027	6,122	8,027	6,172	8,091	39	39	217	285
Trucks	Gasoline	435	381	10,396	8,220	1,017	891	7	7	12	11
	Diesel	11,539	13,040	38,671	43,700	38,983	44,053	248	2,806	1,372	1,551
MC/TC	Gasoline	107,561	124,677	150,354	174,280	1,157	1,341	830	962	11,508	13,339
	Diesel										
Sub-Total	Gasoline	210,347	222,757	945,521	932,408	42,694	41,017	1,896	1,979	13,080	14,841
	Diesel	29,628	33,702	87,331	96,799	69,425	77,507	2,009	4,638	16,252	17,402
Total		239,975	256,459	1,032,851	1,029,207	112,119	118,524	3,905	6,616	29,332	32,243

Source: EMB-DENR, METRO MANILA AIR QUALITY STATUS REPORT 2011.
CO= carbon monoxide, NOx= nitrogen oxide, PM= particulate matter, SOx= sulfur oxide, TOG= Total Organic Gases

2.54 The recent report of the Air Quality Monitoring Section (AQMS) of the EMB-DENR shows a decreasing trend in the annual average total suspended particulates (TSP) from 2004 to 2012, setting an average TSP level of 100 micro grams per normal cubic meter (μg/NcM) in 2012 (see Table 2.2.4). However, this nine-year trend remains above the NAAQGV of 90 ug/NcM, which is the annual mean TSP guideline value over a one-year averaging time period.

2.55 In 2011, EMB-DENR expanded its AQMS for PM10 in 27 stations nationwide; of which 9 stations are in the Metro Manila area (see A to I in Table 2.2.5). Only 18 stations managed to produce good data for the year 2012, 5 of which are located in Metro Manila (i.e., National Printing Office, EDSA, Marikina, MRT-Pasay Taft, Valenzuela, and Caloocan) and these 5 stations recorded risky level of PM10 AQGV above 60ug/NcM.

Table 2.2.4 Annual TSP Trend by Monitoring Stations from 2004 to 2012

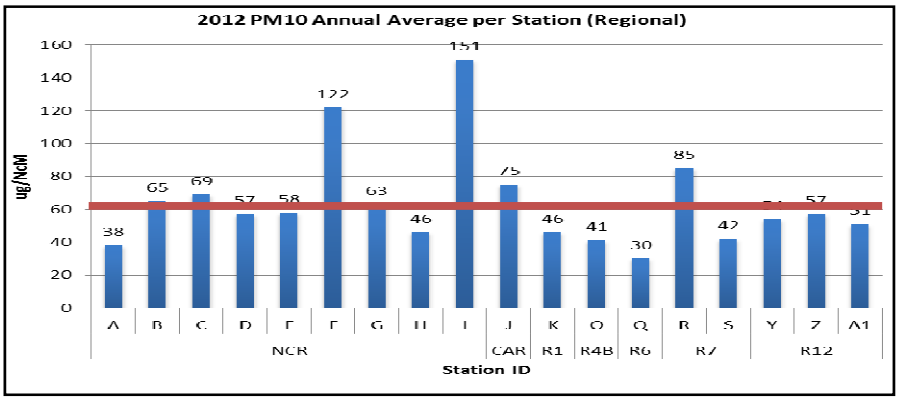
Region		Stations	μg/NcM								
			'04	'05	'06	'07	'08	'09	'10	'11	'12
National Capital Region (NCR)	1	Makati Bureau of Fire Compound, Ayala Ave., cor. Buendia St., Bel-Air, Makati City	211	183	153	146	134	145	160	128	135
	2	Valenzuela Municipal Hall, Quezon City	206	152	157	146	156	164	162	121	123
	3	EDSA East Avenue BFD Compound, East Ave., Q.C.	170	129	104	102	107	90	105	74	72
	4	NCR-EDSA NPO, Q.C.	164	163	138	125	144	89	152	103	96
	5	Ateneo de Manila Observatory, Ateneo University	105	87	72	65	74	62	79	58	62
	6	City Hall, Maycilo Circle, Plainview, Mandaluyong City	133	124	121	134	125	104	138	136	148
	7	Dept. Health, San Lazaro St., Rizal Avenue	134	138	111	110	103	103	132	101	114
		LLDA Compound Pasig City Hall	109	106	90	92	85	126			
	8	Sports Complex, Sumulong Highway, Sto. Nino, Marikina City							125	125	108
	9	MRT-Taft Avenue Station, EDSA cor. Taft Avenue, Malibay, Pasay City	236	323	316	257	282	283	294	219	213
Region III	1	Reg 3-San Fernando								128	243
	2	Reg 3-Saluysoy Station	190	309	186	116	106	124	61	21	14
	3	Reg 3-Intercity Station								344	277
Region IV-A	1	Reg 4-A Cavite								-	-
	2	Reg 4-A Batangas	144	140	46	49	50	19	22	-	-
	3	Reg 4-A Quezon								-	-

Source: EMB-DENR.
Note: There are other stations, but this focuses only on NCR and Regions 3 and 4A - Did not meet sampling criteria

Table 2.2.5 PM10 Monitoring Results in Metro Manila in 2011 and 2012[1/]

Station ID	Location	Year 2011 Annual Arithmetic Mean	Year 2012 Annual Arithmetic Mean
A	Ateneo (RT)	41	38
B	NPO-EDSA	78	65
C	Marikina	70	69
D	DOH-Manila	57	57
E	MMDA-Guadalupe	54	58
F	MRT-Pasay Taft	136	122
G	Valenzuela-Radio ng Bayan (RT)	55	63
H	NAMRIA (RT)	50	46
I	Caloocan	179	151

Source: EMB-DENR.
1/ Air Quality Guideline Values (AQGV) of 60 ug/NcM



Source: EMB-DENR.
Note: Annual arithmetic means are from monthly arithmetic mean results of each station.

Figure 2.2.4 National PM10 Monitoring Results in 2012

(2) GHG Emissions

2.56 Under the National Framework Strategy on Climate Change (NFSCC) 2010–2022, low-carbon paths in the transport sector is regarded as a high strategic priority. The transport sector's contribution to GHG emission has increased significantly both in absolute and relative terms since 1990 (see Table 2.2.6). The GHG emissions from the transport sector are significantly larger, approximately over 30%, excluding effect of land use change. Based on the current motorization growth of about 6%, emission contributions from road transport is projected to increase to 37 and 87 MtCO2e by 2015 and 2030 respectively, under a business as usual (BAU) scenario. A large part of these GHG emissions would come from Metro Manila's transport sector.

2.57 In the global scheme of things, Metro Manila's GHG per capita emission level is relatively small, despite it being the 20th largest metropolis in terms of population. Its GHG emission per person is almost the same as Tokyo's; less than Jakarta (1.6x more) and Bangkok (5.4x more).[3]

2.58 The top-down Metro Manila GHG inventory was calculated under the Climate Change and Clean Energy Project (CEnergy) funded by USAID in collaboration with DENR, Manila Observatory, and the SEED Institute. The Energy sector was the primary source of GHG emissions (accounting for 89.27% of the overall emissions). The contributions of the industrial, agriculture and land use sectors to Metro Manila GHG emissions were insignificant.

[3] World Bank, Cities and Climate Change: An Urgent Agenda, 2010.

Table 2.2.6 Philippines GHG Emissions by Sector in 1990, 2000 and 2004

Sector	1990		2000		2004		% Change	
	CO_2 (Mt)	%	CO_2 (Mt)	%	CO_2 (Mt)	%	1990–2000	2000–2004
Land Use Change & Forestry[1/]	79.4	66.9	94.9	55.9	N/A	N/A	20.0	N/A
Energy	36.0	30.4	68.9	40.6	72.6	91.8	91.0	5.4
Electricity & Heat	14.2	11.9	26.8	15.8	28.9	36.5	89.0	7.8
Manufacturing & Construction	8.3	7.0	9.2	5.4	11.2	14.1	11.0	21.7
Transportation	6.2	5.2	23.5	13.9	25.4	32.1	279.0	8.1
Other Fuel Combustion	7.4	6.2	9.4	5.5	6.8	8.6	27.0	-27.7
Industrial Processes	3.2	2.7	6.0	3.5	6.5	8.2	88.0	8.3
Total Energy	39.2		74.9		79.1		91.0	5.6
Total	118.6		169.8		79.1		43.0	N/A

Source: A Strategic Approach to Climate Change in the Philippines Final Report, World Bank April 2010, originally from Climate Analysis Indicators Tool (CAIT) Version 6.0. (Washington, DC: World Resources Institute, 2009)

[1/] Land Use Change and Forestry data available every 10 years only. No data for 2004

Table 2.2.7 Combined Energy and Waste Sectors GHG Emissions for Metro Manila in 2010

Thousand ton CO2eq (CO_2 Equivalent)

Category		%	CO_2	CH_4	N_2O	Total
Energy	Mobile Source	38.72	7,981.12	39.57	121.6	8,142.30
	Road		7,925.32	39.57	121.68	8,086.17
	Railways[1/]		55.8	0.003	0.32	56.13
	Stationary Source	61.28	12,855.61	18.45	9.6	12,883.67
	Residential /Commercial		8,475.28	15.41	2.77	8,493.46
	Industrial		4,380.33	3.04	6.83	4,390.21
Total Energy emissions			20,836.73	58.03	131.21	21,025.97
Waste				2,292.67	203.1	2,495.89
Gross Emissions			20,866.94	2,351.44	334.24	23,552.63

Source: USAID (2010) Annex 2 Climate Change and Clean Energy Project, Metro Manila Greenhouse Gas Inventory.

[1/] Breakdown of the Railways are Direct, diesel emission by PNR, indirect: 2.99, electricity consumption by LRT, 53.14. The inventory used 2010 as the baseline year.

(3) Water Pollution

2.59 Provision of potable water to households in Metro Manila is carried out by two concessionaires (Manila Waters Company and Maynilad Water Services) under contract with the Manila Waterworks an Sewerage System (MWSS). Some 95% of the population of the metropolis has access to potable water service. In terms of sewerage and sanitation, however, the record is spotty as only about 15% is connected to sewer systems. The rest are either captured in individual septic tanks, and/or discarded into street drains and waterways that eventually flow into the Manila Bay.

2.60 Manila Bay serves as a natural harbor that made Manila an entrepot of commerce and population. To date, the Manila Bay is considered heavily polluted that fish catch from it are considered toxic or carcinogenic, and swimming on its coast a danger to health. In 1999, an environmental activist filed and won a case from the Supreme Court that compelled 12 government agencies to clean up the bay area. Environmental degradation got equated to a human rights issue. This was considered a first-of-its-kind in the world and became a precedent that other countries now adopt.

(4) Disaster Risk

2.61 As indicated in previous sections of this Chapter, the greater national capital region is vulnerable to natural disasters, i.e., earthquake, tsunami, floods, liquefaction, typhoons.

2.62 A number of faults located in Metro Manila and GCR have the potential to cause significant damage to the Metro region. A magnitude 7 earthquake or even larger one is anticipated in case the Valley Fault System moves. The fault line is crossing the west side of Metro Manila on a north-south axis and could damage roads and transport to the east, if and when an earthquake hits. Recently, the USGS had pointed out the possibility of tsunami should an earthquake occur on the Manila Trench.

2.63 The hazard risks from earthquake and tsunami in Metro Manila were evaluated in the "Study for Earthquake Impact Reduction for Metropolitan Manila (MMEIRS)" by JICA from 2002 to 2004, with MMDA and the Philippine Institute of Volcanology and Seismology (PHIVOLCS).It posited several earthquakes scenarios based on past major quakes.

2.64 In the worst case scenario earthquake model 08 (West Valley Fault, Magnitude 7.2), 170,000 residential houses are estimated to collapse, 340,000 residential houses would be partly damaged, 34,000 persons would die, and 114,000 persons would be injured. Fire would break out over an area of 1,710 hectares as to induce secondary death toll of 18,000 persons. It goes without saying that under this severe scenario, infrastructure and lifelines would be heavily damaged.

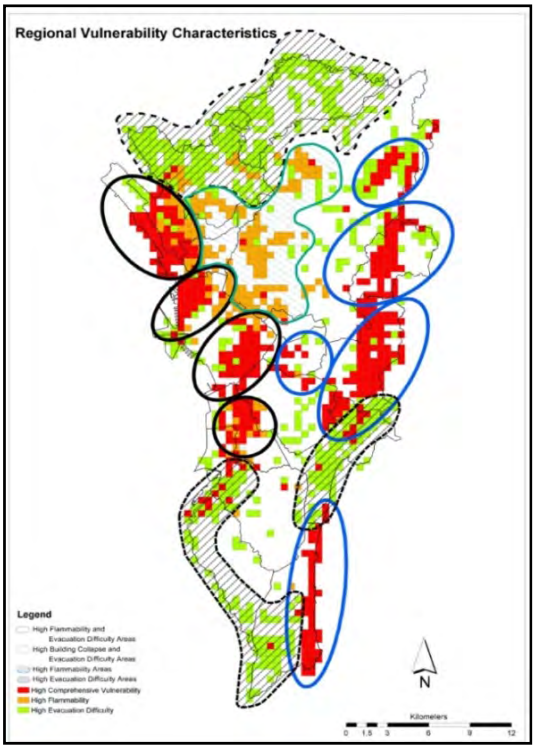
2.65 The tsunami hazard was also estimated based on another scenario earthquake occurring at the Manila Trench with magnitude 7. Such an event would cause a tsunami of 2m to 4m height, and arrival time of 70 minutes after earthquake occurrence.

2.66 The regional vulnerability, possible separation, liquefaction and tsunami hazard risk are mapped in Figure 2.2.5 and outlined in Table 2.2.8. The appropriate counter measures can be gleaned from the specific hazards by location.

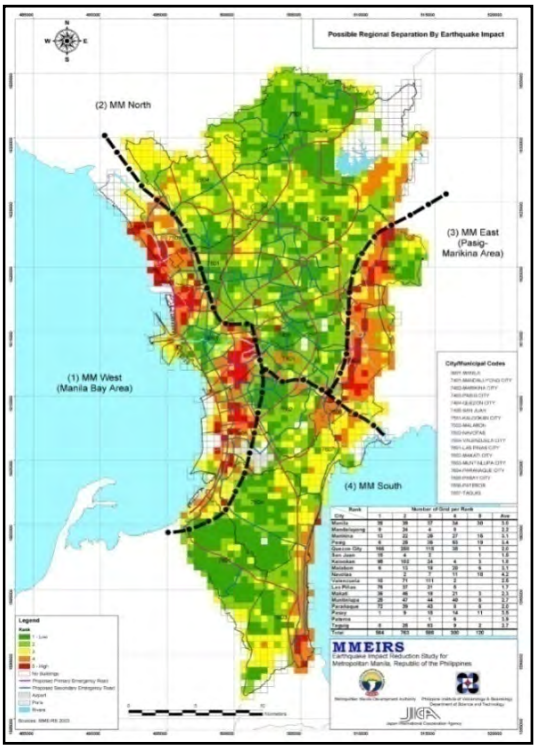
Table 2.2.8 Summary of Estimated Damages (MMEIRS, Model 08)

Scenario Earthquake	Model 08		West Valley Fault
	Magnitude		7.2
	Fault Mechanism		Inland Fault
Residential Building 1,325,896	Damage	Heavily	170,000 (12.7%)
		Partly	340,000 (25.6%)
Fire (Wind Speed 8m/s)	Outbreak		500
	Burnt Area		1,700 ha
	Burnt Buildings		100,000
	Casualty		18,000 (0.2%)
Bridge 213, Flyover 80		Large possibility of falling-off	Bridge 7, Flyover 0
Water Supply Distribution Pipes Total 4,615km		Breaking of pipes or joints	4,000 points
Electric Power Transmission and Distribution Line Total 4,862km		Cutting of cables	30 km
PLDT Telephone Aerial Cable 9,445 km Underground Cable 3,906 km		Cutting of cables	95 km
Public Purpose Buildings (Hospital 177, School 1,412, Fire Fighting 124, Police 43, MMDCC Organizations and 17 LGU City and Municipal Halls 53)		Heavily Damaged	8 – 10 %
		Partly Damaged	20 – 25 %

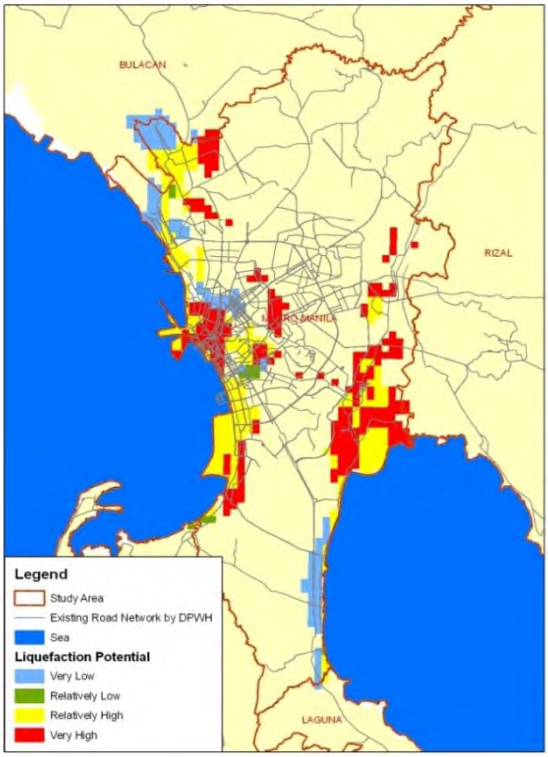
Source: MMEIRS (JICA, 2004).



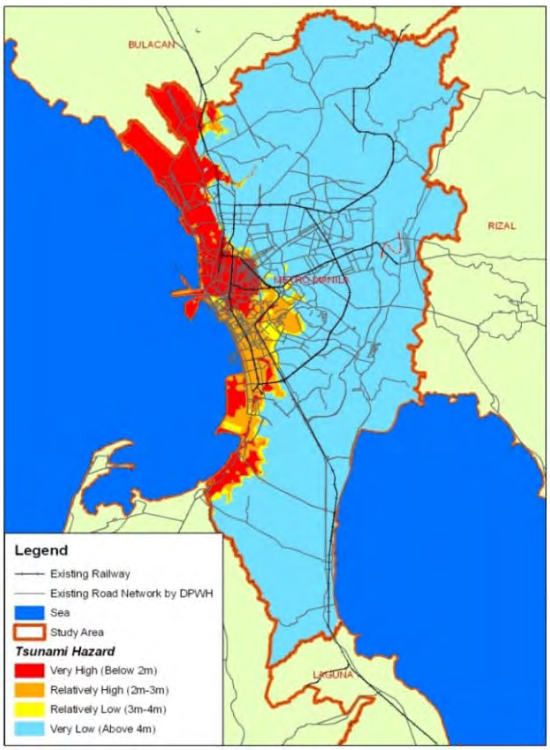
Regional Vulnerability Characteristics



Possible Regional Separation by Earthquake Impact



Liquefaction Potential



Estimated Tsunami Hazard

Source: MMEIRS (JICA, 2004).

Figure 2.2.5 Regional Vulnerability and Estimated Damages

Table 2.2.9 Highly Vulnerable Areas by Type

Type of Vulnerability	Area
Flammability and Evacuation Difficulty	• Navotas Bay Area • Manila North Port Area • South Eastern Manila City Area • Central Manila Bay Area
Building Collapse and Evacuation Difficulty	• North Eastern Quezon City Area • Western Marikina City Area • Eastern Pasig City Area • Muntinlupa Laguna Bay Area • Mandaluyong – Makati – Manila City Border Area
Flammability	• Valenzuela – Kalookan South – Quezon west intersection
Evacuation Difficulty	• Metropolitan Manila Fringes • Northern Fringe • Taguig Fringe • Las Pinas Fringe

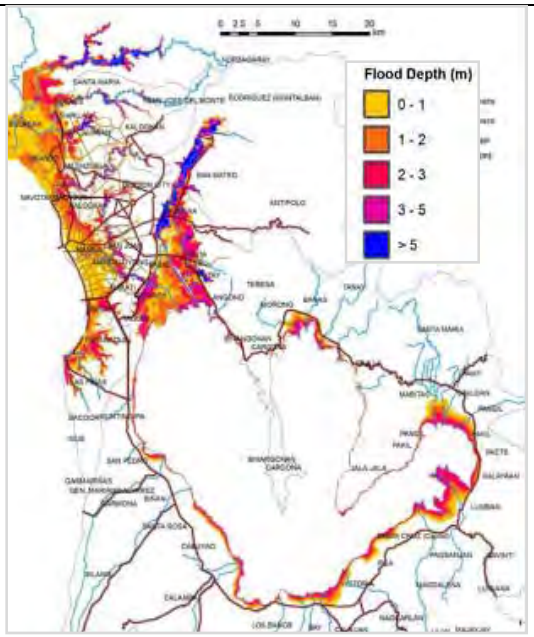
Source: MMEIRS (JICA, 2004).

2.67 The hazard risk of flood is more familiar and vivid to residents in the metro region - because of its annual occurrence, albeit of differing severity. The most recent case was when Typhoon Ondoy hit the region sometime in September 2009, and caused wide spread floodwaters and heavy damages never seen before in living memory. The severity and probable recurrence prompted government and donors to conduct various studies. One of its products is the "Master Plan for Flood Management in Metro Manila and Surrounding Areas"(World Bank, 2012), which proposed a comprehensive flood risk management program including a short list of high-priority 11 projects arising from the analysis of simulated the flood areas affected by typhoon Ondoy.

Box 2.2.1 Disaster by Typhoon Ondoy

Ondoy has affected about one million families or 4.9million 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.

2.68 The extent of damages by flood was estimated in the "Study on Climate Change Impact over Asian Mega Cities (Phase 2): Metro Manila" funded by JBIC in 2008. Utilizing flood simulation, it evaluated impacts to socio-economic activities and infrastructure. Figure 2.2.6shows the result of flood simulation with return period of 30

years and no additional flood management measures in the Pasig-Marikina river basin.

Source: The Study on Climate Change Impact over Asian Mega Cities (Phase 2): Metro Manila (JBIC, 2008).

Figure 2.2.6 Flood Hazard (Pasig-Marikina River Basin)

2.69 By combining vulnerability to and damages from earthquake and tsunami, as well as flood hazard, it was possible to classify and rank specific areas of the region according to hazard levels (high, moderate, low). The scores are compiled into a 500m grid and mapped on GIS. The output is a multi-hazard risk map. The evaluation criteria of hazards are summarized in Table 2.2.10.

2.70 The risk scores calculated from the liquefaction potential, building collapse, and flammability are compiled into an earthquake hazard map, as shown in Figure 2.2.7. This figure shows the distribution of hazard level to earthquake. The high hazard areas are located along Manila Bay including Manila City, Pasay City, Paranaque City, Navotas City, and along Laguna Lake including Pasig City, Pateros, and surrounding areas.

2.71 A tsunami hazard map prepared in MMEIRS is also shown on Figure 2.2.7. It shows the distribution of tsunami hazard levels. The elevation of tsunami affected area is translated into hazard scores except the area evaluated as “very low” (which has over 4m of altitude and is safe from tsunami). The high hazard areas are located

in the cities of Navotas, Malabon, Valenzuela, Manila, Paranaque and Las Piñas.

Table 2.2.10 Hazard Evaluation Criteria

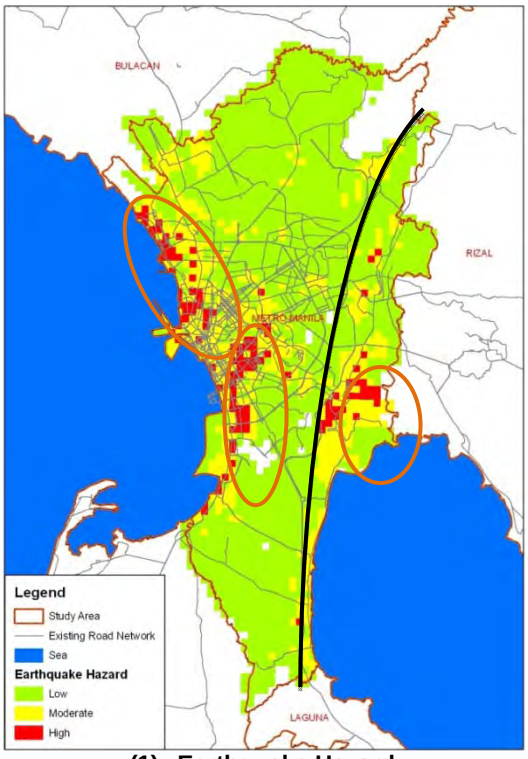
Disaster	Hazard	Criteria	Description	Level	Score
Earthquake	Liquefaction Potential	PL=0	Liquefaction prone area	None	0
		0<PL≤5	Investigation of important building is required	Low	1
		5<PL≤15	Ground improvement is required, Investigation of important structures is indispensable	Moderate	2
		15<PL	Ground improvement is indispensable	High	3
	Building Collapse	PB=0	Building collapse prone area	None	0
		0<PB≤50	Few buildings are collapsed	Low	1
		50<PB≤200	Almost half of building are collapsed	Moderate	2
		200<PB	Most of buildings are collapsed	High	3
	Flammability	PF=0	Fire prone area	None	0
		0<PF≤50	Few fire are spread	Low	1
		50<PF≤200	Easy to spread fires but some open spaces prevent the spreads	Moderate	2
		200<PF	Easy to spread fires and less open space	High	3
Tsunami	Elevation	4.1- (m)	Tsunami prone area	None	0
		3.1-4.0 (m)	Partly affected by tsunami	Low	1
		2.1-3.0 (m)	Mostly affected by tsunami	Moderate	2
		-2.0 (m)	Completely affected by tsunami	High	3
Flood	Flood Depth	0 (m)	Flood prone area in regard of depth	None	0
		0.1-1.0 (m)	Flooded up to waist of adult	Low	1
		1.1-2.0 (m)	Ground floor is damaged heavily	Moderate	2
		2.1- (m)	First floor is damaged	High	3
	Flood Duration	0 (hours)	Flood prone area in regard of duration	None	0
				Low	1
				Moderate	2
				High	3

Source: Prepared by JICA Study Team based on MMEIRS and World Bank's Flood Master Plan.

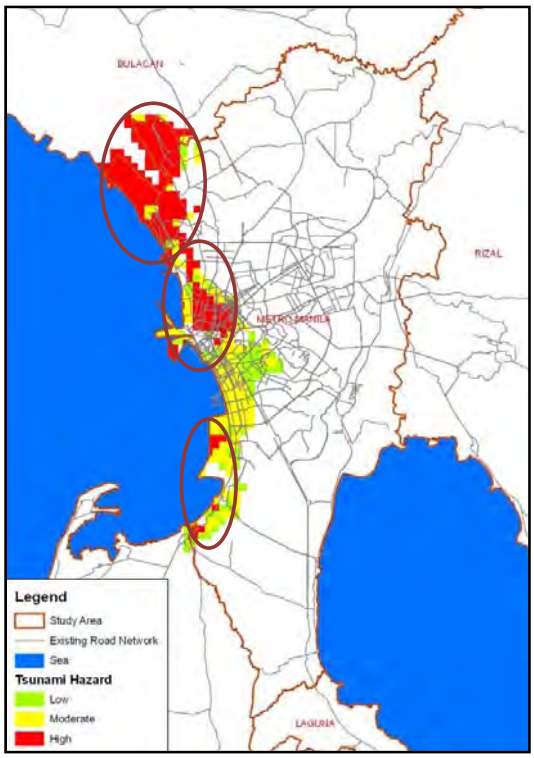
2.72 A flood hazard map is prepared utilizing the flood depth and the flood duration of the affected areas based on the impact of typhoon Ondoy. The simulation results are interpreted into three levels of hazard score and compiled in Figure 2.2.7. The high hazard areas are located along the rivers, particularly the cities of Navotas, Malabon, Valenzuela, Manila, Quezon City, Mandaluyong, Makati, Pasay, Paranaque, Las Pinas, Taguig, Pateros, Pasig and Marikina. Other areas also suffer damages, although less severe.

2.73 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. Table 2.2.11 summarizes the high hazard areas evaluated by the above analyses.

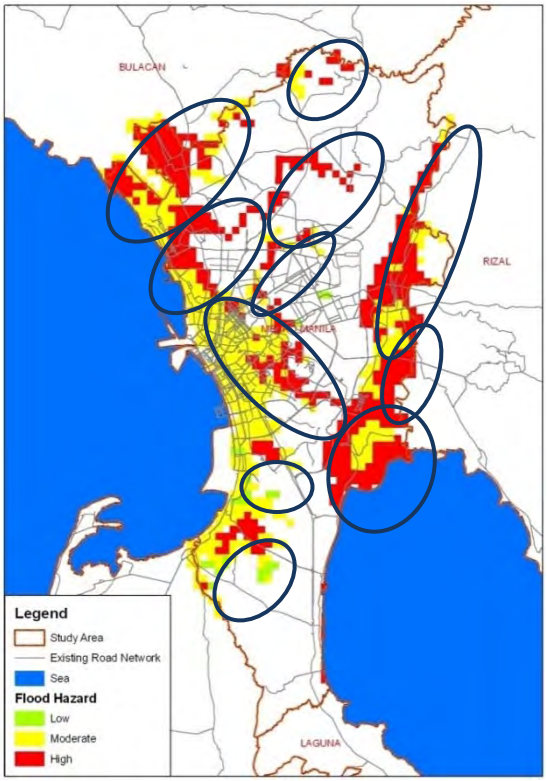
2.74 The probable effects on the residents were also analyzed by overlaying the various hazard maps with population distribution and density. The areas where both population density and multi-hazard risks shown in Figure 2.2.8, where a total of 15 cities and 700 barangays, with a total population of 2,739,215, are vulnerable. These areas and population are suggested targets of redevelopment projects, if only to minimize fatalities in case of disaster.



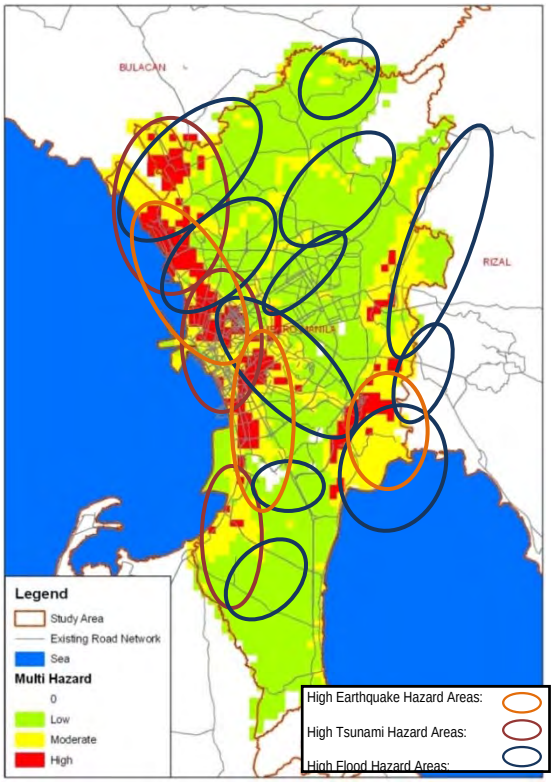
(1) Earthquake Hazard



(2) Tsunami Hazard



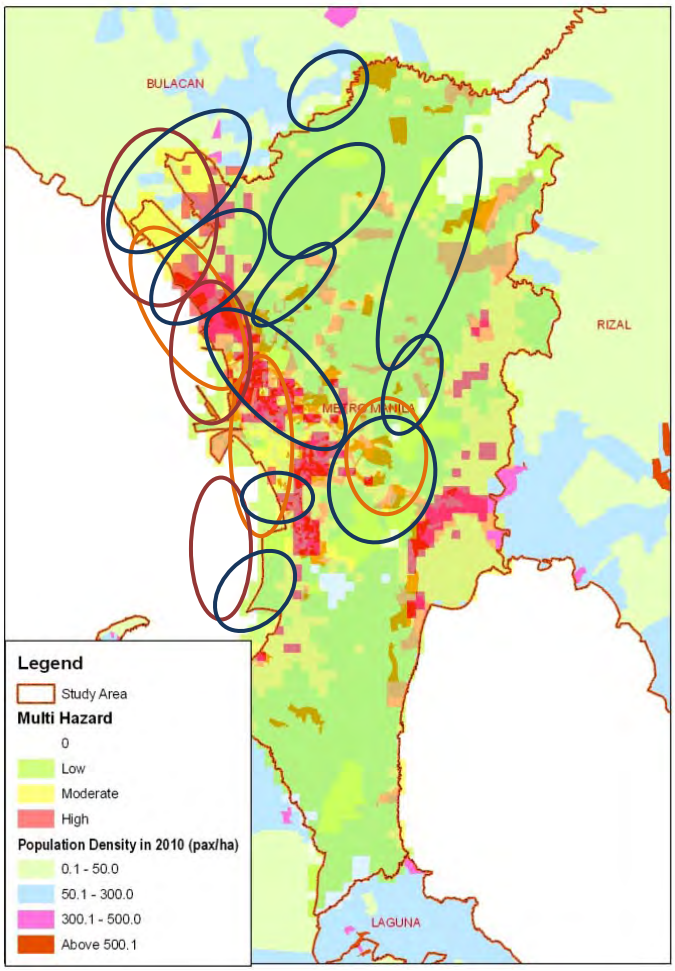
(3) Flood Hazard



(4) Multi-Hazard Risk and Vulnerable Areas to Each Hazard

Source: JICA Study Team based on Data from World Bank Study.

Figure 2.2.7 Hazard Risk and Vulnerable Areas to Each Hazard



Source: Prepared by JICA Study Team based on Census 2010.

Figure 2.2.8 Distribution of Population Density and Multi-Hazard Risk

Table 2.2.11 High Hazard Areas

City/Municipality		Hazards			
		Earthquake	Tsunami	Flood	Multi-hazard
1	Manila	x	x	x	x
2	Mandaluyong	-	-	x	x
3	Marikina	-	-	x	x
4	Pasig	x	-	x	x
5	Quezon	-	-	x	x
6	San Juan	-	-	x	x
7	Caloocan	-	-	x	x
8	Malabon	-	x	x	x
9	Navotas	x	x	x	x
10	Valenzuela	-	x	x	x
11	Las Pinas	-	x	x	x
12	Makati	-	-	x	x
13	Muntinlupa	-	-	-	-
14	Paranaque	x	x	x	x
15	Pasay	x	-	x	x
16	Pateros	x	-	x	x
17	Taguig	-	-	x	x

Source: JICA Study Team.

2.75 Aside from the obvious risk mitigation usage of the multi-hazard risk maps, they are also useful in planning the development of the transportation network. The objective is to build disaster-resilient transport network and infrastructure. Because of the huge expense involved, 100% protection is not possible and would have to be scaled down in relation to the probability of risk occurrence.

2.76 On this basis, flooding will rank highest among the disasters to be mitigated. Thus, relocating informal settler families from waterways would reduce annual fatalities. As shown in Figure 2.2.9, the high-risk hazard areas are located along the rivers.

3) Shortage of Affordable Housing

2.77 A lack of affordable housing is a persistent problem of massive scale. Housing backlogs from 2005 to 2010 is estimated to have reached 500,000 units in Metro Manila, 461,400 units in Central Luzon, and 828,250 units in CALABARZON (see Table 2.2.12). Total requirements for Metro Manila alone is projected to hit 1.74 million units from 2010–2016[4].

Table 2.2.12 Housing Backlog in GCR

Region	Total Backlog (2005–2010)
NCR	496,928
Region III	461,368
Region IV	828,248
Philippines	3,756,072

Source: HUDCC.

2.78 High population growth plus non-affordable housing resulted in the prevalence of informal settlements throughout the region. The number in Metro Manila grew from 544,600 in 2007 to 556,500 households in 2010[5], with Quezon City accounting for 40% of the total, followed by Manila with 18.8%, Pasay with 5.0%, and Parañaque with 4.5%. The locations of informal settlements in Metro Manila are shown in Figure 2.2.9. About 40% have occupied government-owned lands, 34% on privately-owned land, and 18.4% on danger area in Metro Manila (see Table 2.2.13). As of the end of 2006, ADB estimated that 300,000 families are in harm's way and should be relocated. Under the DPWH's flood management project, 19,500 families are located along the eight priority waterways.

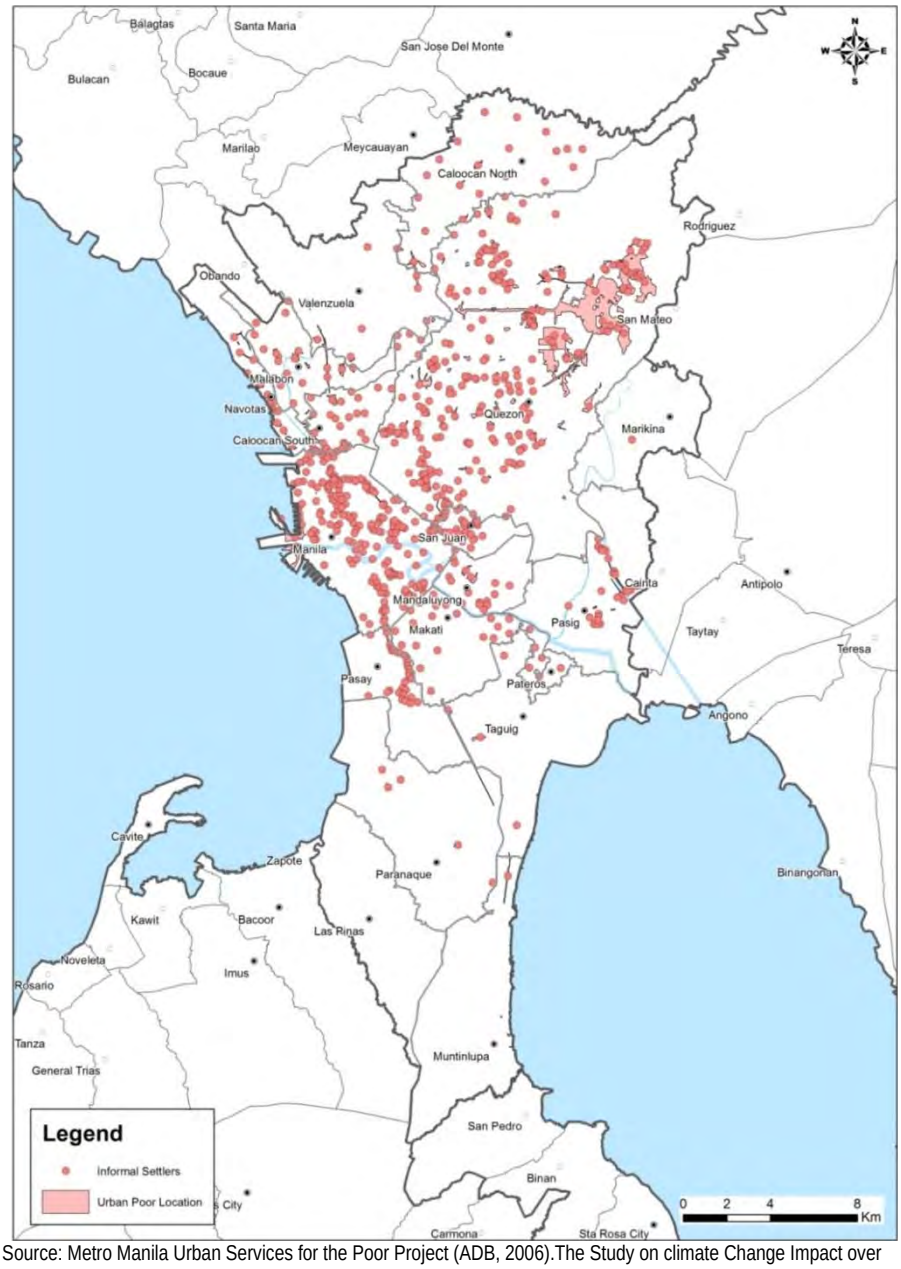
Table 2.2.13 Inventory of Informal Settler Families in Metro Manila in 2010

Cities/ Municipalities	No. of Families by Type of Areas					Total	% of Metro Manila
	Danger Areas	Areas Affected by Government Infrastructure	Government Owned Lands	Private-Owned Lands	Areas for Priority Development/ Others		
Caloocan	6,981	2242	1,692	4209	11	15,135	2.7
Las Piñas	2,357		1,507	10976	146	14,986	2.7
Makati	915		2,386	1560		4,861	0.9
Malabon	7,630	953	12,554			21,137	3.8
Mandaluyong	70		19,893	987		20,950	3.8
Manila	16,095		75,628	12920		104,643	18.8
Marikina	933		119	524		1,576	0.3
Muntinlupa	4,719		2,583	9947	70	17,319	3.1
Navotas	9,584	605				10,189	1.8

[4] Philippine National Philippines Development Plan (MTPDP) 2011–2016.
[5] MMDA data.

Cities/ Municipalities	No. of Families by Type of Areas					Total	% of Metro Manila
	Danger Areas	Areas Affected by Government Infrastructure	Government Owned Lands	Private-Owned Lands	Areas for Priority Development/ Others		
Parañaque	3,320		3,763	15428	2,460	24,971	4.5
Pasay	3,343	441	21,621	2211		27,616	5.0
Pasig	7,133					7,133	1.3
Pateros	2,580	516	1,009	3500		7,605	1.4
Quezon	26,976	2899	80,651	96341	15,877	222,744	40.0
San Juan	4,886		2,518	4043		11,447	2.1
Taguig	1,273	4873	810	16724	1,957	25,637	4.6
Valenzuela	3,611	2552	1,408	11006		18,577	3.3
Metro Manila	102,406	15,081	228,142	190,376	20,521	556,526	100.0
% of Total	18.4	2.7	41.0	34.2	3.7	100.0	

Source: LGUs consolidated by MMDA, 2010.



Source: Metro Manila Urban Services for the Poor Project (ADB, 2006).The Study on climate Change Impact over Asia Mega Cities Phase 2 (JBIC 2008).

Figure 2.2.9 Locations of Informal Settlers in Metro Manila in 2007

Table 2.2.14 Informal Settler Families along Waterways in Metro Manila in 2012

	LGU	Number of Informal Settler Families	Percentage (%)
1	Caloocan	6,012	10.0
2	Las Piñas	2,590	4.3
3	Makati	1,810	3.0
4	Malabon	3,991	6.6
5	Mandaluyong	662	1.1
6	Manila	2,249	3.7
7	Marikina	430	0.7
8	Muntinlupa	3,686	6.1
9	Navotas	6,017	10.0
10	Parañaque	914	1.5
11	Pasay	4,200	7.0
12	Pasig	7,449	12.4
13	Pateros	1,869	3.1
14	Quezon City	10,367	17.2
15	San Juan	1,375	2.3
16	Taguig	3,672	6.1
17	Valenzuela	2,837	4.7
Total		60,130	100


Along Marikina River


Along Marikina River


Floodway in Taytay

Source: LGUs, reproduced from DPWH's "Metro Manila Integrated Flood Risk Management Master Plan," by Secretary Singson; Photos from MMDA, Preparatory Studyfor Sector Loanon Disaster Risk Management (JICA, 2010), Your One Voice,

2.79 There have been attempts to address the issues of housing and informal settlers. Some LGUs have crafted resettlement programs but are constrained by lack of relocation sites within their boundaries, compounded by resistance at the host or receiving communities. Ostensibly, Republic Act No. 7279 would solve the dilemma by requiring subdivision developers to allocate 20% for socialized housing – in the same subdivision, or another site, or in equivalent cost. But this formula has not succeeded to increase supply of socialized housing. The 3rd option of compliance was recently nullified. It is unclear whether an amendment to restrict the provision of socialized housing within the same locality would fare any better.

4) Traffic Congestion

(1) Severity of Congestion

2.80 The daily travel demand by main modes of travel in the study area is summarized in Table 2.2.15. A 'like with like' comparison of the estimated 2012 travel demand with the MMUTIS 1996 observed person trips within and to and from Metro Manila showed an increase of 15% by car, while trips by public transport (jeepney and bus) declined by about 7%. However, in terms of vehicle trips the increase in car trips shot up by 69% (on average 3.3% per annum) and public vehicle trips by 41% (average growth of 2.2% p.a.) in a span of 16 years. The increase in jeepney trips was 2 times as many as bus traffic.

2.81 The high increase in car traffic can be ascribed to higher car ownership as well as decline in car occupancy from 2.5 to 1.7 persons per car. Similar decline in vehicle occupancy has been observed on jeepneys (from 15.1 to 10) and buses (from 46.5 to 35.3 passengers).

Table 2.2.15 Travel Demand in the Study Area – Inter-Zonal Trips in 2012

Main Mode of Travel	Person Trips		Average Occupancy	PCU Factor	PCU	
	No.(000)	%			No.('000)	%
Car	6,170	31.7	1.7	1.0	3,629	71.3
Jeepney	7,620	39.1	10.0	1.5	1,141	22.4
Bus	5,680	29.2	35.3	2.0	322	6.3
Sub-Total Public (Jeepney + Bus)	13,300	68.3	-	-	1,463	29.7
Total Person Trips	19,470	100.0	-	-	5,092	100.0

Source: JICA Study Team.

2.82 As a consequence of the preceding phenomenon (higher person trips and lower vehicle occupancies) traffic congestion have worsened. Not surprisingly, grid-locks on key arterial and circumferential roads have become more frequent. A growing economy would imply more freight volumes being transported, but truck traffic has declined, which can only be ascribed to the truck bans with narrower windows during the day.

2.83 The road network performance was evaluated based on 2012 O-D matrix. It showed that most of the roads are either operating at, or close to, capacity. Table 2.2.16 provides a summary of level of traffic demand on the road network by area and key roads in Mega Manila. Road traffic speeds tend to drop rapidly once the volumes exceed 50% of capacity (Refer to Figure 2.2.10). The table also shows the traffic volume, weighted average speed, and % of the roads sections (km) experiencing below 10kph and 20kph.

2.84 It can be seen that (with few exceptions) majority of the roads in Metro Manila average 10kph, and 75% to 92% travel of the network at speeds below 20kph. This is illustrated in Figure 2.2.10 in terms of both traffic volume and the Volume Capacity (V/C) ratio of each road section, separately for GCR and Metro Manila areas. Sections in orange and red are those with V/C greater than 0.9, i.e., saturated.

2.85 Among the main arterial (R1 to R10) and circumferential (C1 to C5) roads, EDSA (C4) carries the highest traffic volume, with over 4.8 million PCU-km or 11.3 million person-km per day. This level of traffic causes the road to reach capacity throughout the day and close to 70% of EDSA operates at speeds below 20kph. The impact of such high volume of traffic concentration on a single road is not just the economic losses, but also high level of pollution and poor living environment. The busiest radial road is R7, with traffic exceeding one PCU-km and person-km in excess of 3.5 million daily. This shows that the person demand in corridor is even higher than on EDSA on per PCU-km basis. As a result traffic speed on R7 is even worse than EDSA, with its entire length of about 12km operating below 20kph.

2.86 The road based public transport carries bulk of the travel in the study area. In Metro Manila, majority of the travel is by jeepneys (36%), where those using the bus services is not far behind at 31%, as summarized in Table 2.2.16. Overall in the Mega Manila area, the car travel accounts for 30% of person-km, but constitutes 72% of the road traffic in terms of PCU-km. The ratio of car usage within Metro Manila is similar such that the passenger-km accounts for 33% of travel, yet the car PCU-km are over 72% of traffic.

2.87 As discussed, road based public transport has remained the dominant mode of travel despite high car ownership (see Figure 2.2.11), albeit the overall share of public transport shows a small drop of about 4~6% when compared to MMUTIS data. This is despite considerably high growth in car ownership over the same period. It can be seen that there is strong demand for both jeepney and bus travel in all corridors, even in the corridors which are served by railways like EDSA and Taft/ Rizal Avenue. There is also high volume of travel in the east-west corridor, especially east of Santolan (beyond Santolan end of LRT Line-2).

Table 2.2.16 Summary of Road Traffic Volume and Network Performance in Metro Manila in 2012

(by Road)

Road	Road Length (km)	Ave. V/C Ratio	Rd. Section (km) with Speed		PCU (000)		Pax (000)		Modal Share (%)			
			< 10 kph	< 20 kph	kms	hrs.	kms	hrs.	Car	Jeepney	Bus	Total
C-1	6.4	1.14	4.8	5.7	240	36	648	98	27	51	22	100
C-2	10.2	1.26	6.4	9.7	494	79	1,429	228	36	37	27	100
C-3	13.8	1.04	7.2	11.0	606	68	2,391	260	20	56	23	100
C-4	27.1	1.21	13.2	18.6	4,779	462	11,269	1,102	50	-	50	100
C-5	26.8	1.24	12.5	25.2	3,046	288	9,247	869	34	41	25	100
R-1	8.8	1.73	8.1	8.8	918	165	2,692	490	32	39	29	100
R-2	6.7	1.43	6.7	6.7	402	80	1,233	245	39	31	30	100
R-3	4.7	1.40	3.5	4.7	433	80	1,461	262	30	42	28	100
R-4	7.5	1.21	6.2	7.2	295	46	975	156	23	51	26	100
R-5	5.4	1.30	4.3	5.4	294	46	868	133	34	49	17	100
R-6	10.3	1.35	7.1	9.7	633	86	1,860	255	33	42	26	100
R-7	11.8	1.16	6.6	11.8	1,065	132	3,579	445	28	48	24	100
R-8	7.5	1.67	6.4	7.3	534	87	1,871	306	32	37	32	100
R-9	7.1	1.72	6.5	7.1	424	78	1,196	218	36	40	24	100
R-10	6.9	1.25	5.6	6.9	418	78	696	134	29	42	29	100

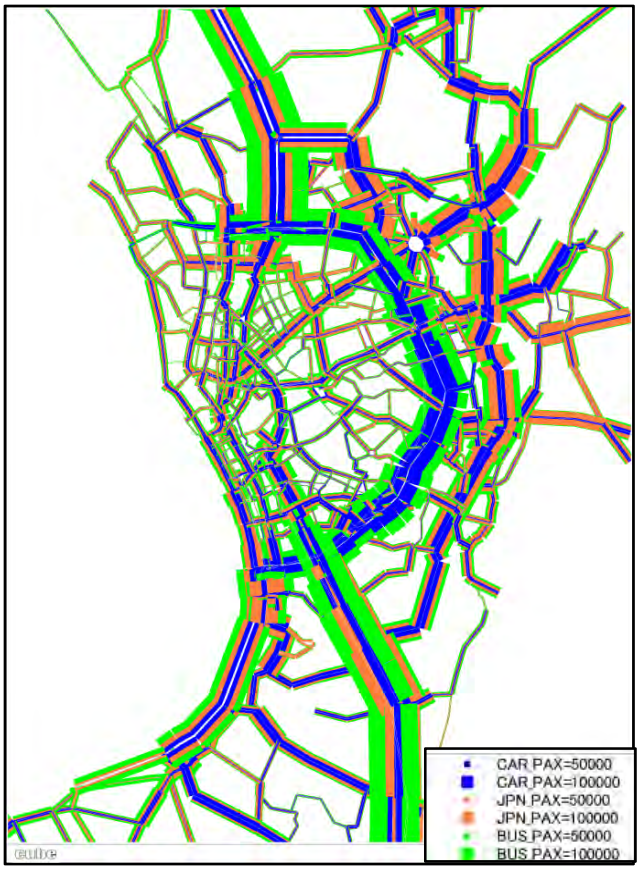
(by Area)

Area	Road Length (km)	Ave. V/C Ratio	Rd. Section (km) with Speed		PCU (000)		Pax (000)		Modal Share (%)			
			< 10 kph	< 20 kph	kms	hrs.	kms	hrs.	Car	Jeepney	Bus	Total
MM Manila City	135	1.31	102	124	3,870	701	11,023	1,973	32	42	26	100
MM North	404	1.26	236	325	20,041	2,450	62,532	7,509	31	40	29	100
MM Center	135	1.23	85	108	6,976	898	21,192	2,649	38	29	33	100
MM South	131	1.21	73	99	8,380	856	27,600	2,540	34	30	36	100
Sub-Total MM	805	1.25	495	656	39,266	4,905	122,347	14,672	33	36	31	100
Sub-Total Adj. Prov.	1,478	0.53	155	332	27,757	1,804	96,884	6,012	28	28	44	100
Total - Mega Manila	2,284	0.80	651	989	67,024	6,709	219,231	20,683	31	33	35	100

Source: JICA Study Team Estimate.

Source: Study Area Traffic Model, Network Image from CUBE Software

Figure 2.2.10 Road Traffic Volume and V/C Ratio in Metro Manila in 2012



Source: Study Area Traffic Model, Network Image from CUBE Software

Figure 2.2.11 Travel Demand Distribution by Mode in Metro Manila in 2012

(2) Public Transport

2.88 The impact of traffic congestion on public transport (buses, jeepneys, and Asian utility vehicles) is even more severe than on private cars. Low speed equates to less number of trips, higher cost, and lower productivity. To passengers, it means longer travel times and higher incentive to shift to cars.

2.89 The overall average speeds for routes of public transport vehicles are shown in Table 2.2.17. The average speeds of buses are below 20kph for all time periods. For jeepneys, the average speeds hardly reached 15kph. AUVs fare better, with average speeds closer to 25kph.

2.90 Despite their shorter route distances, jeepneys only managed to yield 2 to 8 roundtrips a day, while AUVs with their longer distances make 2 to 5 roundtrips a day. Operating hours are long: PUBs averaged 17.2 hours; PUJ at 13.6 hours and AUVs at 11.7 hours.

Table 2.2.17Average Speeds by Routes of PUB, PUJ, and AUJ in 2010

Time Period	Ave. Speed (km/hour)		
	All Public Bus Routes	All Public Utility Jeepney Routes	All Asian Utility Vehicle Routes
0000–0600	19.34	14.70	24.65
0600–0900	18.43	14.65	21.58
0900–1600	16.80	15.13	25.85
1600–1900	16.34	12.86	24.53
1900–2400	16.74	12.74	29.25

Source: MMPTS, DOTC

2.91 Various estimates have been made on the economic cost of traffic congestion. Citing previous report dating back 10 years ago, DOTC mentioned P137.7 billion.[6] Another study estimated that the economic losses from traffic congestion in the last decade are four times larger than investments needed for the public transport projects in Metro Manila.[7] In the course of evaluating the volume-to-capacity situation of the current road network, this Study came up with PHP2.4 billion per day as the cost of traffic congestion in Metro Manila plus another PHP1.0 billion in the adjoining areas of Bulacan, Rizal, Laguna and Cavite. This translates to PHP1.2 trillion per year in the Mega Manila area.

[6] The Philippine Star, "Traffic congestion cost PHP137 billion last year," September 27, 2012.
[7] Regidor, Jose Regin F. 2012.Revisiting the Costs of Traffic Congestion in Metro Manila and Their Implications.Proceedings of the 2012 UP College of Engineering Professorial Chair Colloquium.Available from http://d0ctrine.files.wordpress.com/2012/09/prof-chair-2012-jrfr-02july2012.pdf.Accessed on June 23, 2013.

2.3 Vision and Strategies

1) A Vision for the Metro Regions

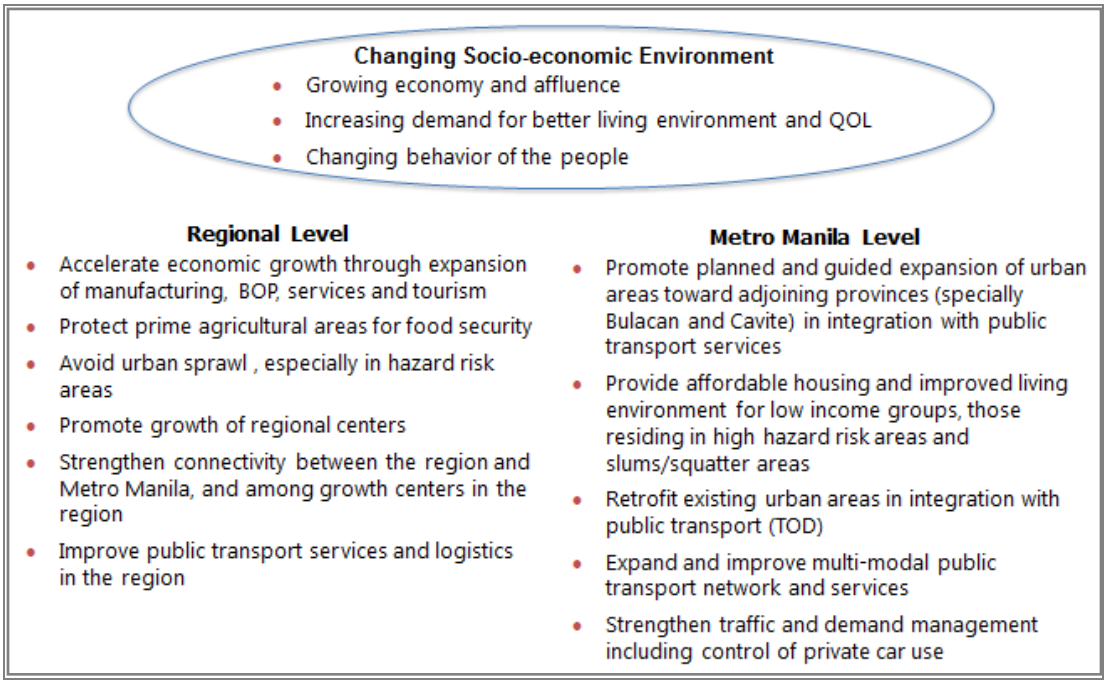
2.92 While there could be disagreements about priority and specific projects, among government agencies, and between public and private parties, it is posited that these can be resolved if there is a common vision that unites everyone. This Study can only suggests an approximation of such a vision – taking into account the physical and socio-economic conditions of the Study Area and an image of what a sustainable and dynamic metropolitan region should be. The latter can be gleaned from the Philippine Development Plan, as well as the respective regional development plans of the component localities.

2.93 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 centers

2.94 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 2.3.1).

2.95 From a transport standpoint, the vision conjures an area free of traffic congestion and free from noise and air pollution. It enables a healthy and invigorating lifestyle, where business activities thrive and provide equal opportunities for all – regardless of race, gender, religion, and income levels. The transport system is an enabler for economic growth, and a means for people to access urban services and opportunities in a geographic space least vulnerable to natural disasters. Outwardly, the three regions also provide the political and economic leadership, an engine of growth and prosperity, a modernizing beacon for the entire country, a place of pride and a jumping board to the world.



Source: JICA Study Team

Figure 2.3.1 Key Development Strategies for GCR and Metro Manila

2) Precedent Plans

(1) Philippine Development Plan 2011–2016

2.96 The predecessor PDP 2004-2010 envisaged a transport logistics system that will decongest Metro Manila by ensuring efficient linkages between its business centers and nearby provinces. In 2007, this was labeled the Subic-Clark-Manila-Batangas (SCMB) Corridor, which connects the three regions.

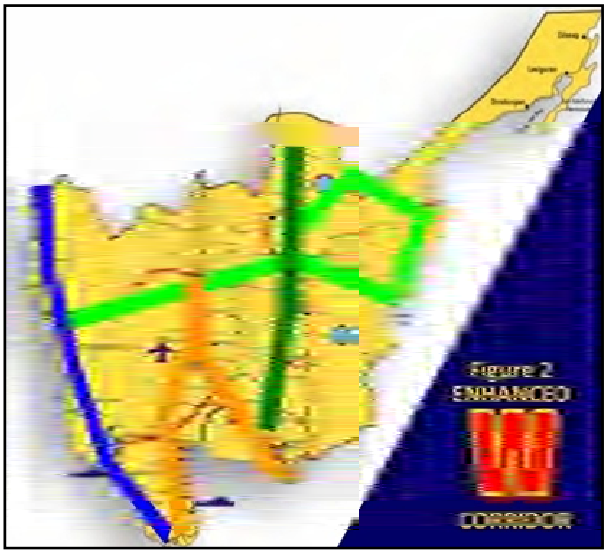
2.97 As a countermeasure to what it considered as high transport costs, the current MTPDP prescribed a seamless multimodal logistics system along the SCMB Corridor to support intra-regional trade and investment, an increase in the level of services of an integrated transport system, and an efficient flow of commodities, supplies and inputs to tourism areas and various economic and industrial zones.

(2) Central Luzon Physical Framework and Development Agenda

2.98 Central Luzon Regional Development Plan 2011–2016 stated a vision of the region for 2025, “Central Luzon: A Sustainable and Caring Global Gateway through Public-Private-Partnership and Growth for All.” The plan’s objectives include: (i) increased level of services of strategic roads and north-south linkages; (ii) integrated land, air and sea transport modes; and (iii) development of Clark-Subic as a regional tourism hub.

2.99 In physical development terms, the plan adopted the “Enhanced ‘W’ Growth Corridor” spatial strategy (see Figure 2.3.2) with the Clark International Airport and its adjoining cities of Angeles and Mabalacat at the center. Each corridor has a different development strategy: tourism development for the blue corridor in the west; industrial development for the orange corridor in the center; agricultural development of high value crops and agro-forestry for the dark green corridor; and tourism and agricultural development for the east-west light green corridor. “Sustainable land use activities” is

suggested as one of five goals.



Source: Central Luzon in Regional Development Plan (RDP) 2011-2016

Figure 2.3.2 Spatial Strategy of Central Luzon

(3) CALABARZON Regional Physical Framework

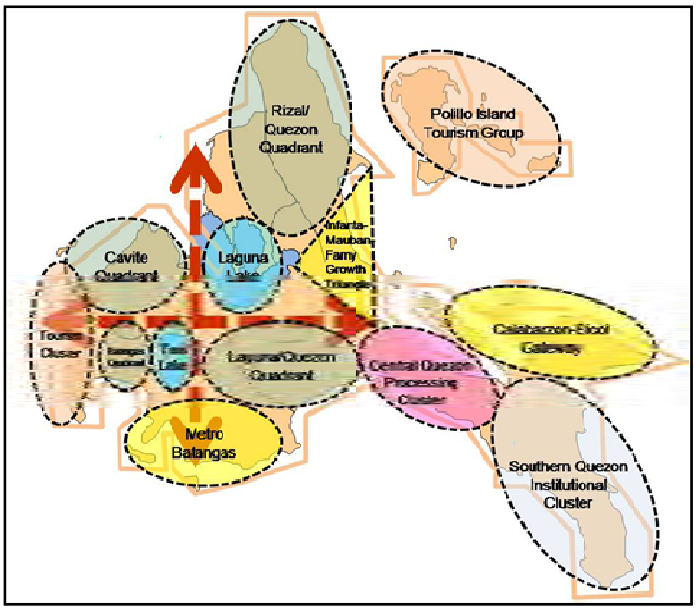
2.100 The CALABARZON Regional Development Plan 2011–2016 aims to realize the vision of the Philippine Global Business Hub by achieving "high and sustained economic growth, equal access to development opportunities, and effective social safety net."

2.101 To realize the region's vision, the plan proposes a spatial development strategy, "the Center/Cluster-Corridor-Wedge (CCW)" to enhance development along the west-east and north-south axes. Table 2.3.1 shows proposed centers, corridors, and wedges in each province. Figure 2.3.3 illustrates the quadrant and cluster spatial framework for the region.

Table 2.3.1 CALABARZON Centers, Corridors and Wedges, per Province

Province	Centers	Corridors	Wedges
Rizal	Antipolo City	Rodriguez, San Mateo, Cainta, Taytay, Angono	Other Municipalities
Laguna	Calamba City	San Pedro, Binan, Sta. Rosa City, Cabuyao, Los Banos,Bay, Sta. Cruz, San Pablo	Other Municipalities
Cavite	DasmarinasCity	Bacoor, Imus, Kawit, GMA, Carmona, Noveleta, Cavite City,Tagaytay, Silang, Rosario, Gen. Trias, Tanza, Trece Martirez City	Other Municipalities
Batangas	Batangas City	San Jose, Bauan, Lipa City, Sto. Tomas, Malvar, Tanauan City	-
Quezon	Lucena City	Tiaong, Candelaria, Sariaya, Tayabas, Pagbilao	Other Municipalities

Source: CALABARZON Regional Development Plan 2011-2016.



Source: CALABARZON Regional Development Plan (RDP) 2011–2016.

Figure 2.3.3 CALABARZON Quadrant and Cluster Spatial Framework

2.102 The Region IV-A strategy seeks compact urban development through cluster development and land use control to prevent sprawl, particularly the spillover from Metro Manila, and to protect agricultural and forest areas. Mixed-use and multi-use communities are encouraged as an appropriate urban development model for walkable community development, traffic reduction, reduction of pollution, efficient land use, and profitable development. Green wedges for agri-tourism, agriculture, forest and leisure areas are proposed as buffer zones and growth boundaries between urbanized areas. The coastal areas in the region will be developed according to the characteristics of each area, i.e., the vicinities of Laguna De Bay for waterfront development, housing, commercial, tourism, and other urban development, and the Taal Lake areas for eco-tourism and recreational purpose.

2.103 The need for land use management was pointed out as a means to balance spatial development and economic development. The plan suggests 10 principles for livable towns and cities and physical development design guidelines as spatial development strategies. Green policies for development, so-called “8Gs of Development,” are emphasized for environmental protection, balanced and high-quality life, and sustainability.

2.104 In acknowledging its share of the Millennium Development Goals, the regional plan sought to provide housing unit for 80% of the population, by hosting relocation sites for informal settlers from Metro Manila and cooperation among LGUs and national government agencies.

(4) Metro Manila Greenprint 2030 Print

2.105 The Metro Manila Development Authority (MMDA) has embarked on creating a green development plan for the metropolis to replace the outdated National Capital Region (NCR) Development Plan. The formulation of the plan started in 2012 and will be completed in June 2013. The MMDA has plotted several goals to be set out in the plan, as follows:

(i) Urban environment that is more conducive for investors, entrepreneurs, and innovators as well as creative minds that will enhance our competitive vis-à-vis other cities in Asia;

(ii) Improved coordination among key players, especially the 17 local government units of the NCR;

(iii) Provide a spatial framework to guide the future urban form of the metropolis as well consider the spatial framework of neighboring areas in the CALABARZON and Central Luzon regions; and

(iv) Provide primary infrastructure, green systems and the clustering of economic activities to improve livability.

Table 2.3.2 Existing Comprehensive Land Use Plans of LGUs

LGUs		No. of LGUs	Latest CLUP Approved Year (No. of LGUs)						Not Prepared/ Disapproved (No. LGUs)	Provincial CLUP Approved Year
			1980s	1990-1994	1995-1999	2000-2004	2005-2009	2010-		
Metro Manila		17	0	0	0	11	1	4	0	-
			0.0%	0.0%	0.0%	70.6%	5.9%	23.5%	0.0%	-
Region III (Central Luzon)	Aurora	8	0	1	0	4	0	1	2	2002
	Bataan	12	0	1	0	11	0	0	0	2002
	Bulacan	24	6	4	5	6	2	0	1	2002
	Nueva Ecija	32	1	1	2	26	2	0	0	-
	Pampanga	22	1	0	0	11	8	0	2	1999
	Tarlac	18	0	1	1	15	1	0	0	2001
	Zambales	14	1	0	7	5	1	0	0	2001
	Sub-total	130	9	8	15	78	14	1	5	-
			6.9%	6.2%	11.5%	60.0%	10.8%	0.8%	3.8%	-
Region IV-A (CALABARZON)	Batangas	34	3	0	2	22	5	0	2	1999
	Cavite	23	1	1	2	16	3	0	0	2006
	Laguna	30	1	0	2	22	3	0	2	2002
	Quezon	41	2	0	4	33	2	0	0	-
	Rizal	14	0	0	0	13	1	0	0	2000
	Sub-total	142	7	1	10	106	14	0	4	-
			4.9%	0.7%	7.0%	74.6%	9.9%	0.0%	2.8%	-
Total		289	16	9	25	196	29	5	9	-
			6.0%	4.1%	9.5%	65.4%	10.3%	1.4%	3.3%	-

Source: HLURB.

3) Spatial Development Strategies for the Three Regions

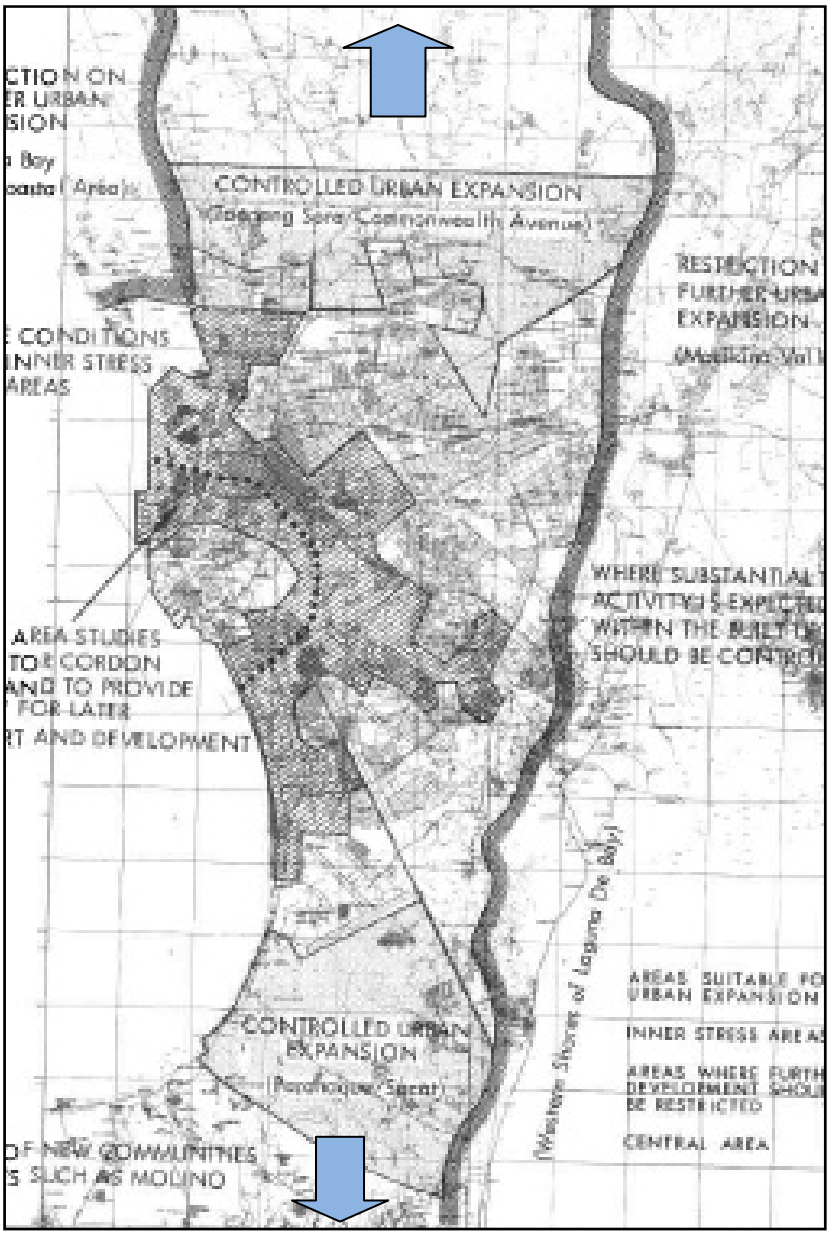
(1) Not an Island, but Part of the Main

2.106 Metro Manila hardly has any space for expansion of its urban area since most lands are already densely populated. 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 of hazard risk clearly indicates that urban area expansion should be directed to the north-south where hazard risk is low to moderate

2.107 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

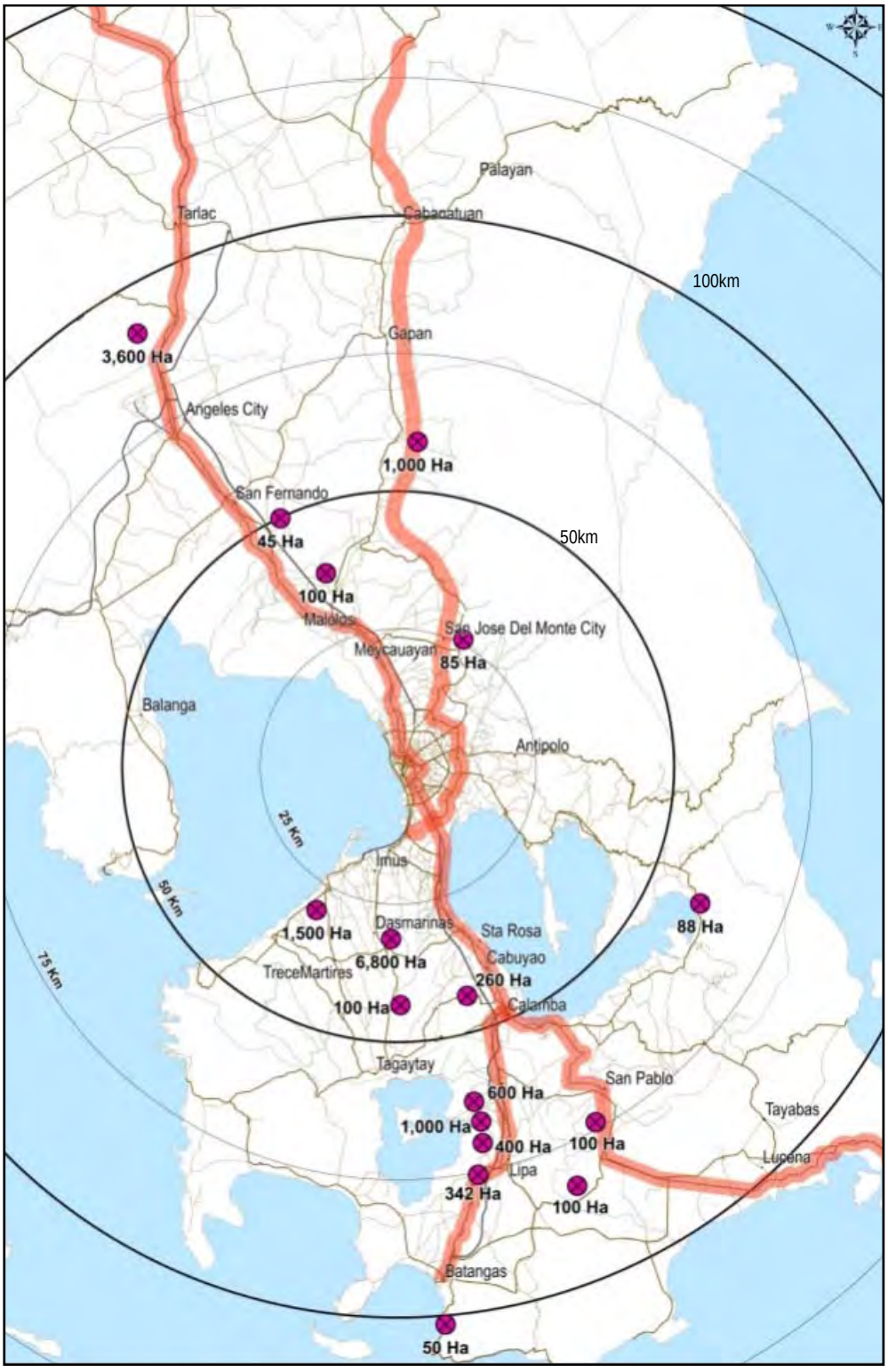
various hazards. (see Figure 2.3.4)

2.108 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 and 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.



Source: MMETROPLAN (World Bank, 1977).

Figure 2.3.4 Recommendation of Metro Plan on Expansion and Management of Urban Areas in Metro Manila



Source: JICA Study Team as compiled from CREBA information, 2013

Figure 2.3.5 Locations of Potential Large-scale Private Properties for Possible Planned Development of New Towns/Urban Areas

2.109 The development of Metro Manila should be planned and managed in conjunction with, and in relation to, the adjoining regions of Central Luzon and CALABARZON, as well as the leading role of the combined regions vis-a-vis the Philippines. From an economic standpoint, the region is the economic powerhouse that drives the country and attracts in-migration. The inflows have its advantages and disadvantages. it provides a large talent pool that sustains growth, but also strains the infrastructure and natural endowment of the region – which, if not properly managed can zap its competitiveness. While its economic base is predominantly of the secondary and tertiary industries, it cannot forsake its rich agricultural periphery that provides sustenance and preserves ecological balance. Thus, the spatial structure must delimit the built-up areas to lands least vulnerable to natural hazards and which avoid impinging on environmentally-sensitive and agriculturally-productive areas. This structure should then become the basis for local government units in formulating their respective land use plans and zoning ordinances. Complementation within the three regions should therefore be enhanced by a multi-modal and hierarchical transport network.

2.110 An inherent part of the vision is inclusive growth, which is only possible via employment generations from manufacturing and tourism activities in these 3 regions. The locations for these are already apparent, but not the places for affordable housing for those to be employed in these activities as well as those to be relocated (but could not be re-settled within NCR). To ensure mobility and access to employment opportunities, especially for the population farther from the high-density core of Metro Manila, an inter-urban or suburban mass transport system must be put in place. This means mass transit backbones from north to south, supplemented by expressways.

(2) Spatial Concept

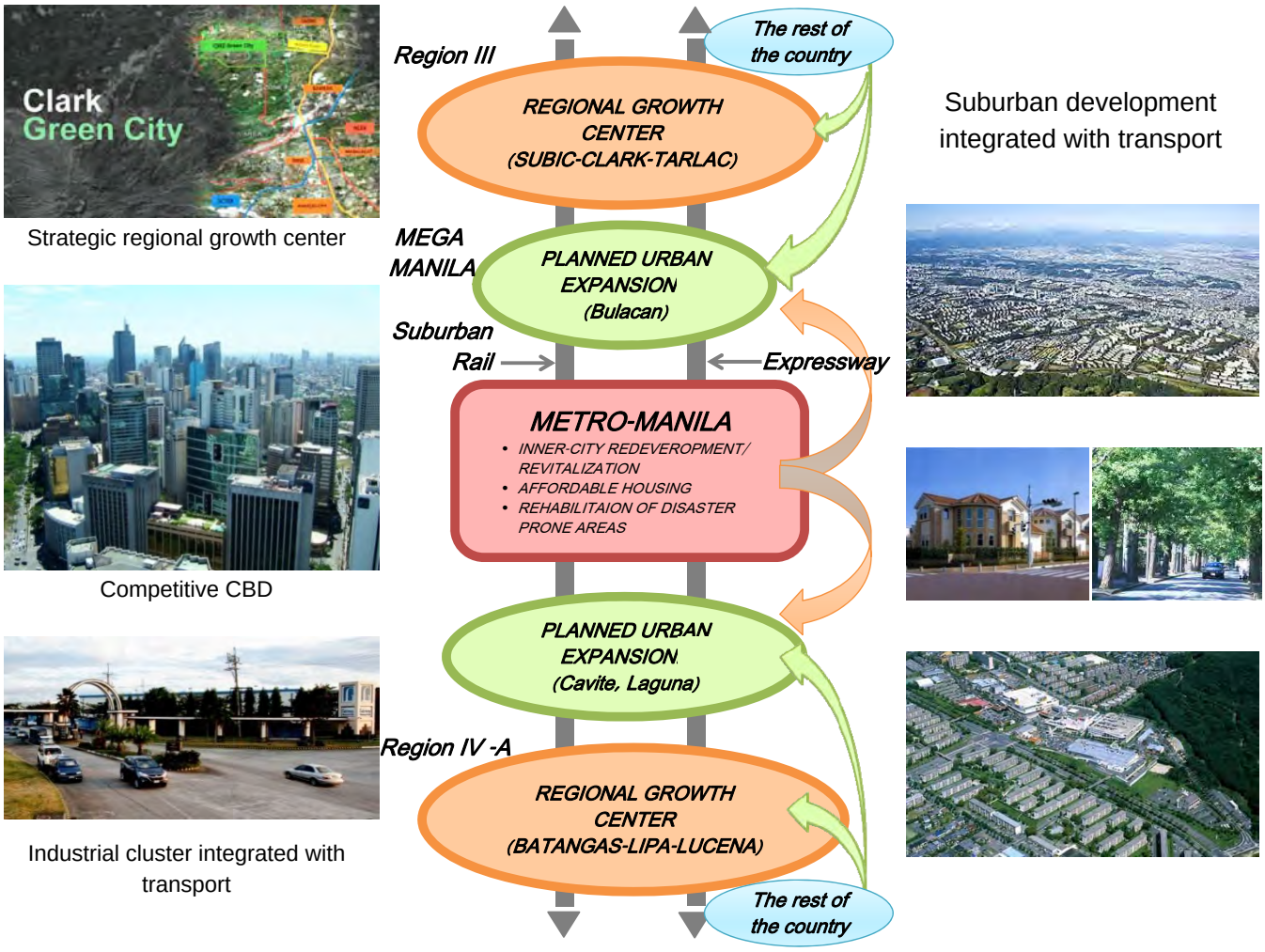
2.111 The re-development and revitalization of the urban core, as well as the old town centers of provinces in Regions III and IV-A, are occurring mostly due to private sector initiatives. What the government can do is enhance the transformation by investing in the appropriate infrastructure – transport and other public works, and lowering the barriers against consolidation of small and blighted parcels into a size and scale where aggregation economics would apply.

2.112 It is in the urban fringe, in the development of new growth centers, where the public sector can probably exert a greater influence. Most of the transport infrastructure in these emerging areas are still not clear, and the complementary services and housing facilities still missing. The affected or host LGUs can therefore leverage the entry of private developers to create a more balanced and integrated community where the development benefits are shared and distributed, rather than fenced in enclaves. Delineating the future road network, and protecting their right-of-way, may well be more effective than the current emphasis on land use zoning which are rarely enforced. At the local levels, connectivity between subdivisions and other property ventures (which, in practice, gets developed in a fragmented manner) should become the focus.

2.113 Core concept is that the region is broadly classified into five clusters (see Figure 2.3.6), which are connected firmly with strong transport axis. 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.

2.114 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.



Source:JICA Study Team

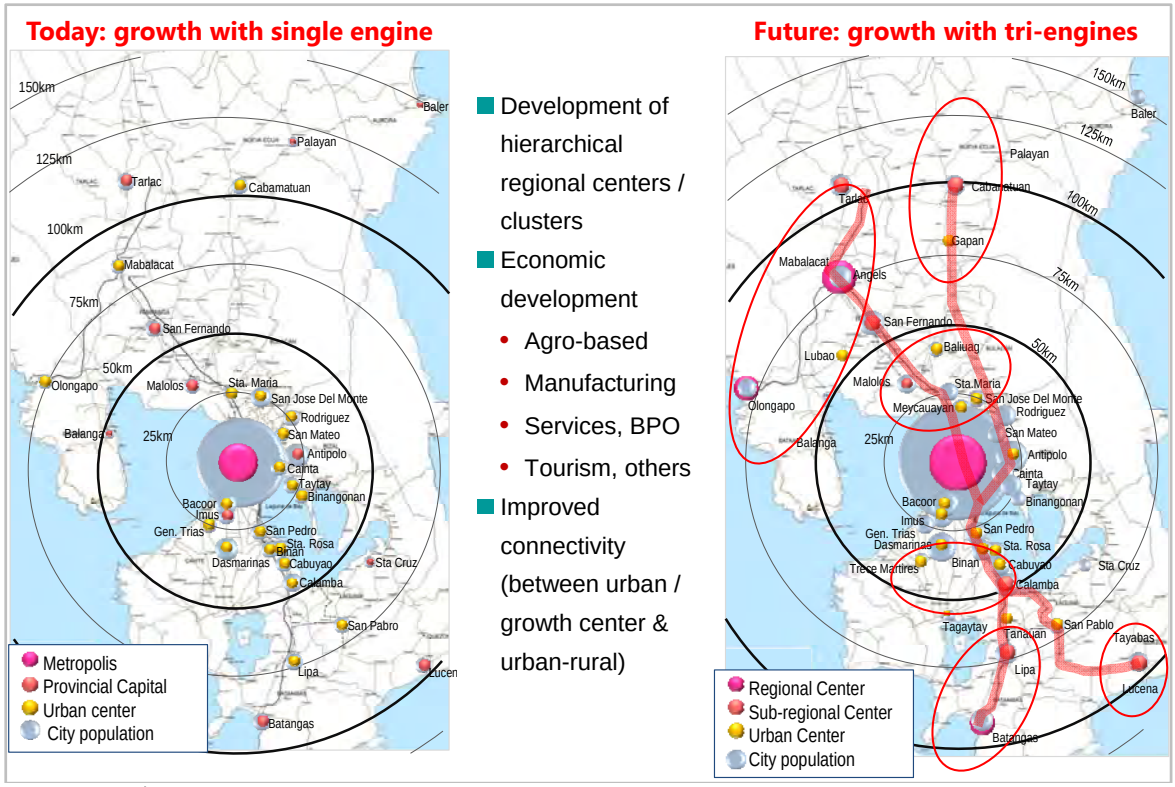
Figure 2.3.6 Proposed Spatial and Transport Framework for GCR

(3) Proposed Spatial Structure in GCR

2.115 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.

2.116 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.

2.117 The urban centers and clusters should be developed hierarchically to decentralize and complement the functions of each urban center and cluster. The proposed urban centers and their functions are as follows (see Table 2.3.3).



Source: JICA Study Team.

Figure 2.3.7 Proposed Development Concept and Structure for GCR

Table 2.3.3 Proposed Urban Centers in GCR

Hierarchy	Functions	Region III	Region IV-A
Regional Centers	Regional centers are the core cities of emerging metropolitan regions which shall serve as a leading center of economy, industry, government, culture, and various activities in the region beyond administrative boundaries. They shall be self-sustained by developing diverse industry and services, higher education, advanced health services, and cultural and entertainment facilities and activities. The centers will be a regional hub of transport network, located within 100 km away from Metro Manila, connected to the world, Metro Manila and other regional centers through an international gateway, expressways, and railways. The urban center shall be developed aiming mixed use and mid-/high-rice development with attractive urban amenity.	Metro Clark (San Fernando, Angeles City, Mabalacat City, and Porac)	Metro Batangas (Batangas City, Lipa City)

Hierarchy		Functions	Region III	Region IV-A
Sub-Regional Centers	Provincial Capitals	Sub-regional centers are expected to be the center at the sub-region or provincial level, by providing a wide range of services and facilities, including employment opportunities, residence, education and health services, cultural activities, and administrative functions. These centers are existing urban centers located approximately 50km away from a regional center and connected to regional centers or Metro Manila by expressways, arterial roads and other mode of transport. A balanced development and sustainability would be pursued in these centers	Malolos Tarlac	Sta Cruz Lucena
	City Centers		San Jose Del Monte Cabanatuan Olongapo	Dasmarinas Tagaytay Calamba Lipa
	Municipal Centers		San Miguel	
Potential New Urban Centers		New urban centers will be residential towns equipped with employment opportunities. They will be connected to commuter railway or expressway to Metro Manila, with emphasis on access to public transport.	Malolos San Jose Del Monte	Dasmarinas Tanauan Lipa
Provincial Capitals		Regional capitals serve as the capital of the government, economy, and services of a province	Iba Palayan Baler	Antipolo Imus
City Centers		City centers serve as the center of the government, economy, and services of a city.	Meycauayan Balanga Mabalacat Santa Rosa	Cavite TreceMartires Cabuyao Tanauan San Pablo Tayabas
Municipal Centers		Municipal centers serve as the center of the government, economy, and services of a municipality.		

Source: JICA Study Team.

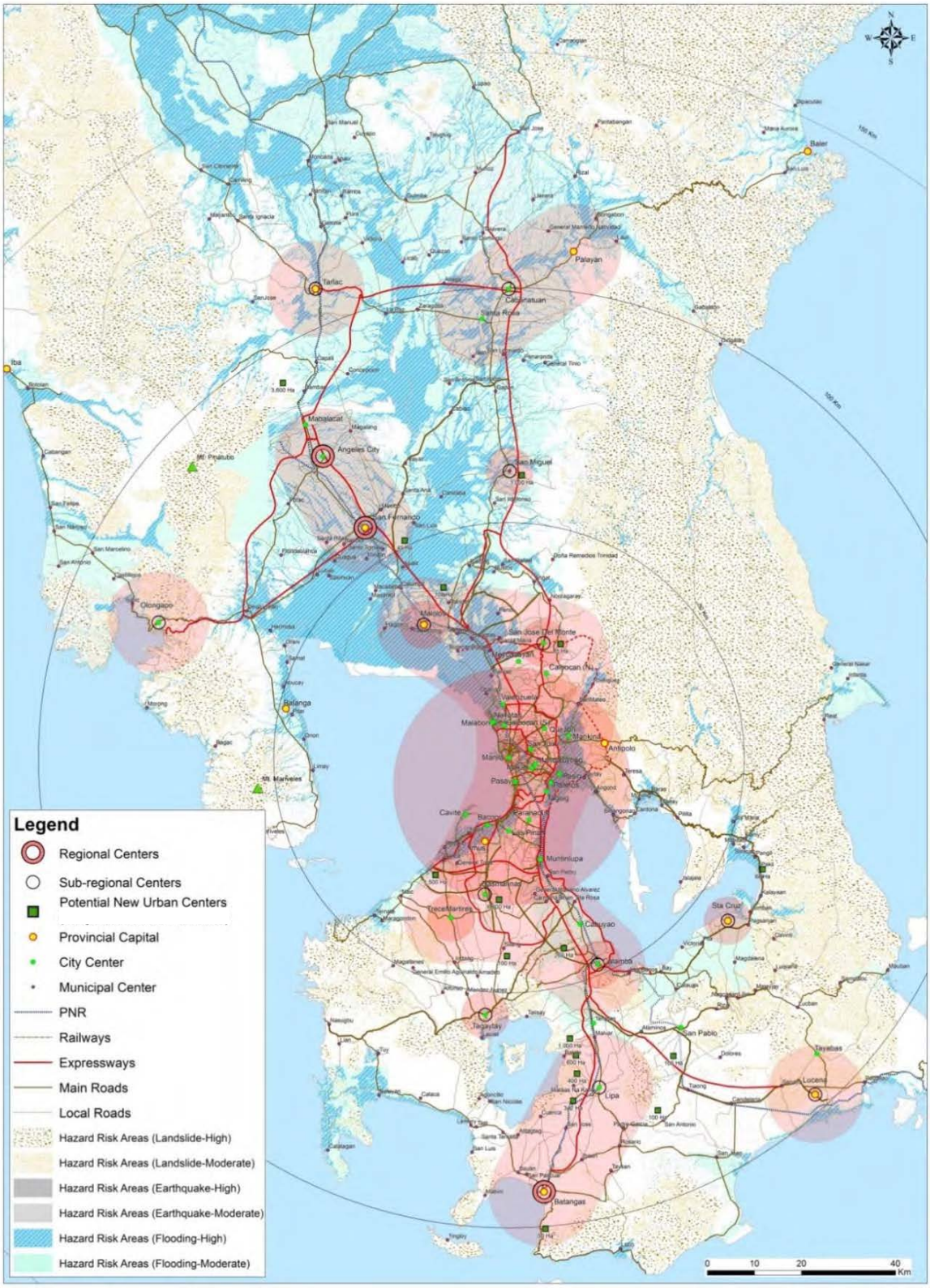
Table 2.3.4 Economic Potentials of Urban Centers

Region	Metro Areas	Major Industries and Strengths
Central Luzon	Metro Tarlac, Tarlac	Tarlac City: a major bus stop for buses going to Baguio and Northern Philippine cities. Economy is driven by commercial centers and food stores. It has the potential to grow its economy as it shifts to higher value agri-based products and manufacturing which can locate in the Tarlac Special Economic Zone since its connection by a highway to the Clark International Airport.
	Metro Cabanatuan, Nueva Ecija	Trading hub of agricultural products from surrounding areas. The costs of transporting rice to Metro Manila could be reduced if the roads connecting Metro Cabanatuan to the NLEX could be widened. Farm to market roads would help reduce the spoilage and transport costs from farms to mills.
	Metro Clark, Pampanga	Angeles City, Pampanga: Business Process Outsourcing (BPO), American IT companies. Angeles City has the Clark Special Economic Zone and the Clark International Airport. It has the largest university in Central Luzon, Holy Angel University. It can harness its pool of educated workforce into Business Process Outsourcing companies. It is the food center of Pampanga province which has 83 restaurants driven by excellent culinary expertise. It could be an educational center for training world-class chefs. San Fernando City, Pampanga: Manufacturing (food processing of tocino and longanisa, and host to bottling plants of liquor and softdrink companies). Its lantern industry (which manufactures large lanterns) has become a tourist attraction. Having a high speed rail or bus rapid transit system or a combination of both could make the Clark International Airport a viable alternative for tourists and air passengers coming from Metro Manila. It will also strengthen the logistics hub that drives its economy. It also broadens the jobs opportunities of both Metro Manila and Pampanga workers.
	Metro Olongapo	Has the Subic International Airport and is positioned to be a major international logistic hub Subic Bay Freeport Zone: contains 700 locators including Hanjin Heavy Industries and Construction, a shipbuilding facility. Ecotourism revolves around an open-sea marine park, a zoo and the Pamulaklakin nature park. The connection through the SCITEX of Metro Olongapo and Metro Angeles makes it more likely to tap the full potential of the logistics hubs of both metros.

Region	Metro Areas	Major Industries and Strengths
	San Miguel-San Ildefonso, Bulacan	San Miguel: Tourism (Madlum Caves and River, a UNESCO heritage site), Biak-na-Bato (the Aguinaldo cave was the headquarters of Emilio Aguinaldo and the First Philippine Republic)
	Malolos-Meycauayan	Meycauayan: Fine Jewelry Manufacturing, Leather Tanning/Services There is a potential here to strengthen the jewelry manufacturing industry into a vibrant jewelry industry cluster which would include jewelry making tourism wherein tourists would visit various jewelry manufacturing sites.
	San Jose del Monte	San Jose del Monte City: the economy is driven by 60 commercial pig and poultry producers. The poultry producers include RFM, Vitarich and FELDAN.
CALABARZON	Antipolo-Cainta, Rizal	Antipolo City: Tourism centered around the Antipolo Cathedral. Serves as a residential community to those who work in Metro Manila. Tourism centered on the Antipolo Cathedral as the pilgrimage hub. It also serves as a residential community for those who work in Metro Manila. Strengthening the transport corridor between Metro Manila and Antipolo city can improve its tourism industry.
	Dasmarinas-Bacoor	The municipalities of Dasmarinas, Bacoor and Imus serve as residential communities to those who work in Metro Manila and in the economic zones in Cavite. Jobs could be opened to workers in this metro area when the road that connects the coastal road to the Hamilo coast is completed. These jobs would include hotel and restaurants service workers.
	Calamba-San Pedro, Laguna	Calamba City, Laguna: tourism (250 hot spring resorts), manufacturing (in 9 economic zones); Calamba City has the benefit of tapping university graduates from nearby University of the Philippines Los Baños. Sta. Rosa, Laguna: automotive parts (4 auto manufacturers, Toyota, Honda, Ford and Nissan hire 2,908 workers). Sta. Rosa has 3 master-planned communities of Nuvali, Eton and Greenfield City, has four economic zones Cabuyao City, Laguna: hosts manufacturing operations of Nestle Philippines, Asia Brewery Inc., San Miguel Corporation, Tanduay Distillers and Wyeth Philippines, has one economic zone San Pedro City, Laguna: a newly proclaimed city that serves as a residential community for those who work in Metro Manila. This area has the potential to be a central business district which could help decongest Metro Manila. Improving its transport connections to workplaces to economic zones in Cavite and Laguna would improve its productivity and livability.
	Metro Batangas/ Lipa	Batangas City: has the Batangas International Seaport. It is positioned to be a logistics hub. Lipa City: Tourism centered on pilgrimage tourists visiting Our Lady of Mt. Carmel Church and farm-based resorts Lipa City has the potential to be a center of agribusinesses based on high value crops such as coffee. The Batangas International Seaport could service the area south of Metro Manila. Thus there is a need to improve the transport network in Laguna particularly those normally congested roads that pass towns and cities around the Laguna de Bay as well as those that connect to the Cavite metro areas of Dasmarinas-Bacoor.
	Metro Lucena	Lucena City: Its economy is driven by agro-based production agro-based products which include coconut oil, milled rice, bamboo and rattan furniture. It has the potential to export coconut water to the US market which sees it as a health drink. It would help to widen the roads that connect Metro Lucena to the Batangas International Seaport because it would cut the cost of transporting its exports of coconut water and desiccated coconut for example.
Other Areas with populations less than 200,000	Nasugbu to Calatagan coastal corridor	This western coastal corridor is home to a tourist industry based on beach resorts. Widening the roads connecting these towns to Tagaytay city would go a long in reducing the travel time. Completing the extension of the Cavite coastal road into Hamilo coast would cut the travel time even further as it would allow those from Metro Manila to pass through the coastal road. The traffic management of the coastal road needs to be improved.
	Tagaytay City	Tourism is centered around the main attraction of the view of Taal Volcano and Lake plus the temperate climate. High value Agriculture products such as coffee, cut flowers and vegetables are grown in this city and the adjacent towns. Widening the ridge road plus constructing a circumferential road to bypass the ridge road will cut the travel time of tourists going to the beach resorts in Nasugbu, Matabungkay and Calatagan.

Region	Metro Areas	Major Industries and Strengths
		Improving the connections to the Silang-Cavite Highway via east-west expressways would also provide an alternative route for tourists going to Tagaytay.

Sources: Developed from various web pages of City Governments.



Source: JICA Study Team.

Figure 2.3.8 Proposed Spatial Structure of GCR

Source: JICA Study Team.

Figure 2.3.9 Proposed Spatial Structure of Mega Manila

Box 2.3.1 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.

Area Classification		Classification of Urban Planning
Boundary of Tsukuba Science City		Urban Planning District
Urban area	Science Area	Urbanization promotion area
Research/education facility area		
Residential area		
Surrounding developing area		Urbanization promotion area Urbanization control area

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

3 TRANSPORT DEVELOPMENT STRATEGIES

3.1 Current Transport Infrastructure

1) Road System

3.1 The road system in the study area is classified basically by administrative responsibility. National roads are predominantly constructed and maintained by the Department of Public Works and Highways (DPWH). Most are primary or arterial in functions. Table 3.1.1 gives the total length of national roads in the Greater Capital Region (GCR) as of 2010, showing Metro Manila with the highest road density by area and the lowest density by population. The road network in GCR is shown in Figure 3.1.1 to Figure 3.1.3.

3.2 Local roads, on the other hand, are under the jurisdiction of the local government units (LGUs). Nearly all are secondary and feeder in function. The inventory of these roads is given in Table 3.1.2. Local roads make up 83% of total roads in GCR. Density by area index is 0.70 km/km^2 while the index to population is very low.

Table 3.1.1 National Road Inventory and Density in GCR, 2010

Region & Road Classification		Paved Roads (km)	Unpaved Roads (km)	Total Roads (km)	Road Density Index	
					Area (km/km^2)	Population (km/000)
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
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
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
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

Source: DPWH as reported in the Study of Master Plan on High Standard Highway Network Development in the Republic of the Philippines, JICA, 2010.

Table 3.1.2 Local Road Inventory and Density in GCR, 2010

Region	Local Roads (km)	Road Density Index	
		Area (km/km^2)	Population (km/000)
Metro Manila	3,723.36	6.01	0.3140
Region III	14,511.71	0.66	1.4750
Region IV-A	9,222.04	0.55	0.7313
Total GCR	27,457.00	0.70	0.0008
Philippines	171,981.00	0.57	1.8626

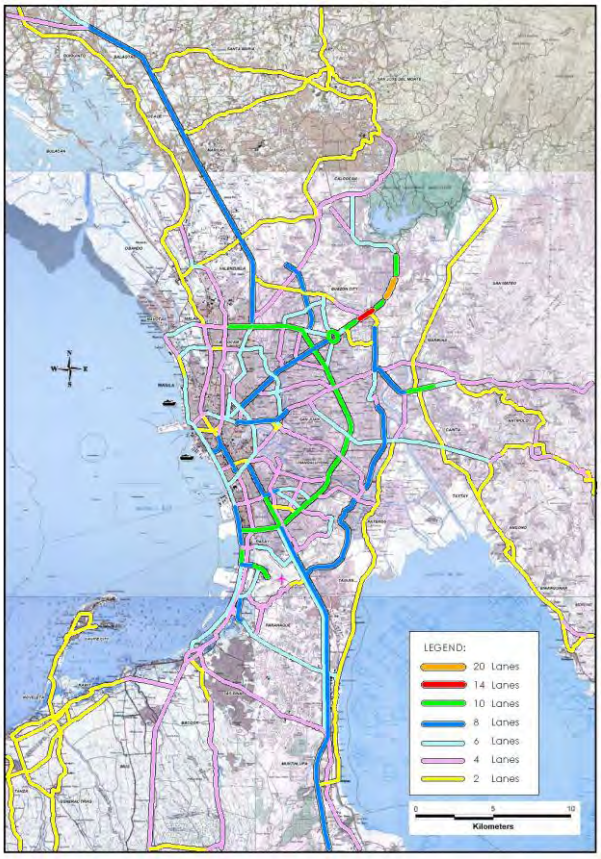
Source: National Statistical Coordination Board.

Source: High Standard Highway Network Development in the Republic of the Philippines, JICA-DPWH, 2010.

Figure 3.1.1 National Roads of South Luzon

Source: High Standard Highway Network Development in the Republic of the Philippines, JICA-DPWH, 2010.

Figure 3.1.2 National Roads of North Luzon



Source: High Standard Highway Network Development in the Republic of the Philippines, JICA-DPWH, 2010.

Figure 3.1.3 National Roads of Metro Manila

2) Rails

3.3 The inter-regional railway network in GCR, or in the entire country for that matter, is composed of one commuter rail transport service provided by the Philippine National Railways (PNR) running from Metro Manila to Legaspi City, south of Luzon (see Figure 3.1.4). The entire system used to be composed of 45 stations on the Manila North Line (MNL) reaching San Fernando of La Union Province and 72 stops on the Manila South Line (MSL) reaching Legaspi, Bicol Province. Today, only the MSL is operational but it experiences frequent stoppages in service due to the poor state of its infrastructure.

Source: Wikimedia Commons, May 2013.

Figure 3.1.4 Philippine National Railways System

3.4 Urban rail systems exist only in Metro Manila. The system consists of three lines operated by the Light Rail Transit Authority and the Metro Rail Transit Corporation as shown in Figure 3.1.5. The main features of the three mass rail transits are given in Table 3.1.3. The three rail lines span 51 km and carry about 1.3 million passengers a day.

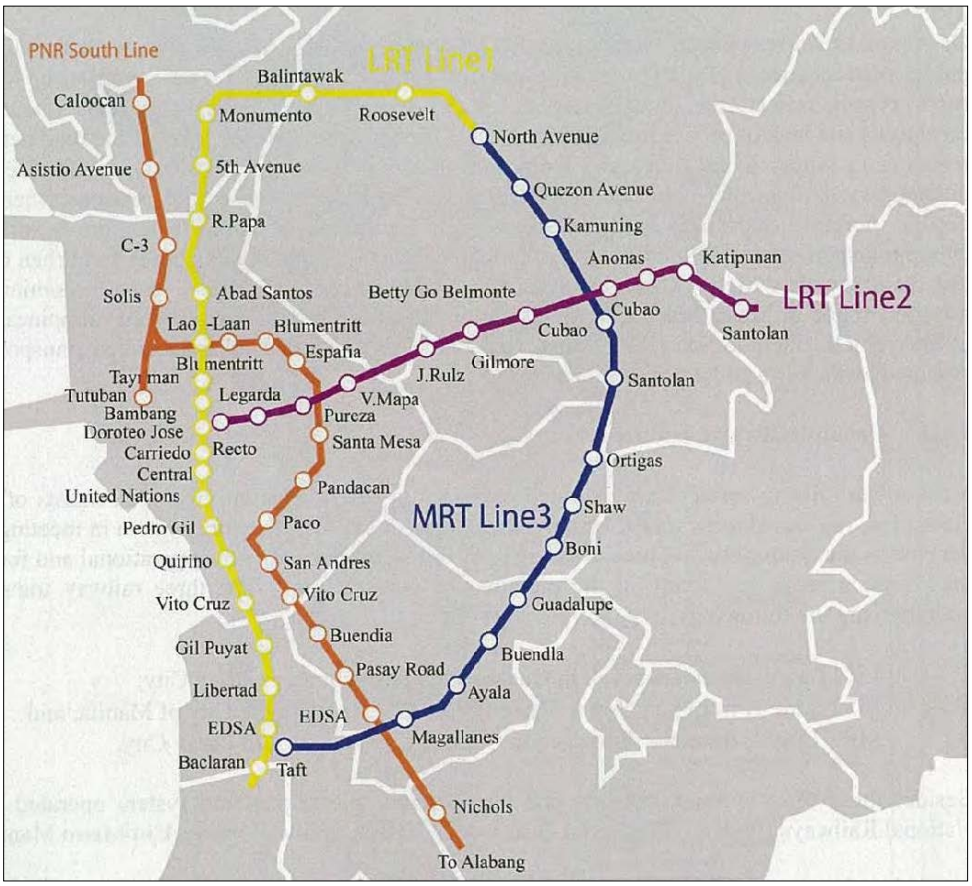
3) Airports

3.5 There are two major airport systems in GCR as shown in Figure 3.1.6. These are the Ninoy Aquino International Airport (NAIA) located within Metro Manila and the Clark International Airport (CIAC) also known as the Diosdado Macapagal International Airport (DMIA) located within the Clark Freeport Zone in Angeles City, Pampanga. Both airports cater to international flights and domestic flights.

Table 3.1.3 Main Features of the Existing Urban Rails in Metro Manila

Item	Line 1	Line 2	Line 3
Structure Type	Elevated track w/ PC-I beams	Elevated PC concrete box girder	Elevated & underground track with PC-I beams
Route Length	13.9 kms+5km (north loop)	13.52 kms	16.9 kms
No. of Stations	20	11	13
Capacity	1,358 pax / train	1,628 pax / train	1,182 pax / train
Max Speed	60 kph	80 kph	65 kph
Scheduled Speed	38 kph	32.8 kph	30 kph
Fare	Distance-wise; min PHP12; max PHP20	Distance-wise; min PHP\12; max PHP15	Distance-wise; min PHP10; max PHP15
Travel Time	27.5 minutes	30 minutes	30 minutes
Headway	112 sec. after Capex 2 projects	Min. 1.5 minutes	Min. 3 minutes
Cost (USD Mil)	USD375, or USD25 per km (PHP3.5 billion as of 1982)	USD850 or USD61.6 per km	USD698 or USD41.3 per km

Source: Preparatory Study for LRT Line 2 Ext. Project, JICA-LRTA, 2011; Updates for Line 3 from 2012 Metro Rail Transit Index.



Source: High Standard Highway Network Development in the Republic of the Philippines, JICA-DPWH, 2010 (as taken from LRTA website).

Figure 3.1.5 Existing Rail Network in Metro Manila

Source: Study on the Airport Strategy for GCR, JICA-DOTC, 2011

Source: Study on the Airport Strategy for GCR, JICA-DOTC, 2011

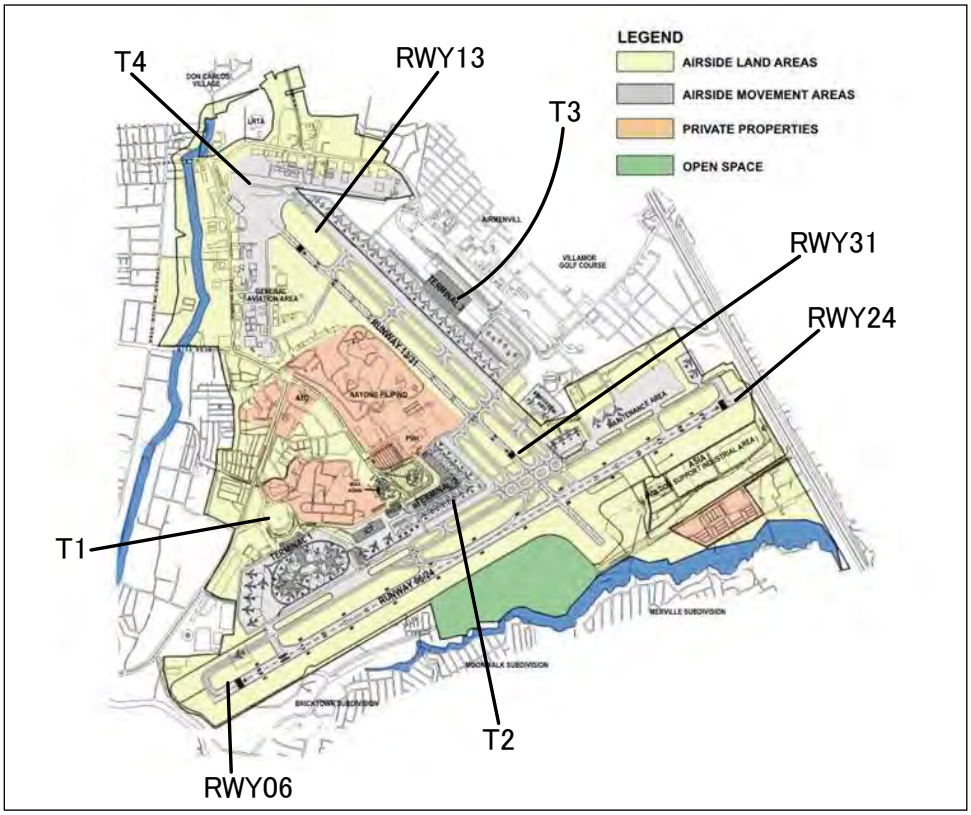
Figure 3.1.6 Location of NAIA and Clark

Figure Error! No text of specified style in document.**.1 Location Map of NAIA and**

(1) Ninoy Aquino International Airport (NAIA)

3.6 NAIA has been and continues to be the gateway international airport of the Philippines, conveniently located approximately 5 km southwest of Makati and approximately 10 km southeast of Manila. The passenger traffic at NAIA rapidly increased from 12.7 million in 2002 to 31.6 million in 2012 at an average annual growth rate of 9.5%. As shown in Figure 3.1.7, there are two convergent runways at NAIA, namely the main runway 06/24 (3,410m x 60m) and the secondary runway 13/31 (1,998m x 45m). Runway 24 and the extended centerline of Runway 13 cross at a point almost one-third along the length of Runway 24, resulting in a capacity

limitation of the runway system because only one aircraft can land or takeoff 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 only). The airport has reached its runway capacity limit in terms of aircraft movements per hour.



Source: Study on the Airport Strategy for GCR, JICA-DOTC, 2011.

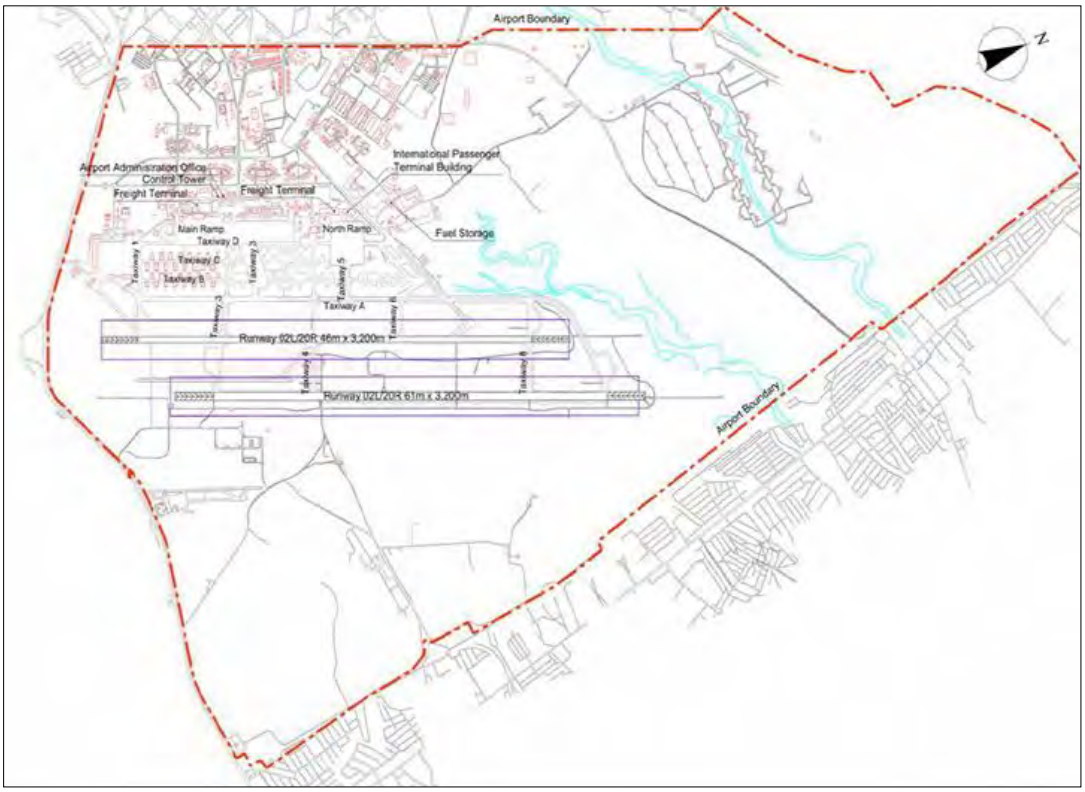
Figure 3.1.7 General Layout of Ninoy Aquino International Airport

(2) Clark International Airport (CIAC)

3.7 Clark International Airport is located approximately 80 kms northwest of Metro Manila. It serves both the GCR and the northern regions of Luzon. From/to Metro Manila, it can be reached using the Subic-Clark-Tarlac Expressway, which is connected to the North Luzon Expressway (NLEX). The airport is currently the hub of Asian low cost carriers. The southern part of the facility is being used by the Philippine Air Force (i.e., Clark Air Base).

3.8 Clark Airport has two parallel runways, namely: the primary runway (Runway 02R/20L) at 3,200m x 60m and the secondary runway (Runway 02L/20R) at 3,200m x 45m (see Figure 3.1.8). The primary runway is equipped with various navigational aids and lighting facilities and has a category 1 precision approach rating. The secondary runway is currently used for Visual Flight Rules (VFR).

3.9 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.



Source: Study on the Airport Strategy for GCR, JICA-DOTC, 2011.

Figure 3.1.8 General Layout of Clark International Airport

4) Ports

3.10 Of the 31 ports listed for Luzon, 14 are found within the GCR area (see Table 3.1.4). The major ports are the Port of Manila, Batangas Port and the Subic Port.

Table 3.1.4 Ports in Greater Capital Region

Name of Port	Location	Province/Region
1. Batangas Port*	Batangas Bay, West Philippine Sea	Batangas / Region IV-A
2. Cavite Port	Canacao Bay, West Philippine Sea	Cavite / Region IV-A
3. Limay (Lamao Port)	Manila Bay, West Philippine Sea	Bataan / Region III
4. Port of Manila*	Manila Bay, West Philippine Sea	Metro Manila / NCR
5. Mariveles Port	Manila Bay, West Philippine Sea	Bataan / Region III
6. Masinloc Port	West Philippine Sea	Zambales / Region III
7. Orion (Capinpin Port)	Manila Bay, West Philippine Sea	Bataan / Region III
8. Subic Port*	Subic Bay, West Philippine Sea	Zambales / Region III
9. Atimonan Port	Lamon Bay, Pacific Ocean	Quezon / Region IV-A
10. Casiguran Port	Casiguran Sound, Pacific Ocean	Aurora / Region III
11. Dingalan Port	Dingalan Bay, Pacific Ocean	Aurora / Region III
12. Infanta (Dinahican Port)	Lamon Bay, Pacific Ocean	Quezon / Region IV-A
13. Real (Puerto Real)	Lamon Bay, Pacific Ocean	Quezon / Region IV-A
14. Lucena Port	Tayabas Bay, Inland Seas	Quezon / Region IV-A

Source: JICA Study Team based on provincial websites, 2012.
* Major ports.

Source: JICA Study Team, MUCEP Project, DOTC (Transport).

Figure 3.1.9 Location of Sea Ports in Greater Capital Region

(1) The Port of Manila

3.11 The Port of Manila is the premier shipping gateway of the Philippines for historical and economic reasons. Located in the vicinity of Manila Bay, the port is the large-scale infrastructure considered a super-hub port of the country.It handles both domestic and international maritime vessels.

3.12 The Port of Manila is located in the City of Manila and 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.

Source: JICA Study Team based on Imagery@2013Aerometrex.

Figure 3.1.10 Location of the 4 Port Groups in Manila

3.13 Table 3.1.5 shows the port traffic in the Port of Manila, Batangas and Subic. Of the 3.15 million TEUs of foreign cargo in 2012, 84% were handled in the Manila port terminals operated by ATI and ICTSI. As to domestic containerized cargo, Manila was also dominant at 51% of the total. In terms of cargo tonnages, the share of Manila was only about 1/5.

Table 3.1.5 Port Traffic, 2012

			All Ports in Philippines	Manila					Batangas	Subic
				South H	North H	MICT	Harbor Ctr	Total MNL		
Cargo	000 MT	Domestic	75,876	1,482	13,543	1,074	940	17,039	7,935	N/A
		Foreign	117,899	6,898	33	18,892	4,659	30,482	12,683	N/A
	Share (%)	Domestic	100	2.0	17.8	1.4	1.2	22.5	10.5	-
		Foreign	100	5.9	0.0	16.0	4.0	25.9	10.8	-
Containers	TEUs	Domestic	2,065	100	866	94	N/A	1,059	8	N/A
		Foreign	3,147	915	0	1,733	N/A	2,647	7	35
	Share (%)	Domestic	100	4.8	41.9	4.5	-	51.3	0.4	-
		Foreign	100	29.1	0.0	55.1	-	84.1	0.2	1.1

Source: PPA, MHPI CEO at skycrapercity.com for Harbor Center, and Port Calls News Asia 2012 Subic Container Throughput.

3.14 The Manila North Harbor is the leading domestic port of the country and is a key hub for domestic commerce. The port covers a total land area of about 52.5 hectares and has a total quay length of approximately 5,200 meters accommodating all types of inter-island vessels. It is currently serving more than 90 sea vessels with its 8 finger, 7 slips between the piers and 41 berthing areas along its piers and slips. Isla Putting Bato is used for smaller cargo vessels and fishing boats. Roll-on/Roll-off areas are available in all piers for all rolling cargoes. Domestic sea routes calling at the port are: (i) Manila–Luzon–Manila; (ii) Manila–Visayas–Manila; and (iii) Manila–Mindanao–Manila.

3.15 The port handles both passengers and cargoes. The volume of passengers is increasing annually from 643,000 in 2011 to 796,000 in 2012 and project to reach 2.4 million in 2018. Modernization projects are ongoing or completed to accommodate forecasted volumes.

3.16 The Manila South Harbor handles the international cargo as well as domestic cargo. The port facilities consist of the International Container Terminal (i.e., Pier 3 and 5 with 7 berths and a 30-hectare container yard) and the Domestic Terminal (i.e., Pier 15 with 5 berths suited for containerized roll-on, roll-off and load-on, load-off operations). The terminal has an annual capacity of 850,000 TEUs.

3.17 The Manila International Container Terminal (MICT) was developed as a dedicated container terminal to mainly handle international containerized cargo. The developed terminal area now measures some 75 hectares and the container yard is 33 hectares. Depth alongside the berths is 12 meters. Starting in 1998, it started to handle bulk and non-containerized cargoes. Again in 2007, it was allowed to service domestic containerized cargo, which resulted in faster movement of cargoes to international vessels and a reduction in cost of clearance and documentation for the shippers.

3.18 Berth 6 of MICT was inaugurated and opened for commercial operations in 2012. The area has a 14-hectare container yard. This increased the capacity of the port to approximately 2.5 million TEUs from the present 1.9 million TEUs. The development of a Berth 7 is underway and is expected to be completed in 2016.

3.19 The Harbour Port Centre is the only Philippine Economic Zone Authority (PEZA)-registered port industrial area. It is a private commercial port of 79 hectares for distribution and logistics. It has a 10-hectare multi-purpose port terminal. The port handles foreign vessels transporting non-containerized cargoes and all types of domestic vessels shipping both containerized and non-containerized cargoes. The working apron of the port has a combined length of 1,105 m for the north and south ports with drafts berth of 11.5 m MLLW. The quay can accommodate about 12 vessels at a time depending on the vessel size or length. There are basically two terminals at the port, i.e., the San Lazaro Terminal with 1 quay and the Sta. Rita Terminal with 8 berths.

3.20 Although the ports in Manila are under the Philippine Ports Authority (PPA), each group has been contracted out to private concessionaire. The Manila North Harbour Port Inc. (MNHPI) operates the domestic-only Manila North Harbor; while the Asian Terminals Inc. (ATI) operates the Manila South Harbor. The MICT, on the other hand, is handled by the International Container Terminal Service, Inc. (ICTSI).

(2) The Port of Batangas

3.21 Batangas Port is located about 2 km from the city proper of Batangas City and approximately 110 km from Metro Manila. It lies on the northeast section of Batangas Bay along the south-western part of Luzon. Access is through a national road passing Batangas City and the Star Tollway connecting to South Luzon Expressway (SLEX) to Metro Manila. The port was built to complement the Port of Manila.

3.22 The port occupies a total area of 150 ha. It serves as the strategic trading point for all industries in the CALABARZON area. Agricultural products, logs, cement, copra, and completely built units (CBUs) of automotive vehicles dominate the port traffic. Port capacity for container traffic is at 300,000 TEUs.

3.23 In 2010, ATI was awarded a 25-year contract for management, operation, development and promotion for container terminal 'A-1' in Phase II of the Port of Batangas.

(3) Subic Port

3.24 Subic Port is located within the Subic Bay Freeport Zone (SBF) in Region III. The port used to be the former U.S. Naval Base but is now a major cruise and transhipment hub. It is the Philippines' first free port, which continues to be a major economic engine with more than 700 investment projects in the area. Currently, port facilities are being upgraded through the Subic Bay Port Development Project (SBPDP) and ties are being forged with the Clark Special Economic Zone in Pampanga to form the Subic-Clark Corridor via the 45 km Subic-Clark Toll Road.

3.25 Subic Bay Freeport is 110 km north of Metro Manila. The Subic Bay area is surrounded by mountain ranges and has a deep natural harbor of 13.7 m. These features make the port protected from typhoons. 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.

3.26 A new container terminal with two berths is now being constructed through the SBPDP. The two new berths have a total capacity of 600,000 TEUs, enough to accommodate all types of sea vessels from small crafts, commercial yachts, ferry boats to container vessels, cargo ships, oil tankers and aircraft carriers.

3.27 The Subic Bay International Terminal Corporation, which is a joint venture company of ICTSI and the Royal Ports Services, Inc., has signed a concession agreement with Subic Bay Metropolitan Development Authority (SBMA) for the management, operation and development of the Container Terminal located at the Freeport's CubiPoint.

3.2 Current Transport Services

1) Motorization

3.28 One sign of growth in transport demand is following the supply of vehicles registered per year (see Table 3.2.1). For GCR, there is a high yearly growth of all types of vehicles used for private and public transport with average yearly increase of 6%. In terms of the share in the national count, 56% of the country's registered vehicles are found in just the 3 regions making up the study area. Vehicles that are more of the private use types are especially high in number with about 77% cars and 73% SUV of national total found in GCR alone.

Table 3.2.1 Number of Registered Vehicles in GCR from 2007 to 2011

Vehicle Type	2007	2008	2009	2010	2011	AGR (%)
Cars	575,925	591,070	593,775	619,970	639,039	2.19
Utility Vehicles	1,019,740	1,004,479	1,015,616	1,051,241	1,063,456	0.86
SUV	143,255	146,827	160,930	190,648	207,762	9.01
Buses	16,649	16,984	19,960	23,092	23,330	8.03
Trucks	125,226	135,412	144,745	144,575	148,095	3.65
MC/TC	1,224,365	1,425,905	1,559,836	1,679,571	1,876,486	10.65
Trailers	15,863	16,781	19,518	19,996	22,490	8.36
Total GCR	**3,121,023**	**3,337,458**	**3,514,380**	**3,729,093**	**3,980,658**	**5.51**
Philippines	5,530,052	5,891,272	6,220,433	6,634,855	7,138,942	5.82
GCR % to Phil.	56%	57%	56%	56%	56%	

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

Table 3.2.2 Number of Registered Vehicles by Type in GCR, 2011

Area	Cars	Utility Vehicle	SUV	Buses	Trucks	MC/TC	Trailers	Total
Metro Manila	446,106	575,614	156,188	13,345	72,121	734,465	16,911	2,014,750
Region III	87,682	239,239	27,137	4,949	48,031	556,228	4,419	967,685
Region IV-A	105,251	248,603	24,437	5,036	27,943	585,793	1,160	998,223
GCR	**639,039**	**1,063,456**	**207,762**	**23,330**	**148,095**	**1,876,486**	**22,490**	**3,980,658**
Philippines	828,587	1,748,402	284,099	34,478	329,385	3,881,460	32,531	7,138,942
GCR% to Philippines	77%	61%	73%	68%	45%	48%	69%	56%

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

2) Road-based Transport

3.29 Buses, jeepneys and Asian Utility Vehicle (AUV) basically comprise the road-based public transport services in the GCR, which are all owned and operated by the private sector but regulated by the Land Transportation Franchising Regulatory Board (LTFRB). Based on the franchise records of LTFRB, there are 3,000 units servicing intra-city trips with operational franchises. Records show another 2,200 with expired franchises although it is common practice that these are easily extended when applied for. In totality, the number of buses for intra-city operations in GCR is about 5,000 buses (see Table 3.2.3) 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 3,300unit, and another 4,000 in the southern regions. DOTC stated 7,736 buses in its justification for establishing common provincial bus terminals to replace the individually-owned terminals within the metropolis.

3.30 Jeepneys, with their urban carrying capacities ranging from 18 to 22, are more for

the intra-city service. The jeepneys, which numbers more than 70,000 in the GCR area, are patronized by the low and middle income strata and carry more than 40% of daily trips in the metropolis. About half of the jeepney population in the 3 regions is catering to the metropolis alone.

3.31 The AUVs (also includes Filcab or FX) is of recent origin. It functions as a shared taxi and has been found convenient by office-bound employees. Both the jeepneys and AUVs provide only intra-city services in GCR. .Refer to Tables 3.2.3 and 3.2.5.

3.32 A smaller version of the jeepney is the so-called multi-cabs with seating capacity of 12. This type of public transport runs on shorter routes and are found in the reclamation area of Metro Manila and in the urban areas of Regions III and Region IV-A.

Table 3.2.3 Buses in GCR, 2012

Service Type	Service Coverage	No. of Units	
		Operational Franchise	Expired Franchise
Intracity	NCR	2,243	1,417
	Bulacan	510	347
	Cavite	46	68
	Laguna	175	229
	Rizal	116	180
	Sub-total	3,090	2,241
Intercity	CAR	300	121
	Region 1	537	446
	Region 2	261	121
	Region 3	1,040	556
	Sub-total North	2,136	1,244
	Region 4A	1,626	801
	Region 4B	160	26
	Region 5	501	377
	Outside Luzon	520	436
	Sub-total South	2,807	1,640

Source: JICA Study Team based on LTFRB records, 2012.

Table 3.2.4 Public Utility Jeepney (PUJ) in GCR, 2012

Service Type	Service Coverage	No. of Units	
		Operational Franchise	Expired Franchise
Intracity	NCR	34,522	-
	Region 3	27,581	500
	Region 4A:		
	Cavite	2,066	14
	Batangas	2,028	20
	Laguna	3,448	44
	Quezon	515	4
	Rizal	650	12

Source: JICA Study Team based on LTFRB records, 2012.

Table 3.2.5 Utility Vehicle (UV) in GCR, 2012

Service Type	Service Coverage	No. of Units	
		Operational Franchise	Expired Franchise
Intracity	NCR	5,691	263
	Region 3	341	26
	Region 4A	451	11

Source: JICA Study Team based on LTFRB records, 2012.

3.33 Taxis are plentiful in the metropolis, as compared to the adjacent regions, and serve the urban areas of Mega Manila only. They are also regulated by the LTFRB and the Land Transportation Office (LTO). They have the same yellow license plates as other public transportation mode but the character of its use is akin to a private car providing door to door service. Fares are higher than other public mode and determined by a meter system (flag down + distance fare) or at times through negotiation. Seating capacity is normally 4 persons but new models are introduced with slightly higher capacities.

3.34 At the low end of the public transport spectrum is the tricycle (motorcycle with a sidecar) and a pedicab (bicycle with sidecar) providing transport service for short distance trip or acts as a feeder from residential communities or subdivisions to arterial roads. Estimated to number 200 thousand in NCR alone, they are rated for 3 passengers but are often seen carrying more. In Region III and IV-A, this type of mode are still important and play a bigger role compared to Metro Manila where the tricycles are restricted to only a few areas. It is the local government units (LGUs) that are responsible for regulating this public transport mode. About 48% of national total of tricycles and motorcycles are found in GCR, as shown in Table 3.2.2.

3) Rail-Based Public Transport

3.35 Among the 4 railways existing in the study area, only PNR has a coverage stretching across the 3 regions of GCR. However, its service is erratic and is reflected in fluctuating volumes of passengers. At present, only the south commuter line is in operation – albeit of limited frequency. A project to re-open the north commuter up to Malolos (30 km north) was derailed, and has not yet been re-started.[1]

3.36 Patronage of the 3 urban rails in Metro Manila is high, as shown in the table below. This observed ridership is used in the modelling process to set up the forecast for overall demand (see Technical Report 2).

Table 3.2.6 Existing Rails and Ridership in Mega Manila

Urban Railway Line	Daily Railway Passengers, 2012
Line 1 – Baclaran to Roosevelt (20.5km)	518,600
Line 2 – Recto to Santolan (13.5km)	212,000
Line 3 – Taft to North Avenue (17km)	570,000
PNR South Commuter- Tutuban to Alabang (28km)	46,700

Source: Statistics from LRTA, DOTC, and PNR.

4) Water Transportation

3.37 The Pasig River ferry has undergone three revival attempts in the last two decades – all of them ending in failure. A shipping company, Magsaysay Lines, started

[1] Demand analysis provided in Technical Report 2.

operating during the year 1990 from Guadalupe (in Makati)to Escolta (in Manila), or a route of 15 km. Stations were basic river-side sheds. After one year, it folded for lack of patronage – aside from the difficulties of navigating through water lilies, garbage and other debris clogging the waters.

3.38 In 1996, another ferry service was launched. The Starcraft Ferry deployed 30 units of catamaran-type boats with a seating capacity of 30 people (and air-conditioned to shield passengers from the foul smell of the river). It was complemented by a River Taxi that offers a seating of 12.The route stretched from Bambang in Pasig City down to Escolta in Manila (a total of 16.2 km). Like its predecessor, the Starcraft Ferry only lasted for a year and called it quits in 1997.

3.39 The 3rd attempt was inaugurated the service on 14-February 2007 graced by then President Gloria Macapagal-Arroyo. A private group -Nautical Transport Services Inc. got the contract from DOTC. Starting with five stations (Escolta, PUP, Sta. Ana, Hulo and Guadalupe), the system expanded to 14 stations after one year. Unlike the previous two attempts, this one used 10 boats of bigger capacity (~150pax) and had stations with passenger amenities such as toilets, ticketing system, waiting seats and security guards. At its peak, the ferry had 17 stations and 2 lines. The first line was the Pasig River Line which stretched from Plaza Mexico in Intramuros, Manila to Nagpayong station in Pasig City. The second line was the Marikina River Line which served the Guadalupe station in Makati City up to Santa Elena station in Marikina City.

3.40 After a year of poor traffic, the number of passengers picked up to the point that NTSI considered purchasing more boats. This service was also promoted by the Pasig River Rehabilitation Commission (PRRC) to highlight the importance of the environment to the people of Manila.

3.41 Through its entire operation, the ferry service changed their trip schedules several times. Each boat has a 30-minute, 1-hour, 2-hour and 3-hour trip intervals depending on the time of the day. Rush hours tend to have shorter boat intervals while off-peak hours tend to have longer boat intervals. This was done to maximize the efficiency of each boats and to reduce fuel consumption.

3.42 By 16January 2011, the service ceased operations, but not the debt obligations (PHP180.87 million) to ADB and the blame finger-pointing. As of 2010, the PRRC has booked losses amounting to PHP94 million for the operation of the ferry stations. Some group put the blame to the operator’s use of 18 50-seater vessels and instead used six 150-seater boats, which of course, meant lower frequency of trips and longer waiting hours for passengers. Others point at the obstacles to efficient navigation.

5) Level of Service

(1) Buses

3.43 Riding the bus is a daily struggle. Journey time is too long, in excess of 80 minutes. Average speeds for all bus routes in Metro Manila and for different time periods are below 20 kph (see Table 3.2.7). While traffic congestion is a factor, it is not an explanatory variable during the non-peak hour where buses had been observed to take their time and wait for passengers at bus stops.

Table 3.2.7 Average Speeds for All PUB Routes, 2010

Time Period	Ave. Speed (km/h)
0000–0600	19.3
0600–0900	18.4
0900–1600	16.8
1600–1900	16.3
1900–2400	16.7

Source: MMPTPSS, 2012.

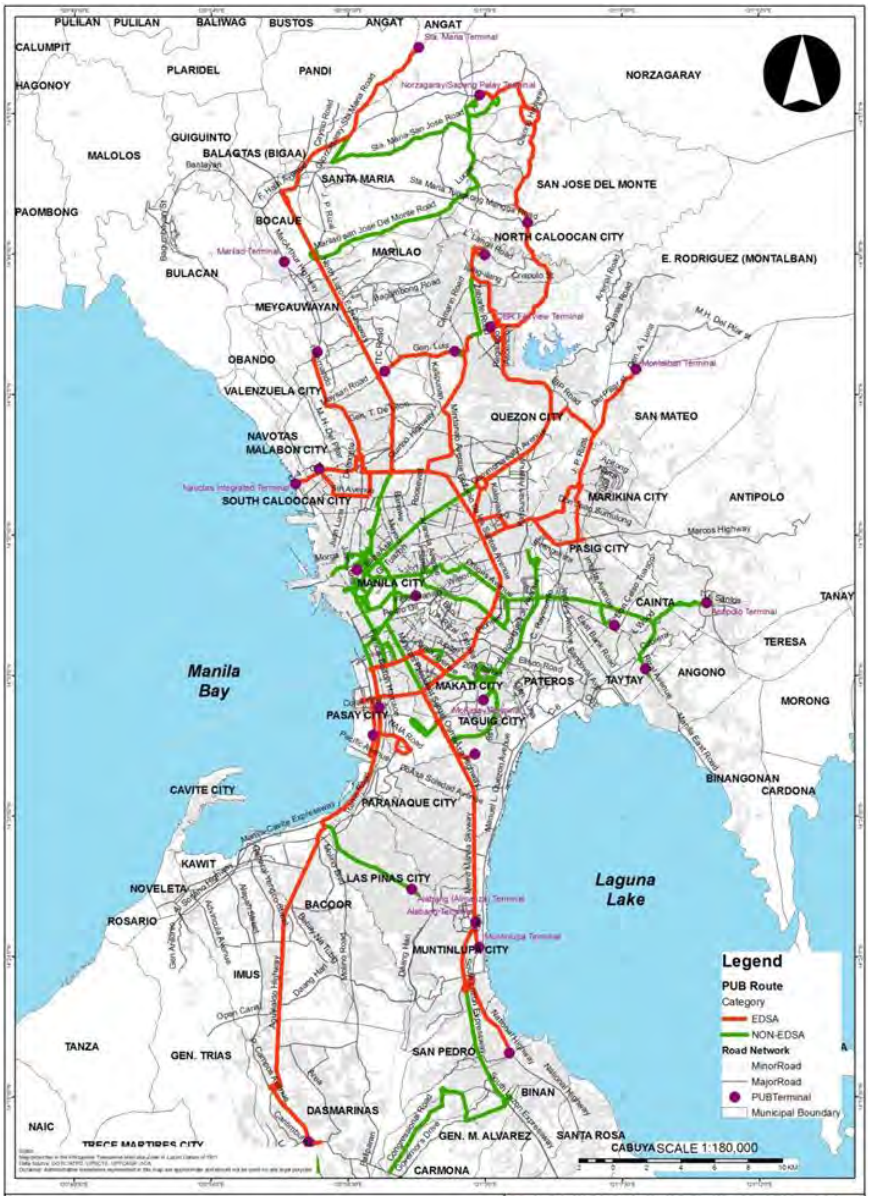
3.44 The daily operation of city buses ranges from 13 to 20 hours with an average of 17.2 hours. But for all that, it managed to post less than 200 km a day – against a norm of 300km.

3.45 The public utility buses (PUB) for Metro Manila has a wide spread coverage as shown in Figure 3.2.1. Their routes are basically categorized as those traversing the length of EDSA and those that are non-EDSA routes (i.e., servicing areas outside of EDSA or crossing EDSA).

(2) Jeepneys

3.46 There are more than 600 jeepney routes in Metro Manila, extensive enough for commuters anywhere to get a ride within 500 meters. While the fare is low when compared to other cities in the developing world, the service is poor. On the positive side, it entails no subsidy from the government.

3.47 Productivity of various routes of jeepneys is low as a unit can only undertake roundtrips from 2 to 8 (as observed in 2012 survey of MMPTPSS).The daily operation of PUJ's ranges from 7.5 to 17.6 hours with an average of 13.6 hours. The overall average speeds for all routes of the public utility jeepney (PUJ) for different time periods are shown in Table 3.2.8. The average speeds hardly reached 15kph due to frequent stopping to load or unload passengers, and to wait for passengers.



Source: Mega Manila Public Transport Planning Support System (MMPTPSS) Project, 2012.

Figure 3.2.1 The PUB Route Network

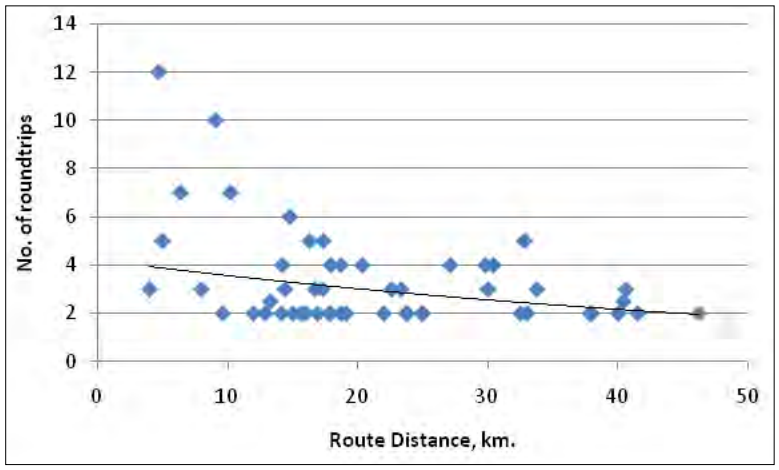
Table 3.2.8 Average Speeds for All PUJ Routes

Time Period	Average Travel Speed (kph)
0000–0600	14.7
0600–0900	14.7
0900–1600	15.1
1600–1900	12.9
1900–2400	12.7

Source: MMPTPSS Project, 2012.

(3) AUVs or Shared Taxis

3.48 Majority of the AUVs make 2 to 5 roundtrips a day. As observed in the 2012 survey of MMPTPSS, many AUVs make the same number of roundtrips (see Figure 3.2.2).



Source: Mega Manila Public Transport Planning Support System (MMPTPSS) Project, 2012.

Figure 3.2.2 Number of Roundtrips vs. Route Distance for UV Express

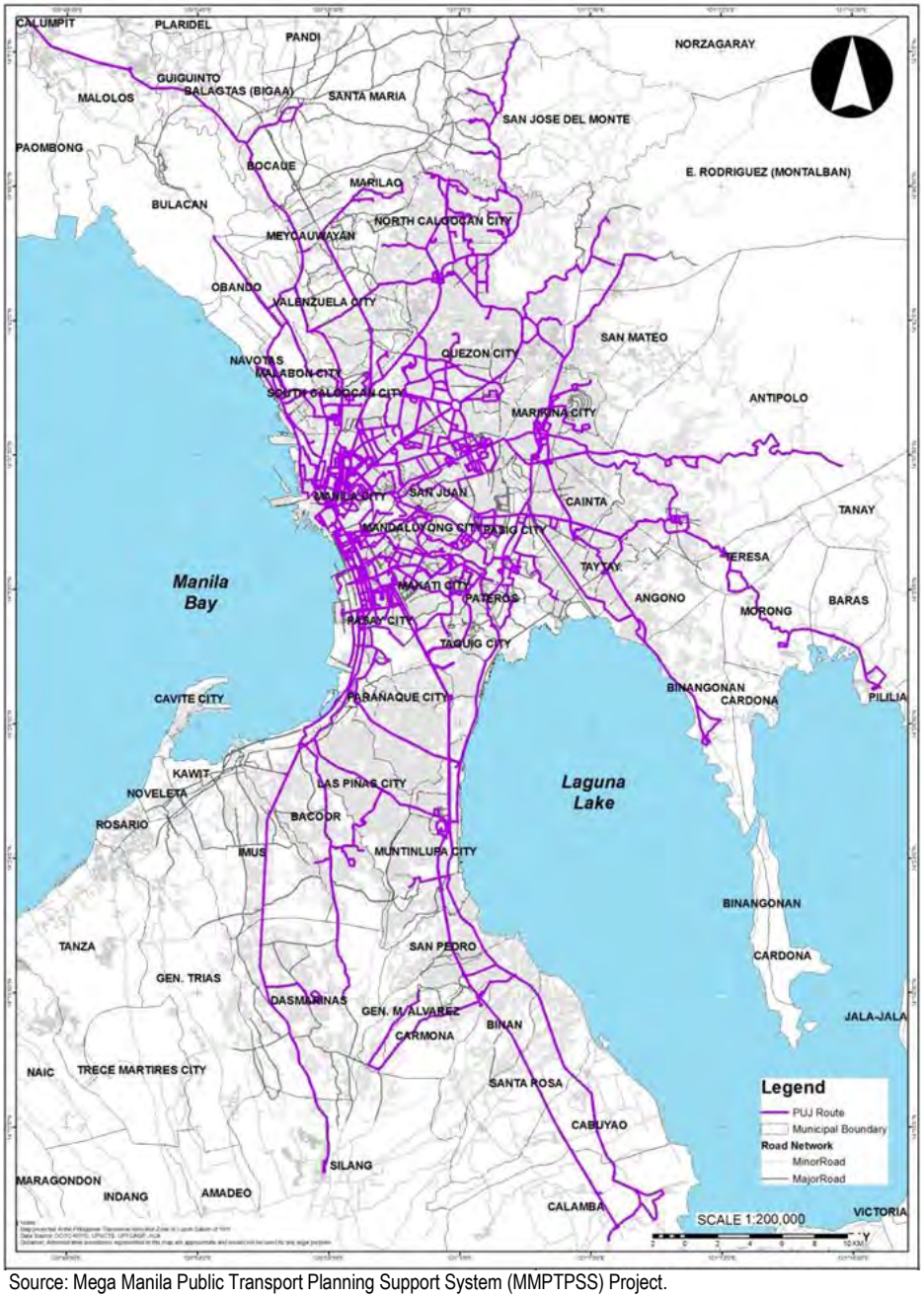
3.49 The daily operation of AUVs ranges from 3 to 18.5 hours, with an average of 11.7 hours.

3.50 Average travel speeds of AUVs are recorded to be much faster than the jeepneys and buses as shown in Table 3.2.9. Average speeds for all time periods exceed 20 kph and come close of 25 kph.

Table 3.2.9 Average Speeds for All AUV Routes

Time Period	Average Speed (km/h)
0000–0600	24.7
0600–0900	21.6
0900–1600	25.9
1600–1900	24.5
1900–2400	29.3

Source: MMPTPSS Project, 2012.



Source: Mega Manila Public Transport Planning Support System (MMPTPSS) Project.

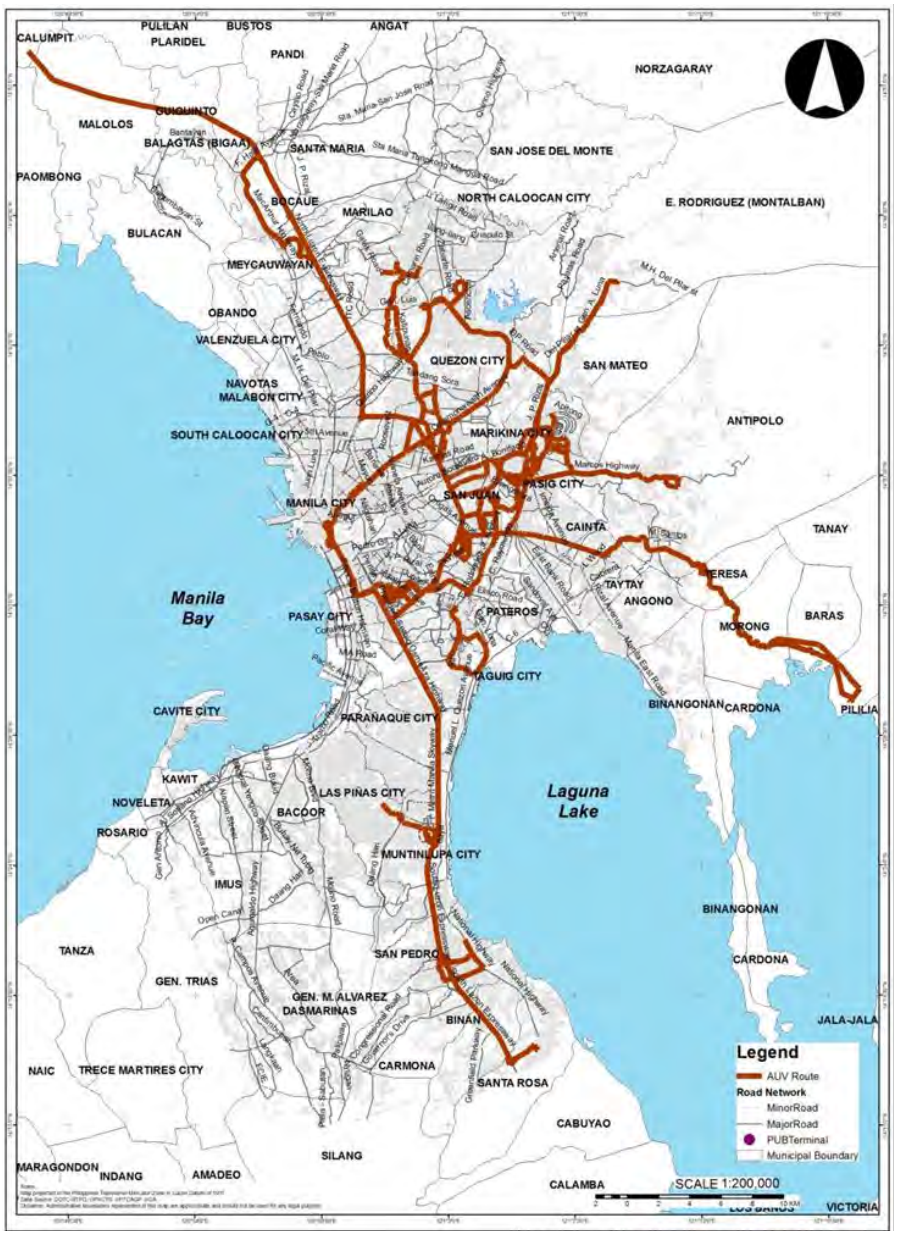
Figure 3.2.3 The PUJ Route Network

3.51 The total route-km and route-km per square km for the different public transport modes are shown in the Table 3.2.10.Within Mega Manila, the jeepneys dominate the public transport service with roughly 1.75 times coverage compared to that of the buses and 7.5 times that of the AUVs.

Table 3.2.10 Public Transport Route Supply

Public Utility Vehicle	Route-km	Route-km per sq. km.[1)]	Route-km per sq. km.[2)]
PUB	1,979	1.058	1.110
PUJ	3,461	1.113	1.942
AUV	460	0.233	0.258

Source: Mega Manila Public Transport Planning Support System (MMPTPSS) Project, 2012.
1) Based on area served by public transport mode;
2) Based on the area of Metro Manila + external zones served by the public transport mode.

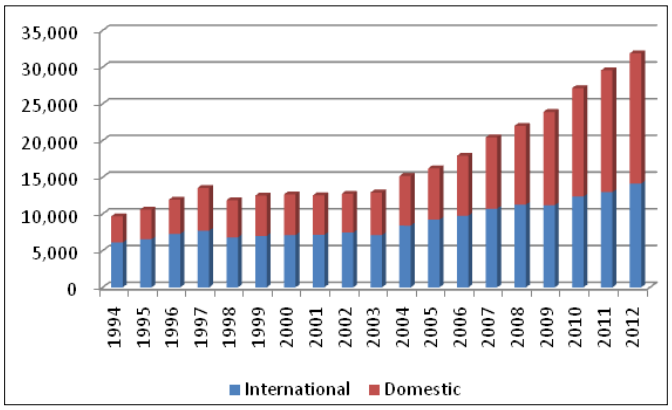


Source: Mega Manila Public Transport Planning Support System (MMPTPSS) Project.

Figure 3.2.4 AUV Route Network

(4) Manila Airport

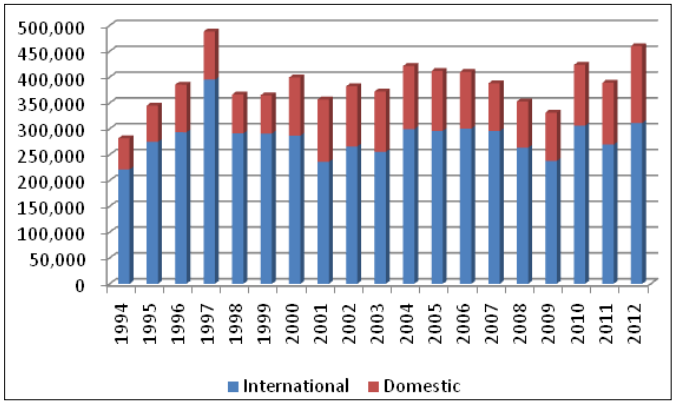
3.52 The passenger and cargo movement record at NAIA is shown in Figure 3.2.5 as well as Figure 3.2.6.The passenger demand was stagnating at a level of around 12.5 million since late 1990s to early 2000s. However, since 2004 the passenger traffic started to increase very sharply. The average annual growth rates of the international and domestic passengers in the last 10 years are 6.6% and 12.9%, respectively. The very rapid growth of the domestic passengers is attributable to active operation of Low Cost Carriers (LCCs) such as Cebu Pacific.



Source: Civil Aviation Authority of the Philippines (CAAP).

Figure 3.2.5 Air Passenger Traffic at NAIA from 1994 to 2012

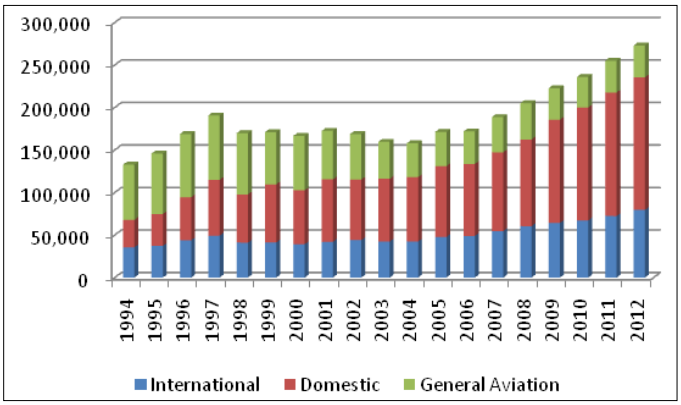
3.53 The air cargo volume at NAIA, shown in Figure 3.2.6,appears to have stabilized at around 400,000 tons annually.



Source: Civil Aviation Authority of the Philippines (CAAP).

Figure 3.2.6 Air Cargo Volumes in NAIA from 1994 to 2012

3.54 Figure 3.2.7 show annual aircraft movements at NAIA – where general aviation accounting for nearly 14% of the total. The main challenge is the inadequacy of the runway as reflected in Figure 3.2.8.



Source: Civil Aviation Authority of the Philippines (CAAP).

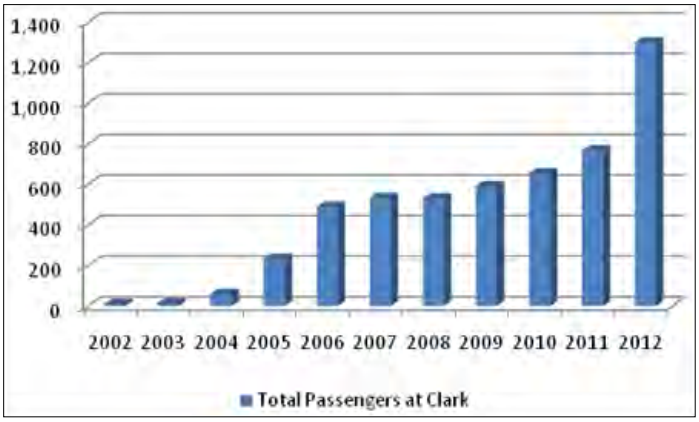
Figure 3.2.7 Aircraft Movement Record at NAIA from 1994 to 2012

Source: Study on Airport Strategy for the Greater Capital Region, JICA 2011.

Figure 3.2.8 Runway Usage in NAIA, 2012

(5) Clark Airport

3.55 After experiencing a steady traffic growth from 2005 to 2011, the passenger movements at Clark nearly doubled from 767 thousand in 2011 to 1,300 thousand in 2012 (see Figure 3.2.9).

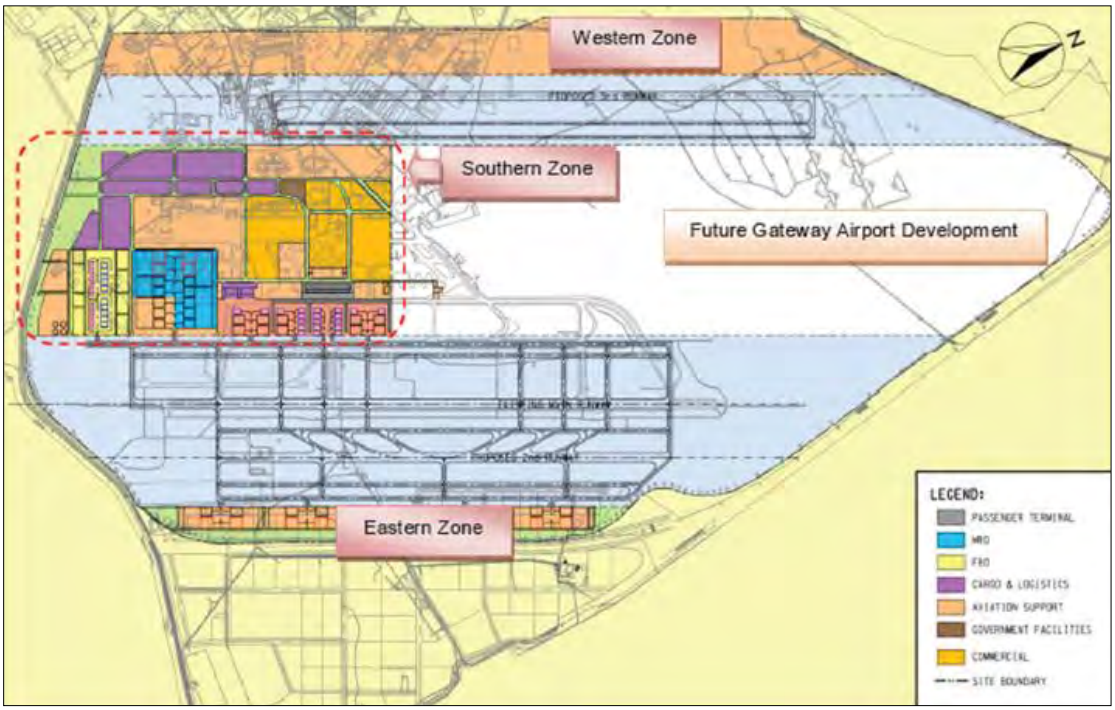


Source: Clark International Airport, 2013.

Figure 3.2.9 Total Passenger Movements Record at Clark

3.56 With its vast land area off 2,367 ha, Clark offers an alternative to the airport capacity shortage in the region, but not a replacement of NAIA. Shown in Figure 3.2.10 is the current zoning plan, which includes an LCC hub and MRO (Maintenance, Repair and Overhaul Facilities) at the Southern Zone. To the north is an area envisaged for legacy carrier international flights and another parallel runway. It is feasible to build three parallel runways (two closed parallel and one open parallel) that can accommodate more than 100 million passengers per annum (MPPA).

3.57 The fundamental issue against Clark is its distance from the main market, Metro Manila. There is no rapid rail link to compensate for the distance. NLEx provides a decent access, but travel time is unpredictable. It normally takes approximately one hour from Balintawak (entrance to NLEx) to Clark, subject to weather and road traffic conditions (heavy rains and traffic accidents could necessitate longer journey time). In addition, it may take another hour to reach Balintawak from Makati. Providing a bus express service at a city airport terminal may provide an interim solution.



Source: "Land Use Plan for Clark Airport Complex" September 2010, AECOM.

Figure 3.2.10 Land Use Zoning Plan Approved by CIAC

3.3 Estimated Travel Demand

1) Current Situation of Traffic Demand

3.58 The detailed demand analysis for this study was undertaken with the following objectives:

(i) To provide magnitude of travel demand within and between Metro Manila (MM) and the adjoining provinces within the Greater Capital Region (GCR);

(ii) Provide information on current and future travel patterns in the GCR for the short, medium, and long term situation, especially by main modes of travel;

(iii) To assist in the identification of network capacity deficiencies, particularly by modes of travel; and

(iv) To assess the performance of the on-going, committed and proposed projects.

3.59 The approach for the demand analysis and corresponding results are presented and explained in Technical Report 2. Based on this, the daily travel demand has been estimated for the study area for 2012, which basically utilized the Metro Manila Urban Transportation Integration Study (MMUTIS) 1996 database, the Masterplan High Standard Highway Network Development 2010 and the MUCEP data of 2012. .

3.60 Daily traffic demand by main modes of travel in the study area is given in the table below. Compared to 1996, occupancy rates have declined for car and public transport. Occupancies dropped from 2.5 to 1.70 for car; from 15.1 to 10 for jeepney; and from 46.5 to 35.3 for buses. This could be attributed to the increase in the number of car ownership and introduction of more bus units and AUVs as given in the number of registered vehicles.

3.61 There are 12.8 million trips made in Metro Manila and 6 million in adjoining areas of Bulacan, Rizal, Laguna and Cavite (BRLC). The rest of 19.4 million trips for GCR or 700 thousand trips are in Region III and Region IV-A.

Table 3.3.1 Travel Demand in the Study Area, 2012[1)]

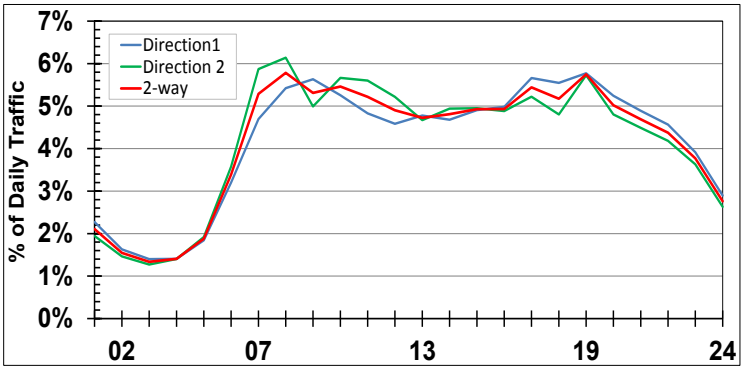
Main Mode of Travel	Person Trips		Average Occupancy	PCU Factor	PCU	
	No. (000)	%			No. (000)	%
Car	6,170	31.7	1.7	1.0	3,629	71.3
Jeepney	7,620	39.1	10.0	1.5	1,141	22.4
Bus	5,680	29.2	35.3	2.0	322	6.3
Sub-Total Public (Jeepney + Bus)	13,300	68.3	-	-	1,463	29.7
Total Person Trips	19,470	100.0	-	-	5,092	100.0

Source: JICA Study Team.
1) include inter-zonal trips only

3.62 Based on the traffic count conducted in 2012 for 11 survey stations in Metro Manila, the hourly distribution of traffic on the roads remains already high throughout the day starting from 7:00 in the morning till about 9:00 in the evening as shown in Figure 3.3.1.

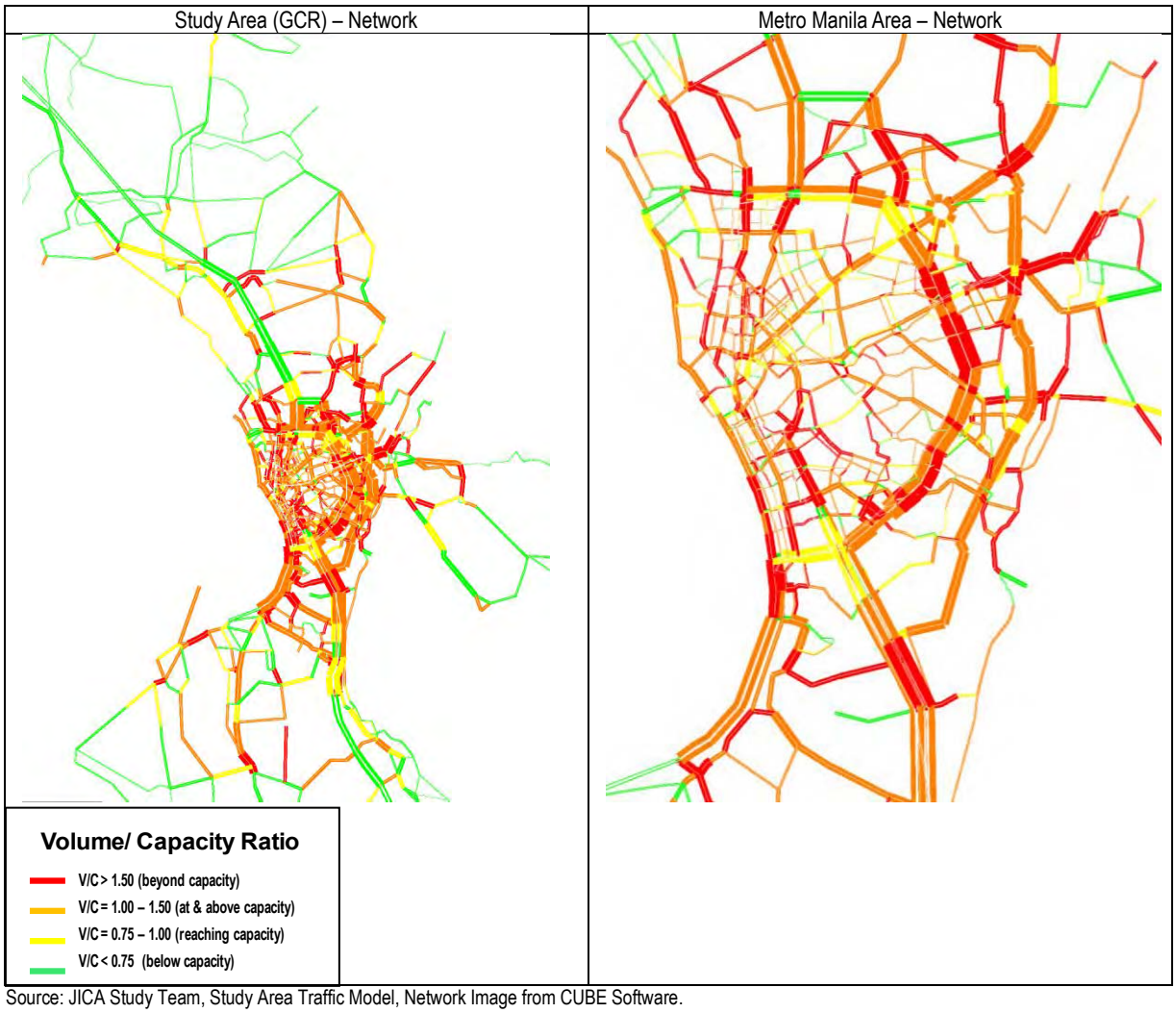
3.63 The assignment model calibrated for the 2012 show that most of the roads in Mega Manila are at volume/capacity (V/C) ratio of 0.80, with close to half of the road network operating below 20kph (see Figure 3.3.2). This assessment demonstrates that it is about time some serious notice is taken of the current traffic condition in the Mega Manila areas. There has been limited expansion of road network both in terms of new roads or capacity expansion through traffic demand management realised since MMUTIS

study. On the other hand, demand continued to increase unabated.



Source: MUCEP, 2012.

Figure 3.3.1 Traffic Demand Distribution during the Day, 2012



Source: JICA Study Team, Study Area Traffic Model, Network Image from CUBE Software.

Figure 3.3.2 Current Traffic Demand on Study Area Road Network, 2012

3.64 The road based public transport carries bulk of the travel in the study area. In Metro Manila, majority of the travel is done using jeepneys (36%) while those using the bus services are not far behind at 31%.The ratio of car usage within Metro Manila accounts for 33% of the travel but it constitutes over 72% of road traffic in terms of passenger car unit km (PCU-km).

3.65 In the adjoining provinces, the travel by jeepney is lower at 28% same as car while the travel by bus is high at 44%. This is mainly because for longer journeys, bus is the preferred mode. Since car ownership is lower in the provinces, the travel by car is somewhat lower (i.e., car passenger-km are 26% of the total passenger-km against 69% of the total PCU-km).

Table 3.3.2 Summary of 2012 Road Traffic Volume and Network Performance

Road Description	Road Length	Av. V/C	Rd. Section (km) with Speed		PCU (000)		Pax (000)	
	km		< 10 kph	< 20 kph	kms	Hrs.	Kms	Hrs.
C-1	6.4	1.14	4.8	5.7	240	36	648	98
C-2	10.2	1.26	6.4	9.7	494	79	1,429	228
C-3	13.8	1.04	7.2	11.0	606	68	2,391	260
C-4	27.1	1.21	13.2	18.6	4,779	462	11,269	1,102
C-5	26.8	1.24	12.5	25.2	3,046	288	9,247	869
R-1	8.8	1.73	8.1	8.8	918	165	2,692	490
R-2	6.7	1.43	6.7	6.7	402	80	1,233	245
R-3	4.7	1.40	3.5	4.7	433	80	1,461	262
R-4	7.5	1.21	6.2	7.2	295	46	975	156
R-5	5.4	1.30	4.3	5.4	294	46	868	133
R-6	10.3	1.35	7.1	9.7	633	86	1,860	255
R-7	11.8	1.16	6.6	11.8	1,065	132	3,579	445
R-8	7.5	1.67	6.4	7.3	534	87	1,871	306
R-9	7.1	1.72	6.5	7.1	424	78	1,196	218
R-10	6.9	1.25	5.6	6.9	418	78	696	134
CAVITEX	10.9	0.81	-	-	903	39	3,434	132
Skyway	17.5	0.90	-	-	1,795	64	8,814	307
SLEX	92.6	0.58	2.7	12.2	5,007	232	20,686	764
NLEX	80.3	0.40	-	2.9	3,330	77	16,538	357

Area	Road Length	Av. V/C	Rd. Section (km) with Speed		PCU (000)		Pax (000)	
	km		< 10 kph	< 20 kph	kms	Hrs.	Kms	Hrs.
MM Manila City	135	1.31	102.0	124.3	3,870	701	11,023	1,973
MM North	404	1.26	235.6	325.4	20,041	2,450	62,532	7,509
MM Center	135	1.23	84.9	107.8	6,976	898	21,192	2,649
MM South	131	1.21	72.6	98.7	8,380	856	27,600	2,540
Sub-Total MM	**805**	**1.25**	**495.2**	**656.2**	**39,266**	**4,905**	**122,347**	**14,672**
Bulacan	458	0.61	62.8	134.9	9,814	627	31,523	1,888
Laguna	392	0.37	19.3	33.6	5,102	298	15,940	842
Rizal	182	0.68	16.9	49.3	4,056	273	13,365	857
Cavite	447	0.55	56.3	114.6	8,785	606	36,056	2,425
Sub-Total Adj. Prov.	**1,478**	**0.53**	**155.3**	**332.3**	**27,757**	**1,804**	**96,884**	**6,012**
Total - Mega Manila	**2,284**	**0.80**	**650.5**	**988.5**	**67,024**	**6,709**	**219,231**	**20,683**

Source: JICA Study Team.

3.66 At its current situation, the transport cost has been estimated(in the demand analysis) to be high for Metro Manila at PHP2.4 billion/day and PHP1 billion/day for the adjoining provinces of Bulacan, Rizal, Laguna and Cavite (BRLC). This translates to about PHP180/trip of transport cost for Mega Manila, which includes the time spent by people on the roads due to long travel times and also the increase in cost for operating vehicles under the present traffic conditions. Among the negative impacts this situation creates are the worsening of air quality, wastage of energy, degradation of livability in the urban areas and spoilage of the image.

3.67 Rail-based public transport, on the other hand, carries about 1.35 million passengers on an average week-day. These are the three mass transit lines (MTS) and the PNR commuter. The latter, however, carried a small proportion of about 46,000 passengers only as of 2012. The combined performance of the three MTS (with 51 km of railways) is 10% of total public transport passenger-km of travel within the metropolis. This is fairly good since the MTS is only 51 km of railways serving Metro Manila with about 13 million trips made in a day. The daily demand and line capacity characteristics of each mass transit line are summarized in Table 3.3.3.

Table 3.3.3 Characteristics of Travel Demand by Railways in Metro Manila

Description		PNR[1)]	LRT Line-1	LRT Line-2	MRT Line-3	Total Railways
Line Length (km)		28.0	18.1	12.6	16.5	75.2
Stations		16	20	11	13	60
2011 Annual Pax (million)		15.4	156.9	63.8	158.8	394.9
2011 Average Weekday Daily Pax		46,000	476,000	193,000	481,000	1,196,000
2012 Average Weekday Pax[2)]		50,000	519,000	212,000	572,000	1,348,000
AM-Peak Hour Boarding Pax/hr		2,000[1)]	43,200	18,000	48,100	111,300
Peak Line Volume (Max: Pax/hr/direction=pphpd)		1,000[1)]	20,100	11,500	20,300	20,300
Current Operational Headway (mins)		30	3	5	3	-
Current Rolling Stock Crush Capacity (Pax/Train)		~500[1)]	1,350	1,600	1,180	-
Current Line Capacity (Pax/hr/direction=pphpd)		1,000[1)]	27,100	19,500	23,600	-
Current Load Factor (Line Volume/Capacity)		~100%	74%	59%	86%	-
Maximum Future Capacity[3)]: Assuming Extended Trains to Full Platform Length & Modern Connected Car Rolling Stock	Train Length (m)	200	110	110	130	-
	Pax/Train	1,800	1,630	1,630	1,930	-
	Headway	3	2.5	2.5	2.5	-
	Pax/hr/dir=pphpd	36,000	40,000	40,000	46,000	-
Available Capacity @ Current Load and Max-Cap:		97%	50%	71%	56%	-

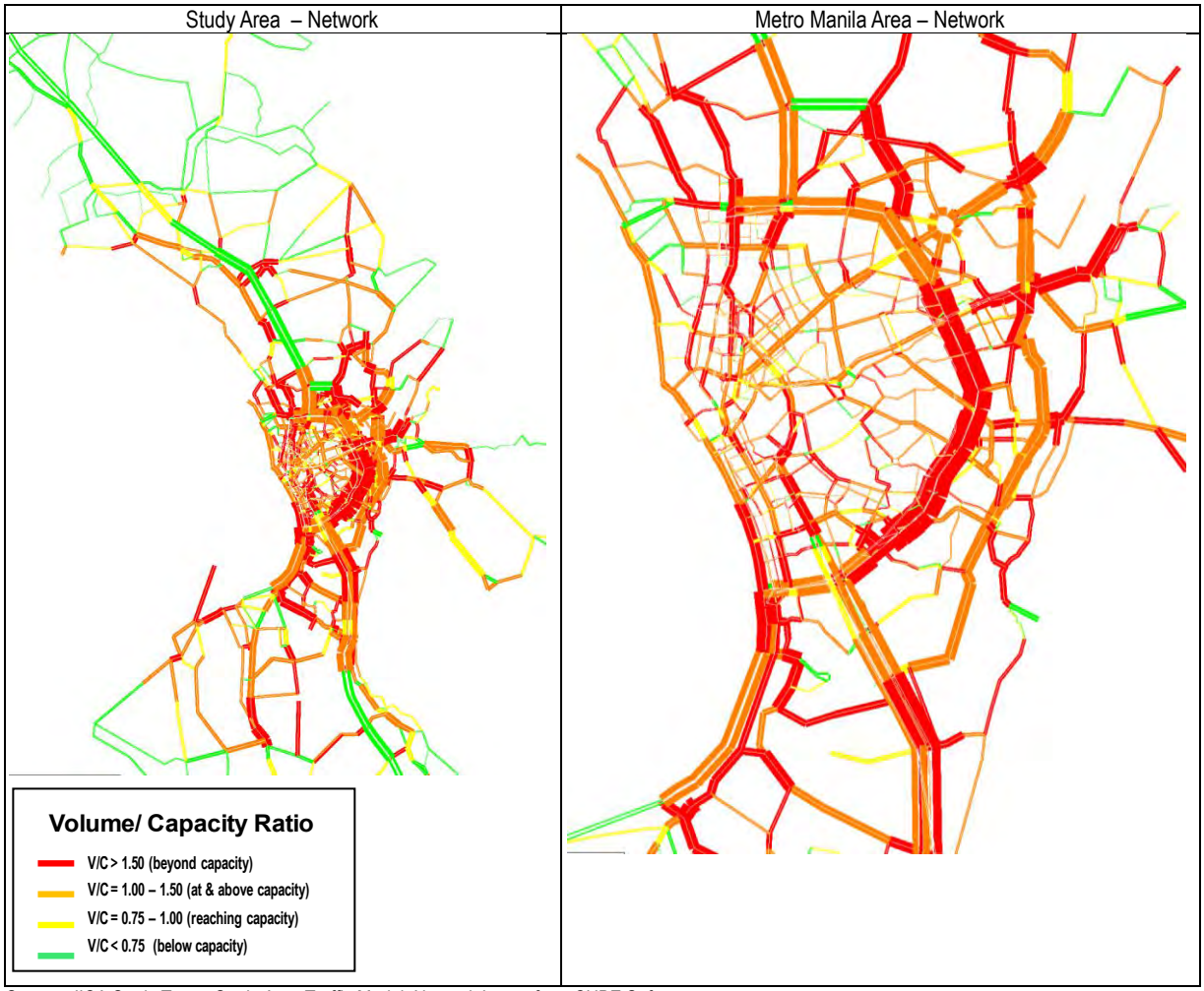
Source: PNR/ LRTA/ MRT Data &JICA Study Team Analyses.
1) PNR Data is for Tutuban to Alabang and peak period data is estimated by the study team.
2) Lines 1&2 Data is for March 2012, Line-3 Data if for September 2012, and PNR for February 2012.
3) Future Capacities are estimated based on possible capacity expansion program.

2) The Future Traffic Situation without Interventions

3.68 Traffic condition in Mega Manila (Metro Manila including the surrounding provinces of BRLC) will only grow from bad to worse with total number of trips rising to 22.5 million trips by year 2030 (see Figure 3.3.3). Almost all roads are beyond their capacities showing congestion on all road sections. As shown in Table 3.3.4, there will be a two-fold increase in transport cost even with only about 20% increase in the number of trips in Mega Manila. The environment will also be aggravated with more GHG emissions thrown into the atmosphere.

3.69 Nevertheless, the 2030 mode share is similar to 2012 and is not expected to change (between private & public). Since MMUTIS study the mode share of public transport has declined from around 74% in 1996 to 68% in 2012. The relatively high share of public transport mode should be sustained, as many Asian cities are striving for such high public mode share through massive investment in both road and rail based public transport infrastructure.

3.70 Environmental impacts for traffic showing the present situation, the future 2030 without any interventions was calculated in terms of air quality. This is explained in detail in Technical Report 2 Environmental and Hazard Risk Reduction Analysis. From 2012 to 2030, estimated Greenhouse Gases (GHG) volume will increase 19% in Metro Manila and 40% in BRLC. This means an additional of 1.23 million tons of GHG per year in the atmosphere of the metropolis and additional of 1.29 million tons of GHG in the BRLC area.



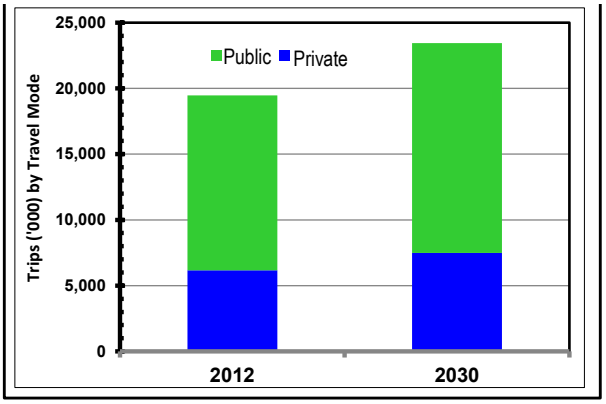
Source: JICA Study Team, Study Area Traffic Model, Network Image from CUBE Software.

Figure 3.3.3 Traffic Demand on Mega Manila Road Network, 2030 (Do Nothing Scenario)

Table 3.3.4 Traffic Demand and Impacts without Interventions[1)]

			2012	2030	'30/'12
Traffic demand (mil. trips/day)	Metro Manila		12.8	14.5	1.13
	Bulacan, Rizal, Laguna, Cavite (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	4.7	1.96
	Bulacan, Rizal, Laguna, Cavite (BRLC)		1.0	2.4	2.40
Air quality (million Tons/year)	Metro Manila	GHG	4.79	5.72	1.19
		NOx	0.049	0.059	1.20
		PM	0.014	0.019	1.36
	BRLC	GHG	3.20	4.49	1.40
		NOx	0.032	0.046	1.44
		PM	0.005	0.010	2.00

Source: JICA Study Team.
[1)]This is the "without" projects or "Do Nothing" scenario.



Source: JICA Study Team Estimate.

Figure 3.3.4 Mode Share of Private and Public Trips, 2012 and 2030

3.4 Development Challenges and Key Strategies

1) Roads

3.71 Nearly all the long term plans for national roads in the GCR have been prepared by JICA consultants, like the Metro Manila Urban Expressway Study of 1993. The most recent one (2009) is the Master Plan on the High Standard Highway Network Development in the Philippines (HSH). These studies tended to be road-centric, i.e., crafted on the assumption that building more and wider roads can solve urban congestion. If one were to take into account the urban constraints and opportunities in the formulation of a multi-modal transport plan (roads, rail, public transport, traffic management, land use controls), a scaled-down road network development plan would emerge.

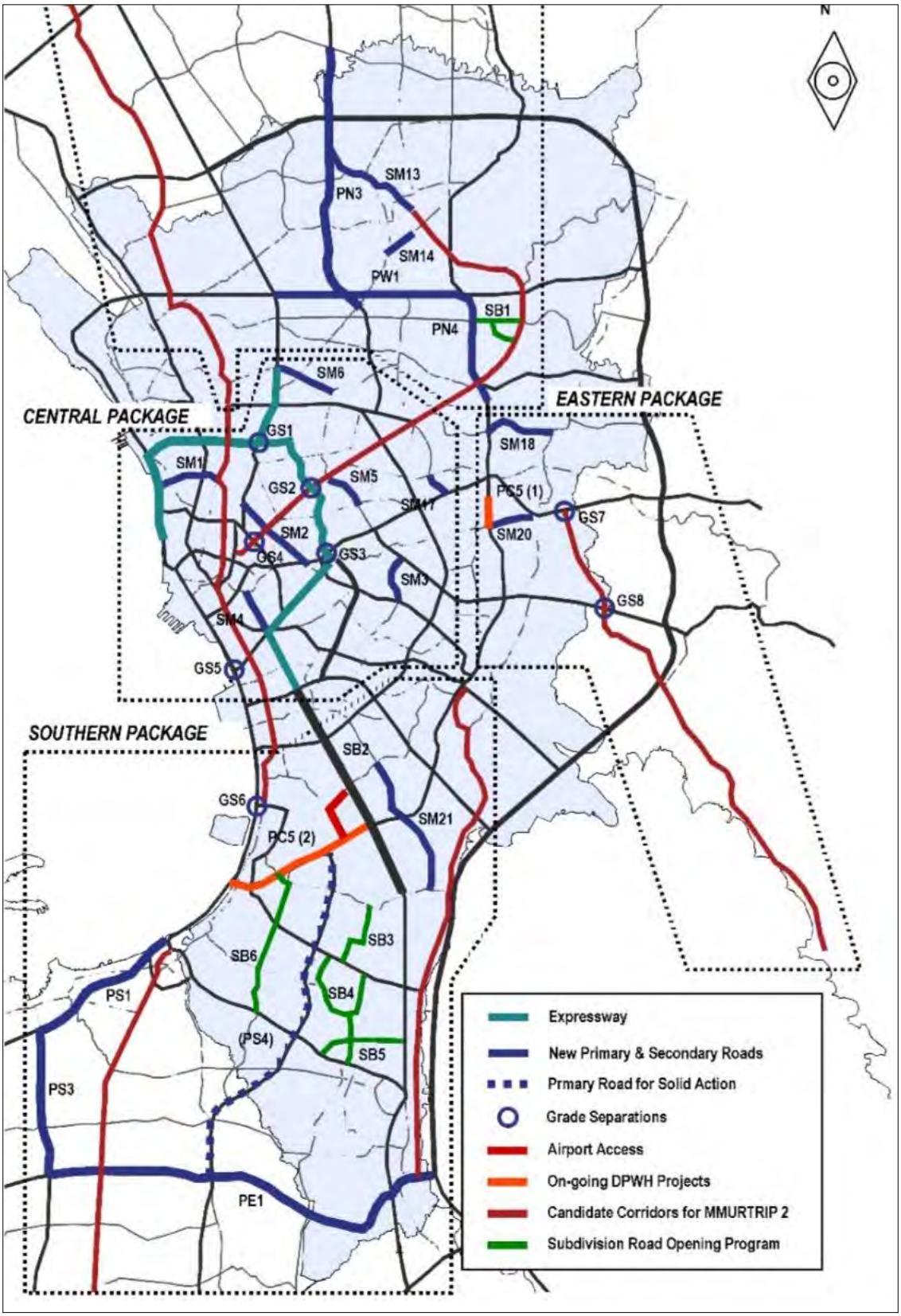
3.72 The availability of ODA-supported plans, however, has not translated into concrete actions. As indicated in Table 3.4.1, many projects have not left the planning board.

Table 3.4.1 Major Road Projects in MMUTIS

Name of Project	Plan Realization vis-à-vis MMUTIS		Remarks
	Plan for 2000–2012	Actual	
Interchanges on Major Arterials (i) EDSA-Roosevelt (ii) EDSA-North Avenue (iii) C5-Kalayaan (iv) C5-JVargas	Funding for these projects were already committed, for completion by 2004	Implementation were aborted by MMDA in favor of U-Turn schemes	Should be re-visited, as well as other major intersections
Expressway: NAIA Access (Skyway 1c)	Underground at Nichols and several flyovers or interchanges at Andrews Avenue and NAIA Road	Modified in 2010 as fully-elevated NAIA Phase 2 Expressway plus extension to Reclamation Area	Currently being tendered by DPWH on PPP mode
Port Access: R10/C3	7.5km elevated expressway to connect the ports of Manila to the Skyway	Not implemented	Should be revived, with revisions in light of new plans for Link Expressway and Skyway 3
Skyway 3, Linking North and South Expressway	To be completed after the extension to Alabang (stage 2) is completed	Stage 2 was completed in 2010. Only in 2011 was the Stage 3 scheme revived	Two competing link expressways, both elevated, were approved for implementation in 2012.
C4 North Section	Extension of Mindanao Avenue to NLEx and to McArthur Highway by 2004	Implementation was delayed by 8 years; and only partially. Sections to Fairview missing	Under implementation by MNTC as part of its Segment 9 and 10 projects. Other segments should also be built
C5 Section from SLEx to R-1 Coastal Road	Reported in 1998 as on-going project	Started, but abandoned	Right of Way acquisition was incomplete; causing abandonment of Phase 2 of R1 Expressway
Flyovers at Other Critical Intersections	7 intersections identified as priority	Only C3/Quezon Avenue was completed, in 2012	Should be revived, for short-term impact on traffic
Use of Subdivision Roads	Start with some villages in Las Piñas and Parañaque	No action	Could be revived to cover only selected roads in large gated villages

Source: JICA Study Team.

3.73 The most recent list of national roads proposed to be built is shown in Table 3.4.2, most of which came from the aforementioned 2009 JICA Study.



Source: MMUTIS, 1999.

Figure 3.4.1 Major Road Projects in MMUTIS

Table 3.4.2 Latest Proposed Roads Projects

Name of Projects	Description	Remarks
Skybridge Project of MMDA	Elevated roadway meant to relieve traffic on EDSA from Quezon City to Makati; specific alignment unknown	A pipe dream by MMDA in 2012. Its purpose and intent are well integrated already in the Skyway 3 and N-S Link Expressway projects.
CALA Expressway	An expressway from R-1 Expressway southward to SLEX in Mamplasan. Subject of 2006 JICA feasibility study	Change in alignment led to 2nd feasibility study. If ROW acquisition is done in 2013, implementation for Cavite sections can commence in 2015
C5-FTI-Skyway Connector Road	Proposed as top priority in the 2009 JICA study on HSH. Also, in PPP project list of DPWH	Should wait until the development plan of Ayala Land re FTI (which was privatized in 2012) is finalized
C6 Expressway Global City Link	Proposed as top priority in the 2009 JICA study on HSH. Also in PPP project list of DPWH	Supposed to be tendered in 2012; Can be delayed as access to Global City is currently adequate
Calamba-Los Baños Expressway	An east-west arterial that will connect Los Banos to SLEX. In PPP project list of DPWH.	Being programmed by DPWH for bidding in 2013.
SLEX Extension to Lucena	Existing concessionaire (SLTC) has announced detailed design in 2011.	Likely to be delayed from the stated implementation schedule. May happen after 2016
Central Luzon Expressway Part 1	A north-east expressway, 28km long, from Tarlac City to Cabanatuan	Implementation schedule (2013-15) of DPWH likely to be delayed. Should be re-evaluated, once TPLEX is finished

Source: JICA Study Team.

3.74 The planning deficiencies, as well as delayed implementation of previously approved projects, have created the recent controversy on competing solutions to connect the NLEX and SLEX. The 1970s plan via C2 (Nagtahan) was abandoned, and replaced by C-3 alignment or Skyway 3. However, the latter went into doldrums for more than a decade. This gave rise to an unsolicited proposal in 2010 to build the Link Expressway, using the airspace on PNR tracks. This move prodded the Skyway 3 proponent to re-activate his proposal. Confronted by two proposals from two powerful private parties, the government opted to accept both rather than decide on which is the better one. The compromise, however, was not without problems – foremost of which is cost-and-revenue sharing issue on the common sections of the two elevated toll roads. Another is the right-of-way. This was deemed for the account of the government in all past PPP projects. But the Department of Justice came out with a different opinion. Also, to resolve the legal challenge faced by Skyway 3, the authority of the Toll Regulatory Board (TRB) to enter into road development contracts had to be restored. Apparently, all the three issues have now been resolved.

3.75 However, there are still issues to overcome. Although the two tollway projects were meant to link two inter-urban expressways and bypass the congested at-grade urban roads, their interconnections (down/up ramps) to the intra-urban network still have to be re-examined to minimize duplication and maximize the new capacities. Their designs and constructions have to preserve as much space for the upgrading of a north-south commuter rail, which the Link Expressway – and to a lesser extent, the Skyway 3 – has to accommodate.

3.76 The preceding problem can be traced to multiplicity of agencies involved in road network development. TRB took the hat of a road development agency when it signed a deal on Skyway 3.

3.77 Another challenge to the development of a hierarchical road network is the passivity of LGUs in the study areas to take a more aggressive role – in articulating and

building a secondary road system, in financing and maintaining local roads, in controlling land use, in clearing the alignment and right-of-way and relocating affected households, in forcing gated villages or subdivisions into opening some of their roads to other motorists, and in managing oppositions to new road projects. For example, the construction of flyovers/interchanges at Julia Vargas–C5 and the Espana–Lacson–C2 are being delayed by vocal minorities.

2) Railways

3.78 The plans for expanding the rail network for the tri-regions (NCR, Region III and Region IV-A) have always been grand and ambitious, but the grasp has always exceeded the reach. Implementation has been weak and the reasons for this are varied such as lack of financing, institutional inadequacy, etc.

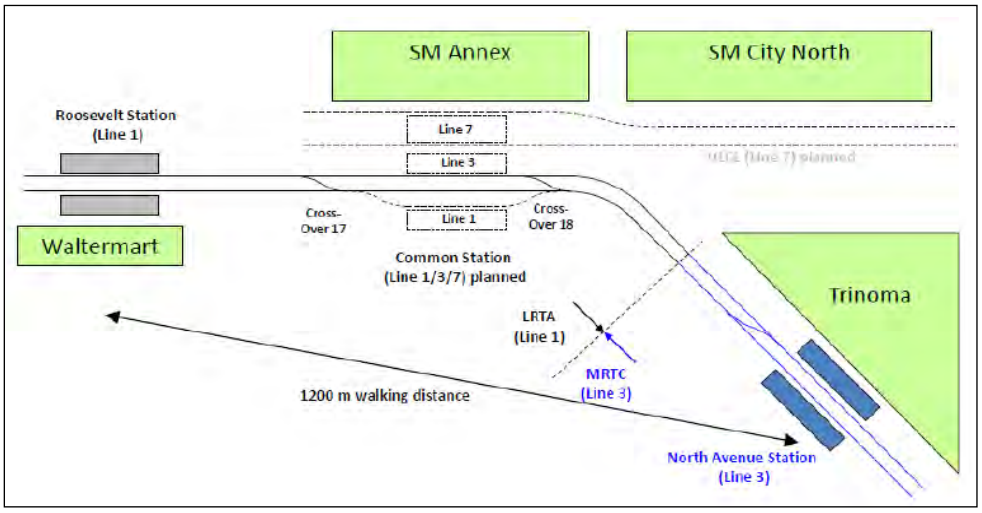
3.79 The 15-year MMUTIS Plan that was completed in 1999 contained a scaled-back rail network plan that took into account a projected budget envelope as well as corollary improvements in the road network to year 2015. Very little of this realistic "master" plan (shown in Figure 3.4.1 and discussed in Table 3.4.1) got implemented over the period 2000–2012. The long overdue Line 1 and 2 extensions are in danger of being delayed again despite government pronouncements.

3.80 The main problem is that the rail projects are being pursued on a piece-meal basis, and without due regard to the concept of a railway network, much less of the role of rail in the family of public transport modes. Integration among the rail lines is as important as integration with other public transport modes such as buses and jeepneys.

3.81 The more urgent issue for urban rail is the “Common Station” for the LRT-1, LRT-3 and the proposed MRT-7 (see Figure 3.4.2). To be located on EDSA in front of SM City, the indecision has stalemated the desirable linkage of two operating lines and sacrificed commuter convenience for the benefit of competing private commercial interests. DOTC has wrestled with the issue for more than 3 years without producing any credible or acceptable resolution. In the MMUTIS plan, this "common station" was non-existent. Neither was it part of the North Loop project when it got tendered. The construction plan and original contract for the North Loop project called for platform transfers of passengers at the North Avenue (Trinoma) Station–by itself a second best solution. When the MRT-7 deal was made, its proponent insisted on a common station that led to a contract variation and a new station costing about PHP2 billion.

3.82 Another challenge concerns the future structure of the railway sector. In the implementation of LRT-1 South extension, DOTC has opted to adopt a PPP modality whereby the track infrastructure shall be built and paid for by the private sector (who shall take over the operation and maintenance of the extended line), while the rolling stock and electromechanical components shall be provided by government via a loan from JICA. The tendering process is now behind schedule, with project completion getting pushed back to 2018 assuming contract award by 4th Quarter of 2013. Privatization of the 3 lines appears to be the long-run objective. If the current DOTC plan on LRT-2 materializes, the earliest the transfer to the private sector would happen is year 2018. Fare adjustments on the rail lines have been frozen to their 2003 levels, while attempts to keep them abreast with those for buses and jeepneys were abandoned. This casts a dark cloud on privatization and/or PPP in the rail sector. All these plans (including the one on Automatic Fare Collection System [AFCS] below) will impact on the future of LRTA as a state-owned

enterprise (SOE), but there is as yet no serious effort to prepare for its prospective role, or its transformation into a rail regulator. The PNR and NorthRail are also in limbo, uncertain as to what their future roles will be in the "unclear environment."



Source: Project Presentation, DOTC.

Figure 3.4.2 Common Station Project

3.83 A common ticketing system for the rail lines -one of the integrating elements of a seamless transit system–is finally taking off, after 10 years. The DOTC has opened the tendering process towards awarding the concession for AFCS to a third party who will set up the system, install the necessary hardware and software, and operate a clearing house for re-distributing revenues to the rail operators. It is expected to boost ridership on a system that is already exceeding capacity constraints. Without concomitant adjustment in fares and additional train frequencies, the existing operator will likely incur revenue drops when the transfer or boarding fee is removed for interline passengers. A common ticketing system is desirable, but not sufficient, to achieve integration. Reconfiguration of rail stations common to more than one rail line, or re-design and reconstruction of stations adjoining each other would become necessary to support the "seamless" promise of common AFCS. So far, this element is missing in the plans of DOTC.

3.84 Presumably, in the interest of contestability if not competition, it would be desirable to get the three existing rail lines in the hands of three separate private operators. This may not happen, given the small number of business groups with the necessary financial resources. In any case, it would be desirable to define a priori the future expandability of the three rail lines or right-size their scale of operations. The implicit market corridors in the MMUTIS plan no longer apply, because of the deviations that had transpired. For example, will it be more optimal to retain the 5-km north loop under LRT-1 operator or should it be placed with MRT-3? Doubling the capacity of the latter is long overdue, but its current depot location (below Trinoma) cannot support expansion. It can build a satellite depot or relocate elsewhere, if MRT-3 is given the right to extend its line somewhere. It has two options for extension: (i) west towards the Malabon–Navotas area, if the North Loop becomes part of its operation and the Common Station is not built; or (ii) northwest towards Novaliches. Unless this is resolved, the LRT-1 will end up with the longest line and catchment areas while MRT-3 will be constrained whilst operating on the highest traffic corridor (EDSA). On the other hand, LRT-2 could be extended to the west with some possibilities at the eastern terminus. It was also reported

that the government wants LRT-2 to be extended to Cainta (which is operationally difficult, as it implies southward drift of the eastbound line or the building of a spur line towards the heartland of Cainta).

3.85 The Commuter Service (north and south) is currently an 'island' in the overall scheme of things. Improvements have been piece-meal, or a case of too little too late; its potential of becoming a major trunk line commuter remains unfulfilled. As stated earlier, it should be part of the overall rail network of the region. The loss of its air rights from Makati to Caloocan, as well as the proliferation of informal settlers along its right-of-way, has constrained options for major upgrading of its tracks. This is compounded by the impending construction of the Link Expressway on top of the PNR tracks. On the other hand, the North Rail Project–which was supposed to be a combined commuter and airport express service–has stalled, with nothing to show in the last 7 years.

3) Other Public Transport

3.86 A high priority project of the current administration is the building of common terminals for provincial buses at the periphery of Metro Manila (see Figure 3.4.3). Although labelled as Integrated Transport System (ITS)[2], the impetus for the bus terminal project is said to be its decongestion effect on urban roads. Three locations have been identified, namely North Triangle Quezon City in the north, Food Terminal, Inc. (FTI) in the southeast, and the reclamation area in the southwest. It is unclear whether these facilities would produce their stated objective of decongestion, considering that the passengers would still need to transfer to another mode to reach their final destinations. In short, it would result in a substitution of vehicles rather than a reduction in road traffic volume. Similar attempts in the past have failed (e.g., provincial bus terminal at FTI in the 1980s and the provincial bus terminal of MMDA in 2007), and the current integrated provincial bus terminal version shows no promise that it would be any different. A Supreme Court decision in 2007 has declared the MMDA venture as invalid, and opined that "eliminating the terminals (of bus operators) would thus run counter to the provisions of the Public Service Act.[3]

4) Airports

3.87 The main challenge is the saturated capacity at NAIA and the unpreparedness of Clark to absorb the overflow, and/or replace NAIA. While the 2011 Airport GCR Study implicitly favoured the twin gateway airport solution, it was unduly biased towards Clark aside from failing to highlight the fact that the country has no choice but to go for dual airports. A compelling case can be made against Clark as a replacement to NAIA, but not as a second gateway or as a reliever airport. Even if a single gateway is chosen, it will still necessitate the simultaneous operations of two airports during a transition period that is likely to occur over 10 years minimum. Table 3.4.3 below summarizes the arguments on both sides of the debate.

[2] This project has been re-labeled hereon from Integrated Transport System (ITS) in the listing of projects to Integrated Provincial Bus Terminal System (IPBTS) to avoid confusion with another project –the Intelligent Transport System (ITS).
[3] GR No.170656, Supreme Court decision dated 15 August 2007.

Source: DPWH/DOTC/MMDA Joint Project.

Figure 3.4.3 Integrated Transport System aka Provincial Bus Terminal

Table 3.4.3 Discussion on Single Gateway and Dual Gateway

Single Gateway: Only Clark Survives	Dual Gateway: Both Clark and NAIA	Remarks
Convenient for air passengers on inter-lines, that is, transferring on arrival into another departing flight	Inconvenience to passengers will depend on traffic characteristics and policy decision on division of roles between the two.	Since NAIA is not a hub airport in the Asian region, the volume of transfers is likely to be low. This can be influenced by market, policy and flight economics.
Clark is deemed too far (~90 km from Metro Manila). A fast train (160kph) must be in place before the transfer/closure. In short, the fate of Clark depends on the North Rail project.	A fast train is desirable, but not mandatory. An airport bus service can be introduced until traffic reaches a threshold to justify the huge investment in rail express. NLEx-SLEX link road offers early relief.	An unintended impact of a single gateway is to constrain international arrivals until Clark is ready (by 2020). There seems to be an over-concern about distance, when travel time is the more critical variable.
An event of natural disaster can be expensive for the country, as it shuts down a premier airport. If an airplane cannot land on Clark, nearest alternative is Subic (but only for some aircrafts).	Two airports can function as twins--one is the alternate to the other in case of accidents or typhoon. Safety of aviation is enhanced. This situation is already happening.	Bangkok was forced to re-open Don Muang Airport when the new Suvarnabhumi Airport was forced to shut down. A one-gateway policy got reversed into two, despite the fact that Bangkok is more of a 'hub' airport than Manila.
Transition from old to new will be demanding. Misstep will be costly, financially and politically.	Managing the transition will be easy. Mistakes will be tolerable and recoverable.	The shift from Kaitak Airport to the new HKIA was a nightmare for Hongkong, which functions as a hub airport.
Redevelopment of NAIA into another CBD can generate incomes for the government. The area is about 400 hectares, of which about 50% can be assumed to be taken.	Dispersal of economic activities helps avoid Manila-centric development; economic gains in Central Luzon could compensate, aside from avoided cost of traffic concentration.	Potential revenue (based on FTI tender of PHP24.3 billion for 74has.) is PHP75 billion (~1/3 of the amount needed for the Rail Express). Hence, the Hongkong formula will not work.
Improves the potential for Clark to become an international hub airport (trans-pacific, regional, inter-continental).	Large cities have multiple airports, e.g. London (6), Paris (3), Chicago (3), Stockholm (4). The Greater Manila region has the traffic to support two airports.	A single gateway can re-enforce the objective of becoming a major airport hub in the Asian region. However, this is very unpredictable in the light of competition from Changi, Hongkong, Incheon, Narita, etc.
Institutionally, invites bureaucratic ossification due to its monopoly; Bad perception of passengers will adversely impact on the whole country.	Prevents bureaucratic ossification due to pressure of inter-airport rivalry and competition; Bad rating for one does not affect the other	Management of CIAC should be independent of MIAA, to preserve contestability.

Source: JICA Study Team.

3.88 The riskiest option is the closure of NAIA with Clark as replacement. For this to succeed, several things haveto be undertaken in a coordinated manner, a capability for which the public sector is not known for:

(i) Build a new terminal building at Clark;

(ii) Build the Airport Rail Express (i.e., a reconfigured NorthRail); and

(iii) Develop Clark's second runway.

3.89 As a consequence of this single airport solution, NAIA will be forced to operate at risky levels until Clark (or another airport) is ready. This will have the unintended effect of choking the growth of international aviation into/out of the Philippines.

3.90 While NAIA has three passenger terminal buildings, the third (Terminal 3) is only partially operational and has missing items to be built. The 3 decades old Terminal 1 is in dire need of rehabilitation, while Terminal 2–which was designed for domestic use–is forced to operate also as an international airport whilst monopolized by a single carrier. The more fundamental problem is the runway capacity constraints, which has already been exceeded as far back as 2006.

3.91 Operational and other physical improvements can still be done to increase its capacity up to 250,000 aircraft movements per year. The following measures have been proposed in the 2011 GCR Airport Study:

(i) Transfer of General Aviation (GA) from NAIA to another airport;

(ii) Spreading domestic operations to early morning/late evening hours;

(iii) Provision of additional Rapid Exit Taxiways (RET);

(iv) Construction of an additional parallel taxiway for RWY 13/31; and

(v) Use of larger-sized aircraft by airlines.

3.92 The construction of another runway at NAIA will entail expropriations of large tracts of residential areas. It may be costly and take years to execute. But when compared to the huge cost of building an airport express railway to Clark and the time (15 years), on-site expansion looks a more viable option.

3.93 For Clark Airport, its development plans must continue to be pursued alongside with that for NAIA. For the next ten years, at least, the region (and the country) has to live with a Twin Gateway Airport System. That is, both MNL (Manila) and CLK (Clark) have to function concurrently and split the air traffic volumes.

3.94 Clark must be developed to absorb the overflow air traffic from NAIA, as well as carve out its own market niche – which is the Low Cost Carrier (LCC) traffic in the Asian region. The 2011 GCR Airport Study forecasted that Clark can attract about 15 to 20 million passengers per annum (MPPA) in 2020 and 25 to 30 MPPA in 2025. Aside from the construction of an LCC Terminal and a new International Passenger Terminal, the existing main runway RWY 02R/20L needs to be extended from current 3200 m to approximately 4000 m. The existing secondary runway RWY 02L/20R can be converted to one of parallel taxiways.

5) Ports

3.95 The main challenge to the development of the ports of Manila is tempering its continued growth, so that more cargo can flow into Subic and Batangas. Its success has enabled the economic growth of the region, but it also resulted in high volume of truck

container traffic in the metropolis, especially in the old city of Manila. This was often cited as a major cause of traffic congestion, leading to the adoption of a truck ban that had been in effect for more than 3 decades. This policy has led to underutilization of freight vehicles, with the perverse effect of inducing more trucks than necessary. With a narrow time window to bring cargoes in and out of the ports, more vehicles had to be deployed.

3.96 On the other hand, due to the perceived limitations of the port (shallow draft, among others) plans were laid out by government to develop two alternate gateway ports for international shipping. These are the port of Batangas (about 110km south of Manila) and the port of Subic (about 110km north of Manila). The two ports outside of Metro Manila are now operational, but their traffic volumes are way below their original forecasts or initial expectations. The government has borrowed more than USD240 million from JICA to develop the international ports of Batangas and Subic. The Batangas International Port was completed in 2006, after years of delay, while the new Subic Container Port was completed in 2008. To support these ports, the Star Expressway and the Subic-Clark Expressway were also built.

3.97 Traffic authorities favor the closure of the Manila ports partially, if not totally. This resonates well with proponents of the ports of Bataan and Subic. Some business groups have joined the clamor for phasing out the ports of Manila (North Harbor, South Harbor, Harbour Center, and MICT), without examining the implications.

3.98 The main arguments for the phase-out boils down to two: (i) it will decongest traffic, and (ii) it will make the relatively new ports of Batangas and Subic productive. The first may be true, for roads leading to/from the ports. A survey made in 2011 showed container trucks accounting for about 20% of traffic volume on R-10. On other urban streets, trucks are not as prevalent, mainly because of the truck ban. Due to the needs of freight distribution, trucks will not disappear from city streets simply because the ports have been closed. With less than 10,000 registered heavy trucks in the NCR, they represent less than 1% of the metropolitan's vehicle population.

3.99 The case of Batangas and Subic ports provide a stronger argument, albeit it may seem to justify an error. The two new ports have a combined capacity of 1.0 million TEUs per year, but their current utilization is less than 5%. Either these ports were over-designed from the outset, or justified on illusory demand, or simply unattractive to shipping lines. In theory, transferring more cargoes from Manila to the two ports would diminish the number of trucks on urban roads. To support the goal of making the two new ports productive, its main funder (JICA) commissioned a study in 2012 to formulate measures to shift cargoes away from Manila. The draft report of this study has recommended reduced port charges in the outlying ports as incentive, aside from an administrative order mandating the transfers.

Table 3.4.4 Market Share of Ports in the GMM, 2012

Port	Operator	Capacity (TEU)	Volume (TEU)	Volume/Capacity (%)
MICT	ICTSI	2,800,000	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	35,216	4.2

Source: Assembled by Study Team from multiple sources; 2012 data

3.100 While such a shift in the flow of port-bound cargoes appears logical, especially for

shippers in the CALABARZON area, the market is not responding. With more than 1,000 PEZA locators (export-oriented enterprises) in 42 industrial estates, the ports of Batangas would seem to be more convenient for them due to proximity. And yet, most of their cargoes still flow through the ports of Manila. More ship calls in the latter mean shorter time-to-market, which shippers want and are prepared to pay. As long as the international shipping cartels prefer to call in Manila, there is very little incentive for shippers to move their cargo to the ports of Batangas or Subic where ship calls are few and far in between. On the other hand, shipping companies would not call at ports with very little traffic. This is the classic chicken-and-egg situation. About 23 container liner shipping companies call on Manila, whilst Batangas can only claim one ship call a week and Subic claims two.

3.101 A sampling survey done under the 2012 JICA port decongestion study showed that more than 50% of the tonnage unloaded in the port of Batangas, and more than 60% of cargoes from South Harbor and MICT, were destined to points within the Metro Manila area. Only 10% and 13%, respectively, went to consignees south of Manila. If these were representative of the whole, then forcing a shift away from the ports of Manila cannot be justified. The same survey also showed that shipments through the port of Subic are mainly from the north of NCR. The implication is that its future relies less on diversion from Manila.

3.102 The 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 2.7million TEUs mark.

3.103 Terminal operators (like ATI and ICTSI) have the incentive to attract more ship calls. Aside from carrying marketing campaigns, they continuously pursue service and facility improvements. Thus, the huge investments poured to expand capacity and improve the ports of Manila.

3.104 ICTSI has just opened a new terminal berth (Berth 6) at the MICT, reportedly at a cost of USD200million. This provided an extra 300mwharf at 12m draft and 12 ha of container yard. Its total berth length stands at 1,600 m and container yard capacity is 45 ha.

3.105 The port operator ATI has set aside PHP1.5 billion to expand its capacity at the South Harbor to more than 1 million TEUs. A passenger terminal was also completed via PPP in 2002, with the tacit encouragement of PPP Center. The concession has a term lasting up to 2027.

3.106 In the domestic port of North Harbor, PPA has awarded a 25-year concession in 2010 to redevelop the area to Manila North Harbour Port Inc, which is a joint venture between Harbour Centre Port Terminals Inc. and San Miguel Corp. The consortium has committed investments of around USD300million. Developments already ongoing are: (i) construction of an integrated Passenger Terminal Building (PTB), (ii) reconstruction works and extension of Pier 4 to consolidate Ro-Ro and passenger operations and provide sufficient deep water berths; and (iii) reconstruction works and extension of Pier 10-southside to provide sufficient deep water berths for Lo-Lo vessels. The Passenger Terminal 1 is expected to be completed by November 2013. So far, the joint venture is said to have invested PHP1 billion.

6) Summary of Main Transport Development Strategies

(1) SWOT Analysis

3.107 The development strategies for the Study Area can be derived from an examination of the strengths, weaknesses, threats and opportunities of the transport sector. This is summarized in Table 3.4.5 below. The short-to-medium term strategies should necessarily be built on current strengths to capture emerging opportunities, and remedy weaknesses in order to counter threats.

Table 3.4.5 SWOT Matrix

	PRESENT	FUTURE	
STRENGTHS	• Strong private sector interests in infrastructure development via PPP, to the point of being ahead of the infrastructure agencies; • Honest leadership at the top, and open to consultative process • Resurgent economic development that is seen to be in the lead pack of countries in the Asian region • Larger fiscal space or budget envelope for infrastructure investments	• High level of ICT development provides opportunities for wider penetration of telematics in transport • Keen interest of ODA agencies (like ADB and JICA) to assist in navigating to a more sustainable model of transport • Congestion reaching intolerable levels, as to make radical solutions gain primacy and acceptability	OPPORTUNITIES
WEAKNESSES	• Institutional weakness in coordinating and executing plans among agencies; • Disregard of (or lack of fidelity to) past 'master plans' and penchant for short-term impact projects • Exploitation by private interests of the weakness of the bureaucracy; • Absence of effective land use controls, private property owners can get whatever they want; • Strong Congressional (and ODA) influence in the funding of capital projects, to the point of distorting investment priorities	• Rapid motorization slanted towards private cars to result in severe and costly traffic congestion; • Road and rail infrastructure have fallen behind demand, catch-up difficult; • Fundamental reforms have been avoided or postponed; • Dominance or primacy of the National Capital Region is intensifying (greater proportion of GRDP) • Intensification of property development in areas without the support infrastructure	THREATS

Source: JICA Study Team

(2) Regional Transport Development Direction

3.108 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.

(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.

Kansai International Airport

Proposed New NAIA

Airport Terminal
(Dubai International, Dubai)

Personal Rapid Transit
(Heathrow International Airport, London)

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

Figure 3.4.4 Gateway Airports

Docklands (London) **Minato Mirai 21 (Yokohama)**

Source: STACIA CAPITAL, flickriver, Yokohama City

Figure 3.4.5 Images of Port Area Development

(3) Strong Bias for PPP

3.109 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 fuelled by high domestic liquidity and thrust in the political leadership. It will also sidestep the weakness of the bureaucracy, particularly in operations and maintenance as well as slow response to market. The new-found 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. Conversely, projects on the short-term period (up to 2016) should much more on local funding rather than ODA, if only to shorten gestation periods and support the BSP in addressing the large foreign reserves of the country.

3.110 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 the reduction of economic dominance of the three regions and more equitable (geographically) distribution of economic opportunities and wealth.

(4) Clear the Backlogs and Ramp up Tendering

3.111 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. The sweet spot (convergence of many favorable factors) may not last long. For roads, this includes: (i) all the missing sections of C3, C4, and C-5; (ii) several flyovers and interchanges; (iii) at least one of the two NLEX-SLEX connector roads; and (iv) frontloading by private sector concessionaires of their investment commitments on SLEX, CAVITEX, and NLEX. For railways, this includes: (i) LRT 1 Extension to Cavite; (ii) LRT 2 extension to the East; (iii) MRT-3 capacity expansion and system upgrade; (iv)Improvement and

rehabilitation of the commuter service on the south and revival of the north service,[4] and (v) MRT-7 from QC circle to San Jose del Monte. 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 complete several landside and airside projects for Manila and Clark airports.

3.112 For the seaports, the urgent action is to improve access to the North and South Harbors - notwithstanding the policy goal of controlling the ports farther expansion. Improving access to the North and South Harbors is vital to the country's international competitiveness. More than 80% of containers (import and export) were handled at South Harbor and MICT. Liberating trucks from the constraint of truck bans can only raise the productivity of truck haulage and reduce overall cost to export. Designating truck routes provide minor reliefs as it is delimited in time and space, nor does it free truckers from occasional harassment or exaction by traffic enforcers. The MMUTIS plan of 1998 recommended several infrastructure projects to improve port access. Except for some road widening on R-10, most of the recommendations remained unimplemented.

3.113 Full implementation of the MMUTIS recommendation is no longer applicable, given what had happened in the last 10 years. A review of the MMUTIS plan, as well as plans of MNTC, lead to the obvious solution of piggybacking the R10-C3 elevated road on Segment 10 of NLEX. The nearest-to-realization option is to extend Segment 10 to R10, and design the entire Link Expressway to handle heavy trucks. This will remove truck traffic at street levels, transfer them to an elevated tollway, and free them from the truck ban.

Source: Left figure from MMUTIS 1998 study, while the figure on the right is an amalgamation of MNTC and Citra plans.

Figure 3.4.6 Road Infrastructure Projects to Improve Port Access

(5) Tap ODA for Quick and Targeted Planning

3.114 While the preceding thrusts put emphasis on delivery, it should not be construed as the avoidance or disregard of planning – especially, necessary project preparations for obviously justifiable projects. In effect, the planning radar should

[4] Appendix to this chapter provides concepts on the integration of transport projects relating to the accommodation of north-south commuter service with other projects such as the expressways.

focus on getting these projects into immediate implementation, and on filling up the information gaps required by bidding rules. This contrasts with a shot-gun approach of trying to plan for as many possibilities as possible. The latter is a luxury for a 2016 horizon.

3.115 The renewal, expansion, and upgrading of the computerized signalling system is at the top of the list. There are, however, no comprehensive project documents to specify the location and number of intersections to be covered, nor a sense of an overall design of the system, nor assessment of the physical conditions of previously-installed embedded sensors that were abandoned, nor corollary traffic engineering measures such as geometric improvements. Hence, tendering is slow and fragmented.

The suburban railway, or north-south commuter system, is another urgent project with vast data(from PNR and North Rail) – but still short of a tender document. It is vital that the South and North Commuter Service be transformed into a high-grade mass transit service, especially to the south. This will require double-tracking from Malolos (in the north) all the way to Calamba (in the south) and providing grade separations. Such plans are currently under review. South of Metro Manila, it is virtually impossible to add road capacities due to the natural constraints of Laguna Lake. An elevated toll road above the SLEX has been completed up to Alabang, but the expressway is reaching its capacity limits. The only feasible (and economical) option left is to provide the needed capacity via railway. Thus, to cater to the growing demand in the south, the South Commuter needs to be upgraded.

3.116 Another focused study that may need to be initiated soon is the formulation of a road map or action plan to temper or slowdown the momentum of further capacity expansion in the ports of Manila. This could happen is some key functions of the port of Manila get relocated to Batangas. The most logical target is to transfer domestic shipping, which currently calls at North Harbor. Nearly all domestic vessels that call on Manila originate from the south, i.e., Visayas and Mindanao. By terminating at Batangas, instead of Manila, they would save on sailing time–by 3 to 5 hours. More than 5.7 million tons of cargo was unloaded at North Harbor in 2012, the highest among all ports in the country. If this volume lands at Batangas instead of Manila, the export-cargo would naturally shift to Batangas. The vacated space in Manila can then be re-developed into a mixed-used prime commercial and residential area, the kind of urban renewal that the old city of Manila badly needs. The western terminus of LRT Line 2 can then be built to serve this new harbor front development. The current concessionaire, MNHPI, may find this change in plan more lucrative in the long run.

3.117 The City of Manila is looking at South Harbor, rather than the North, for a new financial center. The area is about 20 ha and covers the main office of the DPWH along Bonifacio Drive. On the other hand, the PPA has entertained the idea of redeveloping the same area due to the opportunity opened up by expiring leases. The problem with this plan is that it does not reduce the port-related traffic, but super-imposes a new business-related traffic on the roads leading to the port zone.

3.118 Conversion of ports inside the city core is not novel. Ports typically evolve through a five-stage cycle: (i) primitive city port, (ii) expanding city port, (iii) modern industrial city port, (iv) retreat of the city from the waterfront, and (v) redevelopment of the waterfront. Around the world, many commercial ports are either in or moving towards the fifth stage. And the port of Manila, or at least a major portion of it, is ripe

for the fifth stage.

3.119 Figure 3.4.7 shows the two areas that are candidate for re-development. An independent assessment and exploration of the costs and benefits of the two sites is needed. It was reported that the PPP Center is considering a feasibility study for the South Harbor site. As indicated earlier, this site will not have impact on cargo and truck volume.

Source: Study Team.

Figure 3.4.7 Alternative Sites in Port Area for Possible Re-development

3.5 The Transport Dream Plan for Mega Manila

1) Goals and Planning Conditions

3.120 The challenge postulated in this study is – Can we dream of a transport situation realizing five NOs? Isn't too late to follow a dream plan for Metro Manila? 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

3.121 It is expected that transport function as a catalyst to:

(i) Integrate cities, growth centers, gateways, urban and rural areas distributed in the region,

(ii) Facilitate local economic development, enhance social integrity and promote environmental sustainability, and

(iii) Facilitate planned and guided urban growth and expansion of Metro Manila.

3.122 In order to achieve the above goals, transport network and services must be designed as follows:

(a) **Hierarchical:** The network must be designed in a way that it is a configured efficient network comprising of primary (high standard at regional level), secondary (main network at provincial/municipal level which is connected with primary network effectively to articulate basic transport network to serve the region/province), and tertiary network (main local transport network to connect communities with primary/secondary network).

(b) **Multi-modal:** Effective use of and connectivity between different transport modes such as rail, road, expressway, water, air as well as car, bus jeepney and others to satisfy diversified transport demands and provide choices for users is important.

(c) **Disaster-resilient:** Transport network must be disaster proof and designed in a way that it can provide alternative route.

(d) **Intelligent:** Available equipment and soft measures which can farther increase efficiency and service level of transport system must be incorporated in the transport system.

(e) **Service-oriented rather than hard infrastructure:** Transport system must be always developed in a way that it serves users.

2) Overall Transport Network and Components of "Dream Plan"

3.123 In order to meet future (2030) demand, basic principles considered in formulating the network plan include:

(i) To promote shift from road-based traffic to rail-based mass transit,

(ii) To develop strong north-south backbone both of rail mass-transit and expressways,

(iii) To strengthen network configuration of primary roads, expressways and mass-transit

lines,

(iv) To integrate transport network in peri-urban areas, especially in rapidly urbanizing areas of Bulacan, Rizal, Laguna and Cavite,

(v) To strengthen accessibility to/from and around the CBDs where traffic generation/attraction is significant, and

(vi) To strengthen network resilience through integrated multi-modal transport system (urban roads, expressway and rail-transit including MRT, LRT, AGT, BRT and subway)

3.124 The plan entails looking into the projects that are ongoing, projects that are submitted by agencies to NEDA for review and approval, and projects that have been proposed and evaluated in past master plan studies with the objective of improving the performance of the transport network. The realization of the “Dream Plan” then is the synergizing all these projects and even proposing more needed projects to attain the desired level of transportation network service.

3.125 Initial comparison of demand and supply revealed that adding capacities by upgrading existing facilities would not suffice. New roads/expressways and railways would be needed to meet the projected demand of 2030, which is the travel demand person trip generation of 23.4 million trips for GCR or22.5 million trips for Mega Manila. The proposed roads/expressways and an integrated rail network was developed through an iterative process where at the end the final network provided a congestion free environment in Mega Manila are with relief to most road users and retains a high share of public transport.

3.126 As such, the “Dream Plan” was determined to include five main components of the transport interventions for a better Mega Manila as follows (see Figure 3.5.1):

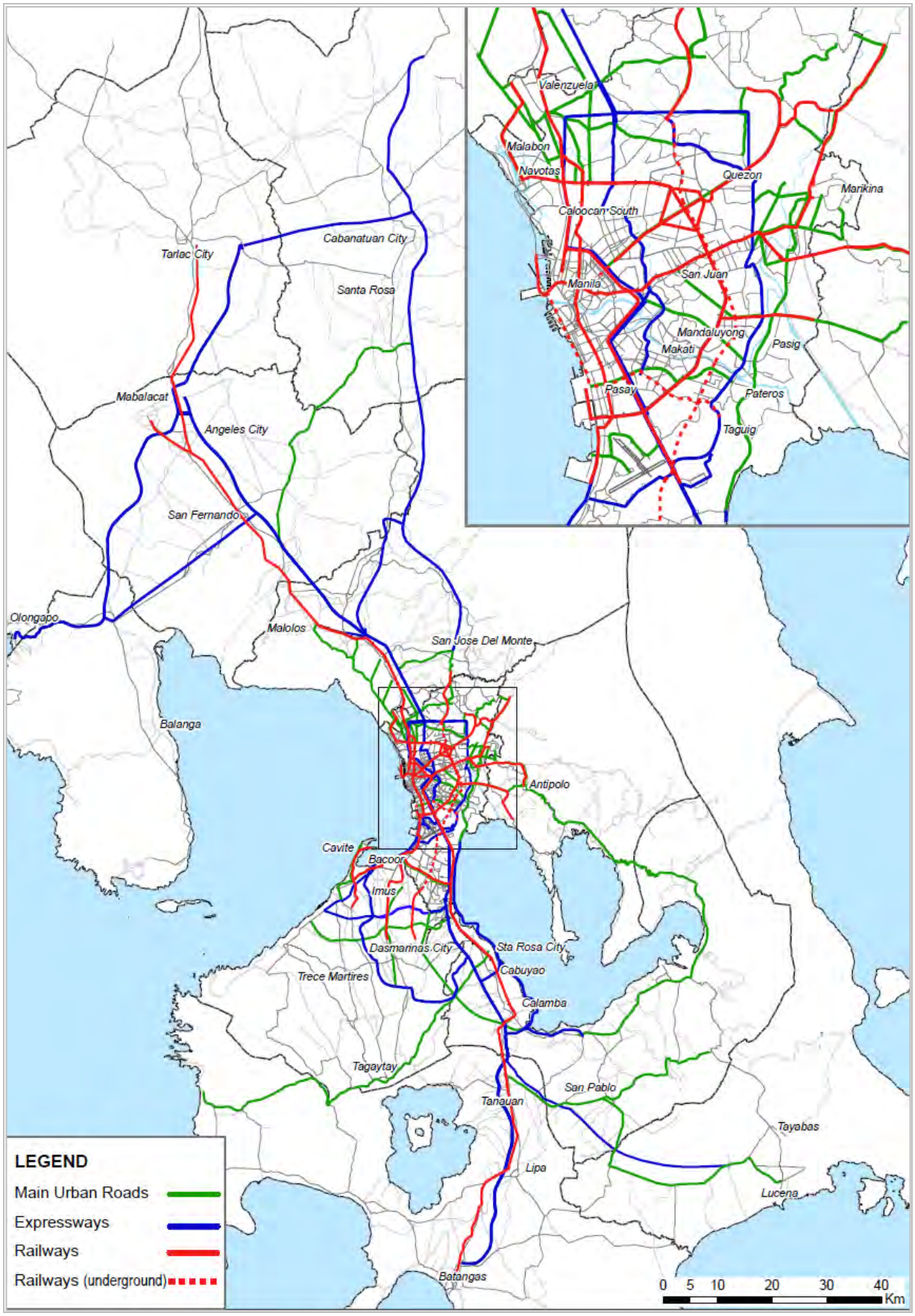
(a) **At-grade Roads**: includes missing links on C3, C5, bridges and others; 137 km of new roads; flyovers; sidewalks and pedestrian facilities.

(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 3.5.1 Overall Transport Network of Dream Plan for Mega Manila 2030

3) Mass Transit Network

3.127 The proposed mass transit network comprises the following (see Figure 3.5.2):

(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.

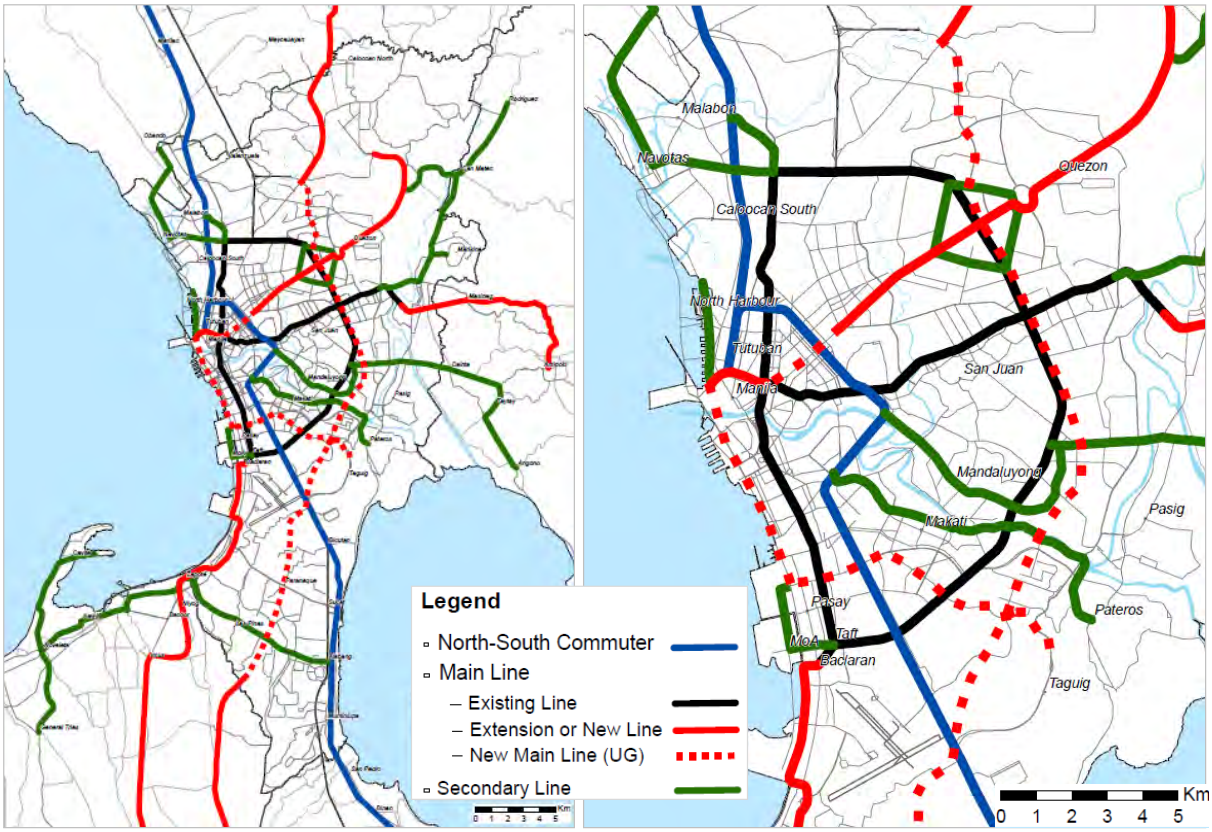
(iii) Other lines: In addition to these, other main and secondary corridors should be provided with adequate urban rail transit systems such as MRT, LRT, monorail, BRT, depending on their local conditions.

3.128 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.

3.129 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.

3.130 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 3.5.1)

3.131 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.



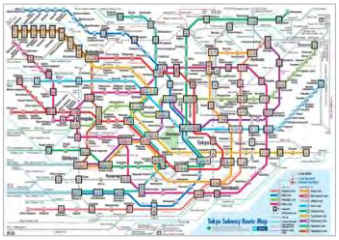
Source: JICA Study Team.

Figure 3.5.2 Proposed Mass-transit Network for Mega Manila, 2030

Box 3.5.1 Examples of Mass-transit Systems and TOD for Improved Mobility

Commuter rail (Odakyu Line)

Tokyo Metro (MRT)



Total length of railway in Tokyo metropolitan ≒ 2,400km

Station plaza (interchange facilities) (Kawasaki)

Monorail (integrated with commercial/ other building) (Kokura)

Monorail (Chiba)

LRT & feeder bus (Toyama)

BRT (Gifu city)

Linear motor car (Aichi)

AGT Yurikamome (Tokyo)

LRT Greenmover (Hiroshima)

Guideway Bus (Nagoya)

Source: JICA Study Team

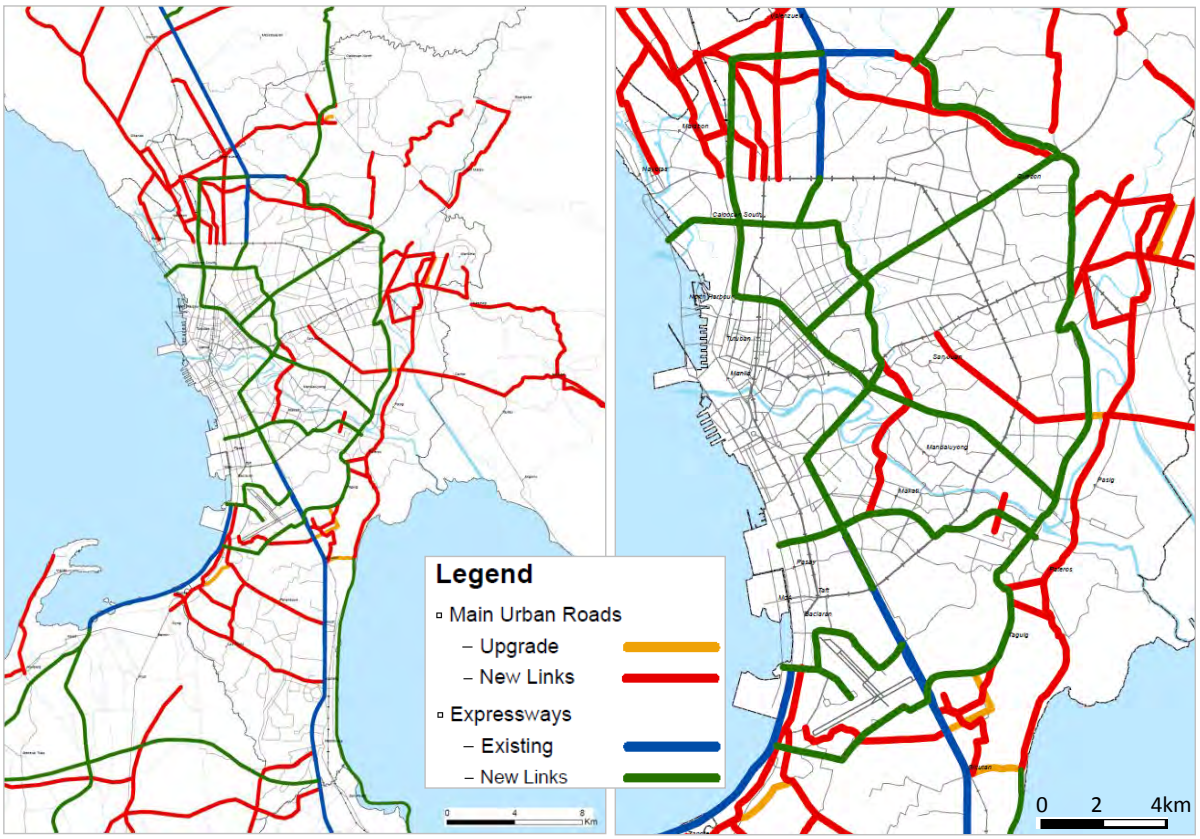
4) Main Urban Road and Expressway Network

3.132 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.

3.133 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.

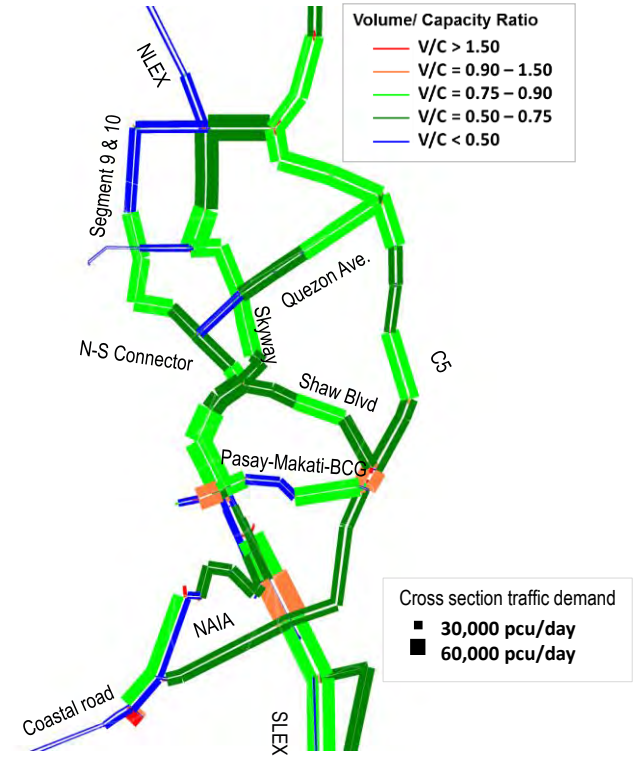
3.134 When the expressways network is in place, it will attract significant traffic demand along major corridors in Metro Manila and contribute to decongesting traffic on at-grade roads. In planning and development of urban expressways, it is also important to consider the integration of different expressway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

3.135 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 3.5.4).



Source: JICA Study Team

Figure 3.5.3 Primary Road/Expressway Network for Dream Plan



Source: JICA Study Team

Figure 3.5.4 Estimated Traffic Demand of Expressways in Dream Plan, 2030

5) Road-based Public Transport

3.136 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.

3.137 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.

3.138 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.).

3.139 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 3.5.2 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

3.140 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.

3.141 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.

3.142 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.

3.143 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.

3.144 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 3.5.3 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

6) Main Projects of Dream Plan

3.145 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.

3.146 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

[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.

others are either proposed or in concept planning by the agencies themselves while others are proposed by the Study Team (see Table 3.5.6).

Table 3.5.6 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)		979,502	
Total Main			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)			1,206,245	
Road				
C3 Missing Link (San Juan - Makati)			24,000	P
C5 Missing Link			696	C/P
Pasig River Bridge (BGC – Ortigas)			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 Phase2		15,860	C
Pasay - Makati – BGC		24,180	P
Sta. Mesa - Pasig (Shaw Boulevard)		23,430	P
CALA Exp. (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			
ITS (3 Provincial Bus Terminals)		6,300	C
2-BRT Lines		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

3.147 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.

3.148 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.

3.149 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.

3.150 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.

3.151 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.

7) Evaluation of Dream Plan

3.152 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. 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 31 minutes due to dream plan as compared to Do-Nothing situation is also significant. Reduced traffic congestion can widen the travel distance significantly (see Figure 3.5.6).

(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.

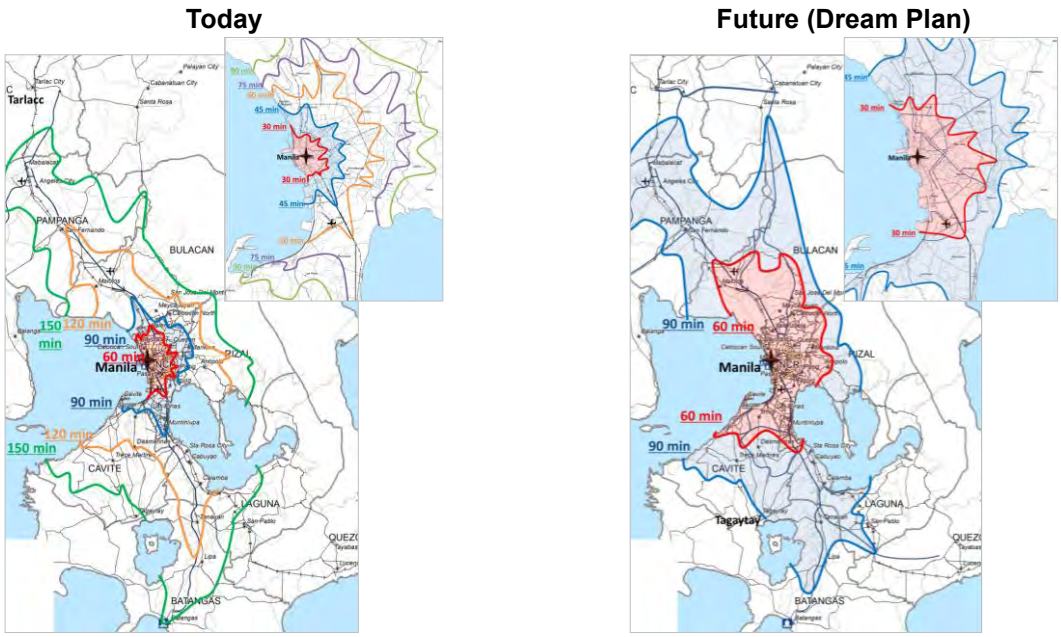
Volume/ Capacity Ratio 2030

- V/C > 1.50 (beyond capacity)
- V/C = 1.00 – 1.50 (at & above capacity)
- V/C = 0.75 – 1.00 (reaching capacity)
- V/C < 0.75 (below capacity)

Indicators			2030	%Change from 2012
Metro Manila	Transport demand (mil. person-km/day)		152.3	15.4%
	Transport Cost (Php billion/day)		1.4	-41.5%
	Air quality	GHG (million Tons/year)	3.99	-16.7%
		PM (million Tons/year)	0.005	-64.3%
		NOx (million Tons/year)	0.04	-18.4%
Bulacan, Rizal, Laguna, Cavite	Transport demand (mil. person-km/day)		115.2	18.9%
	Transport Cost (Php billion/day)		0.8	-15.2%
	Air quality	GHG (million Tons/year)	3.15	-1.6%
		PM (million Tons/year)	0.003	-40.0%
		NOx (million Tons/year)	0.031	-3.1%

Source: JICA Study Team

Figure 3.5.5 Dream Plan Impact on Traffic Cost and Air Quality



Source: JICA Study Team

Figure 3.5.6 Dream Plan Impact on Travel Time (to/from City Center of Manila)

4 TRANSPORT INVESTMENT PROGRAM

4.1 Criteria for Priority Setting

4.1 In an ideal world, priorities among projects competing for scarce fiscal resources can be determined by optimizing the combined benefits of projects. Stated another way, this entails the selection of a combination of projects over time that leads to the highest level of service in the transport network or maximizes the social welfare function. In practice, this is not possible due to other considerations – such as social and institutional, not to mention information gaps for selected projects. The optimization objective is undermined by the inability of implementing agencies to deliver approved and funded projects at the desired point in time[1]. Compounding the problem is a lack of fidelity to a "master plan" that is desired for achieving a long-term vision of an integrated transport system.

4.2 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). The compilation of projects from NEDA, DOTC, DPWH and MMDA are key sources of projects for review[2].

4.3 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 doable in the next three years. It is made easier by the fact that there is a long backlog of projects that should have been completed, but had been waylaid.

4.4 On the other hand, the long-term investment program aims to move 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.

[1] Refer to Institutional Review of the Transport Sector in Appendices for Chapter 4 (1).
[2] Listing of All Projects is provided in the Appendices for Chapter 4 (2).

4.2 Review of Agency Investment Programs

1) Airport Projects

4.5 As discussed in earlier sections of this report, the Philippines has no choice but to embrace a twin gateway airport solution in the short and medium-term period (i.e., from now up to 2022). Any change in this policy can only be effected after 7 to 10 years. Accordingly, resources must be allocated towards enhancing the capacity of NAIA as well as that of Clark. Table 4.2.1 below summarizes the investment proposals from MIAA and CIAC through DOTC.

4.6 The six-year total investment for NAIA is PHP6.28 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 delays in implementation.

4.7 For Clark, the proposed investment is PHP7.538 billion, of which 90% (or PHP6.8 billion) is programmed for 2014–16. The investment profile is back-loaded, and it remains to be seen whether CIAC can be given the resources to deliver them rapidly.

4.8 Furthermore, key observations about the agency proposals are as follows:

(i) The projects were divided into smaller packages or lots, which may be risky. Delays in one package could make the other components unusable, or also trigger delays in the others. Synchronization of implementation can be problematic.

(ii) The division can also lead to financial difficulties, as cost overrun in one package cannot utilize savings from another, without getting into conflict with budgetary regulations.

(iii) Repairs should be excluded from the capital expenditure budget.

Table 4.2.1 Proposed Investment Projects in the Airport Sub-Sector

Airport Projects		Amount (in PHP million)		Remarks
		Total 2011–16	Total 2014–16	
A.	**Ninoy Aquino International Airport**	**6,280.89**	**608.09**	
1	T1:Retroffiting/Renovation of Terminal 1	1,500.00	-	Delayed. Tendering not yet scheduled. Allocation needs to be rolled over to 2014-15
2	T1 and ICT Structural Investigation	9.90	-	Completed, per inquiry
2a	T1 Retrofitting	340.00	-	This follows from Project#2. For tendering.
2b	T1 Refurbishment	500.00	-	Maybe duplicative of Project #1, T1-renovation
3	T1: Leveling/Construction of Flooring on the Escalator Opening at T1	3.10	-	
4	T1:Additional Immigration Booth and Equipment	11.00	-	
5	T1:Continuous Repair of Terminal CRs	30.93	-	Repairs should be part of Operation and Maintenance (O&M) of MIAA; may overlap with Project#1
6	T1: Repair and Rehabilitation of T-1 Apron (Wheel Path and Parking Bay)			Placed on-hold; probably not necessary
7	T2: Construction of Arrival and Departure VIP Lounge	52.80		
8	T3: Completion Works for full Operation	1,600.00	-	Delayed. Amount needs to be rolled over to 2014.
9	T3: Structural Retrofitting	212.00	-	On-going works. To be completed by 3rd Quarter of 2013.
10	T3: Cargo Terminal and Unit Loading Device Yard	-	-	No cost estimate. Being lined up for public-private-partnership (PPP), but no project preparation yet
11	Construction of Remote Parking for T2	231.00	231.0	Maybe suitable for PPP

Airport Projects		Amount (in PHP million)		Remarks
		Total 2011–16	Total 2014–16	
12	Expansion of Arrival and Departure Areas at NAIA Terminal 4	30.00	-	
13	Repair and Overlay of Runway 06-24 (Civil and Electrical Works)	331.45	-	
14	DED+CMS of Rapid Exit Taxiway and Extension to TW-Lima	28.63	-	
15	Construction of Rapid Exit Taxiway and Widening of Taxiway Echo 1	328.60	-	
16	Construction of Taxiway November Extension	426.00	-	
17	Repair and Overlay of T2 to T4 Access Road	53.84	-	
18	Repair and Resurfacing of North and South General Aviation Taxiways	136.6	-	If general aviation is being phased out of NAIA, will this still be necessary?
19	Repair and Resurfacing of T4 Apron including Vehicular Access Road	25.88	-	
20	Relocation/Upgrading of Vehicular Road from Lima Gate to T-4 Ramp	23.44	-	
21	Taxiway H1 to Taxiway C5	-	-	
	- Phase 1	56.07	56.07	
	- Phase 2	69.87	69.87	
	- Phase 3	11.29	11.29	
	- Phase 4	87.63	87.63	
	- Phase 5	99.43	99.43	
22	Upgrading of the Existing Fuel Storage Facility	-	-	For 2014, cost not available. Likely to be borne by private fuel supplier
23	Supply and Installation of Primary Line Conduit of AFL System (Phase 2)	110.00	-	
B.	**Cark International Airport**	**7,538.10**	**6,801.70**	
24	Upgrading of Passenger Boarding Bridge to Two Finger Aero Bridge	110.00	-	
25	Passenger Terminal Phase II Expansion	360.00	-	Delayed
26	Construction of Low Cost Carrier Terminal Building	6,242.70	6,242.70	Should be accelerated
27	De-rubbering of Rubber Deposits at the Runway	5.59		Should be part of O&M
28	Reconfiguration of Pavement Markings	2.88	-	Should be part of O&M
29	Supply and Installation of Thermoplastic Paint at Taxiways	7.92		Should be part of O&M
30	Replacement of Navigational Aids Equipment	230.00	-	
31	Rehabilitation of Pavement at Portion of Taxiway Delta	20.00		Should be part of O&M
32	Replacement of Ground Lighting System	400.00	400.00	
33	Replacement of Weather Observation System	40.00	40.00	Should be coordinated with Department of Science and Technology (DOST)
34	Rehabilitation of Overrun at Runway 02R/20L	32.00	32.00	
35	Replacement of Perimeter Security Lighting System	7.00	7.00	Should be part of O&M
36	Repainting of Pavement Markings at Runway 02R/20L	16.00	16.00	Should be part of O&M
37	Asphalt Overlay at shoulder of Main Ramp and North Ramp	12.00	12.00	Should be part of O&M
38	Asphalt Overlay at Taxiway A, F5 and F7	40.00	40.00	Should be part of O&M
39	Rehabilitation of Taxiway F2 from TW-Delta to Passenger Terminal Exit	12.00	12.00	

Source: JICA Study Team.

2) Traffic Improvement Projects

4.9 The list of projects from MMDA included a mixed bag – ranging from road infrastructure, traffic engineering, mass transit to bus transport interventions. This is shown in Table 4.2.2. The more important investment package is that for Traffic Improvements, which is clearly under the aegis and mandate of MMDA.

Table 4.2.2 Proposed Investment Projects from MMDA

	Projects by Groups	Amount (PHP million)	Remarks
A.	**Road Infrastructure**		
1	Skybridge (formerly San Juan Elevated Highway)	13,650	Two elevated roads to link NLEX-SLEX will also address traffic demand for this project.
2	Skyway 3	26,500	Part of DPWH program
3	Feeder Lane to South Bus Terminal	102	Should be part of the cost of the Terminal. Currently bided out.
B.	**Public Transport**		
4	Integrated Transport System (3 Provincial Bus Terminals) now called Integrated Provincial Bus Terminal System (IPBTS)	6,300	A project of DOTC. A full-pledged bus reform study should be launched to formulate a comprehensive set of solutions to road-based public transport system, starting with buses. Legal hurdle: MMDA cannot be an implementing agency.
5	Elevated Loading/Unloading Bay	TBD	Not workable, without a corresponding BRT system or changes in the technical regulations over motor vehicles
6	MMDA Bus Management and Dispatch Facilities(BMDS)	TBD	Should be part of an overall Bus Sector Reform Program.
7	Electronic Tagging System or 'E-tagging'	TBD	Should be part of an overall Bus Sector Reform program. Cannot stand on its own, without project#5.
C.	**Mass Transit**		
9	Development of Alternative Modes of Transport - BRT for C5	1,642	Study already being conducted by DOTC.
D.	**Traffic Management**		
10	Module A: traffic signal upgrading	2,777	A major study should be launched to review state of TEAM 1, 2, 3 &4 and to determine optimal coverage of a smart traffic signalization system. Also upgrade traffic engineering capacity of MMDA
11	Module B: communication	532	Should be integrated in envisaged Team V Smart System project.
12	Traffic Signalization Project (Phase I). initially 85 intersections	295	Should be integrated in envisaged Team V Smart System project.
13	Construction of LED Boards	TBD	Should be integrated in Team V Smart System
14	Metro Manila Traffic Navigator II (TNAV 2)	20	Should be integrated in Team V Smart System
15	Construction of Rotundas	TBD	Backward step to signalization; ROW acquisition will render scheme unfeasible
E.	**Others**		
16	NMT: Bicycle Lane	10	Should be coordinated with, if not assigned to, concerned LGUs
17	Construction of Footbridges	TBD	66 structures built; systematic program missing. Should be made part of an envisaged Team V Smart System.

Source: JICA Study Team.

4.10 There are strong doubts about the other investment modules. Following a decision handed out by the Supreme Court (GR No. 170656) in August 2007, the MMDA is not authorized to implement the provincial bus terminal project (or IPBTS). It can also be inferred from that decision that it cannot be the implementing body for its proposed Skybridge project, assuming the latter is viable. 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 same successful and sustainable.

3) Mass Transit Projects

4.11 Of the 13 identified projects being proposed for inclusion in the transport investment program to year 2016, 12 are from DOTC. The indicative six-year investment value is PHP297 billion. Of these, 5 are deemed committed (i.e., at the stage of tendering or already have signed contracts) with an investment sum of PHP140 billion. These 5 "committed" projects are: (i) 3 ITS bus terminals, (ii) LRT-1 Cavite Extension Project, (iii) LRT-2 East Extension, (iv) AFCS, and (v) MRT-7. Except for LRT-2-East Extension, all are on the PPP-track.

Table 4.2.3 Proposed Investments of the Mass Transit Type

	Name of Project	Amounts (PHP million) 2011–16	Total:2014–16	Remarks
1	Integrated Provincial Bus Terminal [1/] (Provincial Bus Terminals) *[committed]*	7,500	6,300	For 3 provincial bus terminals; committed but likely to suffer delays. Amount includes investment from private sector; as per EO#67s2012, these projects must be implemented via PPP. Based on F/S for 2 southern terminals,
2	LRT Line 1 Cavite Extension Project *[committed]*	64,915	30,764	Committed via PPP+ODA. Delayed tender. Earliest start of construction in 2014, with completion by 2018.
3	LRT Line 2 East Extension *[committed]*	9,568	9,568	Committed with NG & ODA funding. Earliest start of construction in 2015, with completion in late 2016.
4	MRT 3 Capacity Expansion (48 LRVs)	4,500	-	Committed. Already 2 years delayed. Amount maybe inadequate to resolve Line 3 problems.
5	AFCS (Common Ticketing) *[committed]*	1,722	1,722	Committed. Now on PPP Tender, with expectation of 100% funding from private sector
6	Line 1 North Extension Project	5,930	2,894	North loop completed 3 years ago. If intended for Common Station, amount is excessive
7	Line 1 and Line 2 System Rehab *[committed]*	9,316	4,500	Committed, mostly for LRT 1. Implementation of sub-projects delayed
8	Manila-Clark Airport Express Rail Link	94,180	-	As proposed, this project is not doable before 2016. Will not likely proceed with government leaning for a twin gateway airport.
8	Makati-Pasay-Taguig Mass Transit System	63	34	Amount refers to pre-FS. Investment not likely to happen before 2016.
9	Main Commuter Line Rehab	323	133	For South Line only. Deserves higher priority, based on criteria. However, amount is too little to produce significant improvements in level of service from Alabang to Calamba
10	Subsidy for MRT3	32,464	15,406	No longer necessary considering approval in Jan 2013 of the buy-out of the debt papers of MRTC. Also, points to an order-of-magnitude estimate on future subsidy if MRT-7 pushes through.
11	BRT System for C-5	TBD	TBD	Study is under preparation by DOTC. Implementation unlikely to happen before 2016.
12	New Transport System of BCDA, phase 1	31,373	19,361	Per study submitted by METI to BCDA, project cost = JPY105.5 billion for 19.8km in 3 phases. Cost and alignment are preliminary as per pre-FS level. For deferment into the long term after a more detailed study is done on access to tri-CBDs.
13	MRT-7 [*committed]*	51,870	-	23-km elevated LRT on Commonwealth Avenue, from EDSA to San Jose del Monte in Bulacan. PPP concession signed in June 2008. Was supposed to be completed in June 2013. Cost at USD1.235 billion
	Total Investment in MTS	**313,724**	**90,682**	

Source: JICA Study Team compiled from DOTC, BCDA.
1/ Submitted project name "Integrated Transport System" was changed to Integrated Provincial Bus Terminals to avoid confusion with "Intelligent Transport System" or ITS.

4.12 Three big-ticket rail projects (Airport Express, LRT-1 North Extension, and Monorail) with an aggregate cost of PHP131.5 billion can be excluded from the short-term program for reasons indicated above: they are not doable before 2016. Also, the subsidy (of PHP32.5 billion) to MRT-3 can also be excluded on the assumption that the debt-equity of MRTC would be effected in 2013.

4.13 No figure is available as yet for a BRT Line. If a detailed feasibility study is made soonest, it is also possible to complete this project by 2016.

4) Ports Projects (PPA)

4.14 The primary international gateway seaport, MICT, has just completed its Berth 6 that expanded its capacity to 2.5 million TEUs per year, at a cost of USD200 million. Anticipating continued growth, the port operator ICTSI is preparing to build Berth 7 within five years.

4.15 There is also a plan to expand South Harbor, which also serves international shipping. The port operator, ATI, has a commitment to PPA to invest in rail and quay cranes to improve its throughput capacity to 24 million metric tons and 1.6 million TEUs annually.

4.16 For domestic shipping, the main port is North Harbor. It is just starting on its 25-year re-development plan under a PPP arrangement with MNHPI. The plan components include the following: Terminal 1 (for containerized vessels)-wharf structure at Pier 14, Terminal 16 and Marine Slipway; Terminal 2 (also for containerized vessels)-wharf structure at Piers 6 to Pier 12; Terminal 3 (for non-containerized, bulk/break bulk vessels)-construction of a new alignment of berthing spaces at Piers 2 and 4, and reclamation of an area in Pier 2 extension; and the construction of Passenger Terminal Buildings. When completed, the capacity of North Harbor will be increased to 1.6 million TEUs and 2.5 million metric tons, respectively, by 2017 and 3.2 million metric tons and 2.3 million TEUs, respectively, by 2035.

4.17 Investments in other small ports are being programmed for Regions III and IV-A. However, the investment amounts (PHP835 million) pale in comparison to those for MICT, South and North Harbors for which no information is available.

4.18 The DOTC is studying the revival and expansion the Pasig Ferry, which has twice been tried and failed. It has programmed an investment of PHP546 million for this purpose – the bulk of which would come from the private sector operator. This is unlikely to happen before 2016.

4.19 To support the objective of tempering traffic congestion at the ports, logic dictates that proposed investments at MICT, South and North Harbors should be put on hold.

5) Road Projects from DPWH

4.20 The capital expenditure program submitted by DPWH is shown on Table 4.2.4. The total value is over PHP218 billion, or an annual average of nearly PHP73 billion for the GCR 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 doable before 2016.

Table 4.2.4 Proposed Investment on Roads

Name of Project		Amount (PHP Million)	Remarks
1	Missing Links of C-5		
a	- Flyover on CP Garcia in Sucat	251	Committed
b	- Coastal Road/Parañaque	210	New proposal
c	- Flyover at SLEX	235	New proposal
2	- Skyway/FTI/C5 Link	17,880	
3	DaangHari-SLEX Link Tollroad	2,000	Committed. PPP concession signed in 2011.
4	NLEX-SLEX Connectivity		
a	Link Expressway	25,556	Unsolicited proposal from Metro Pacific
b	Skyway 3 section	26,500	Concession of Skyway Citra with inclusion of common section
c	- Segment 9 & 10 and connection to R10	8,600	Committed investment of MNTC
4	NAIA Expressway, phase 2	15,860	Concession awarded to San Miguel/Citra
5	CALA Expressway, stages 1 and 2	35,426	Four (4) bidders pre-qualified. For bid submission
6	EDSA (C-4) Rehabilitation	3,744	Approved, but implementation postponed
7	EDSA/Taft Ave to Roxas Blvd.	3,033	Committed. No need to accommodate probable MRT-3 extension
8	Interchanges for High-Standard Roads		
a	- C5: Greenmeadows/Acropolis	1,575	
b	- C4: Roosevelt/Congressional	941	Potential conflict with railway's Common Station
c	- C4: West Ave./North Ave./Mindanao Ave.	1,502	
d	- C5: Pasig-Bagongllog	435	
e	- C2: Gov. Forbes / Espana	1,070	
8	Plaridel Bypass (Bulacan) Phase II	900	Committed: Phase 1 ongoing from previous loan; Phase 2 new loan
9	CLLEX Phase 1 (La Paz, Tarlac-Cabanatuan)	14,936	Committed
10	C6 Flood Control Dike Expressway	18,590	Desirable project arising from Laguna Lake Flood Control Project
11	STAR Expressway (Batangas-Lipa)	2,320	Committed
12	Segment 8.2 of NLEX to Commonwealth	7,000	Proposed
13	Other Central Luzon Road Packages	16,000	Committed
14	Other Southern Luzon Road Packages	36,360	Committed
15	Preparatory Studies for several roads	500	Proposed

Source: JICA Study Team compiled from DPWH.

4.21 The widening of Star Expressway from Lipa to Batangas would complement the port decongestion strategy while the construction of the Calamba–Los Baños Expressway 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.

4.3 Recommended Short-Term Investment Program (2014–2016)

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

(i) 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 improve overall network connectivity and efficiency). Projects that promote public transport usage take precedence over projects that encourage private cars.

(ii) Doability, that is, 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.

(iii) Robustness, that is, the ability of the project in resolving present and future capacity constraints.

4.23 The result is a proposed short-term transport investment program (TRIP) shown in Table 4.3.1. 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.

Table 4.3.1 Consolidated Short-term Transport Investment Program 2014–2016

	Name of Project		Amount (PHP Million)	Public	Private	2014	2015	2016	Remarks
A	**Roads**		**64,943**	**47,063**	**17,880**	**20,532**	**25,031**	**19,380**	
1	Missing Links of C-5 (South); 3 Packages	a							
	a. CP Garcia flyover on Sucat Road		251	251		251			Committed: Urgent national arterial/ secondary roads & bridges
	b. Coastal Road/C5 Extn. South		210	210		210			Committed: DPWH is undertaking study for best design option
	c. C5 South Extn Flyover at SLEX		235	235		235			DPWH is undertaking study for best design option
2	Global City to Ortigas Center Link Road	b	8,120	8,120		2,030	4,060	2,030	Proposed: Originally in DPWH program, after 2016
3	Skyway–FTI - C5 Connector		17,880		17,880	5,960	5,960	5,960	Committed: To piggyback on Ayala Land development of FTI
4	Missing Links of C-3 (S. Juan to Makati)	a	24,000	24,000		4,800	9,600	9,600	Proposed: Cost is nominal. Under study by DPWH
5	Rehabilitation of EDSA	↗	3,744	3,744		3,744			Committed: Assuming reduced scale of improvements
6	Arterial Road Bypass Project Phase II	↗	3,341	3,341		2,227	1,114		Committed
7	EDSA-Taft Flyover	a	3,033	3,033		455	1,820	758	Committed. Possible tendering end-2013. No need to accommodate probable MRT-3 extension
8	Metro Manila Interchanges Construction Phase IV: 7 Packages	a	4,129	4,129		620	2,477	1,032	Committed:
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			Ongoing and close to completion
2	NLEX–SLEX Connectors								
a	Link Expressway	↗	25,556		25,556		12,778	12,778	Committed: To undergo Swiss challenge within 2013.
b	Skyway stage 3	↗	26,500		26,500	6,600	13,250	6,650	Committed: Concession of Skyway Citra, net of common section with inclusion of Common Section
c	Segment 9 & 10 and connection to R10		8,600		8,600	4,300	4,300		MNTC is committed to build under its concession.
3	NAIA Expressway, phase II	↗	15,520		15,520	6,208	6,208	3,104	Committed: Concession awarded to San Miguel/Citra
4	Cavite – Laguna Expressway	↗	35,420	17,710	17,710	7,084	14,168	14,168	Committed: To be tendered late 2014
5	CLLEx Phase I	d	14,936	7,468	7,468	4,491	6,416	1,925	Committed
6	Calamba–Los Baños Expressway		8,210	4,105	4,105		4,105	4,105	Proposed: Promote emergence of urban node at Calamba–Malvar
7	C6 Extension–Flood Control Dike	↗d	18,590	9,295	9,295		7,436	3,718	Proposed: A co-benefit of the flood control

	Name of Project		Amount (PHP Million)	Public	Private	2014	2015	2016	Remarks
	Expressway								program for Laguna Lake
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**	**0**	**21,347**	**29,377**	**25,136**	
1	Secondary Road Packages	b	23,000	23,000		7,667	7,667	7,666	Proposed: Approx. 150-km roads in Cavite and Bulacan, and other areas
2	Prepared studies for several projects		500	500		250	250		Proposed: Assuming PHP 50m per project
3	Other Central Luzon Road Projects	b	16,000	16,000		3,330	7,330	5,340	Committed and proposed projects as of March 2013
4	Other Southern Luzon Road Projects	b	36,360	36,360		10,100	14,130	12,130	Committed and proposed projects as of March 2013
D	**Railways**		**178,823**	**75,854**	**102,970**	**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	Committed: Approx. 50% will come from the private sector, and PHP25 billion from government. Completion in 2018
2	LRT2 East Extension	↗	9,759	9,759			4,879	4,879	Committed: Current plan of DOTC is to implement the civil works with local funds, and the incremental electromechanical components via ODA.
3	MRT3 Capacity Expansion	↗	8,633	8,633		2,158	4,317	2,158	Committed: This amount is higher than what DOTC is proposing, as it includes estimated cost for power system upgrade, signaling, track rehabilitation and station refurbishment
4	MRT 7 stage 1 (Quezon-Commonwealth)	↗d	62,698		62,698		15,675	15,675	Committed MRT7 Project: Assuming feasibility study for a BRT is undertaken soon, for implementation in 2015-2016 of a 22-km line, which can be converted to an MRT in the future.
5	Contactless Automatic Fare Collection System	↗	1,722		1,722	688	688	344	Committed: DOTC expects the entire amount to come from the private sector
6	LRT Line 1 and Line 2System Rehabilitation	↗	6,067	6,067		6,067			Committed: This assumes that nearly 50% of PHP 9.3billion proposed had been spent or signed off before 2014.
7	Manila – Malolos Commuter Line	b d	24,800	24,800		6,200	6,200	6,200	Proposed: F/S under review
8	Metro Manila CBD Transit System Study	c	75	75		75			Proposed: Study Ongoing
9	Mega Manila Subway Study	c	120	120		120			Proposed: Concept Study is part of this study.
10	Common Station for LRT 1, MRT 3 and MRT 7	↗	1,400	1,400			700	700	Committed: Line 1 preparation for a Common Station
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			Committed: Balance, assuming that PHP 1.2 billion will be used in 2013. Per EO#67s2012, must be pursued under PPP. Hence, at least PHP 3.8 billion must come from private sector.
2	Road-based Public Transport Service Modernization Study	c	60	60		40	20		Proposed: A feasibility study to re-structure metro bus services based on lessons from Seoul and other cities, achieve true common dispatching via application of ITS in bus and jeepney operations, and establish common ticketing and new payments of compensating drivers and operators
3	BRT System 1	b	3,200	1,600	1,600	1,167	2,033		Proposed
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	Committed: Subject to project preparatory study on system coverage and ITS technology. Consolidates DPWH and MMDA programs in one package
2	Systematic Road Safety Interventions	c	1,000	1,000			500	500	Proposed: Amount and scope to be determined under a thorough road safety study and investigation
3.	Comprehensive Traffic Management Study	c	50	50		50			Proposed: Engineering study to determine the coverage and sophistication of a new generation traffic signaling system
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		Committed: Some projects committed while others awaiting project approvals.
2	Clark International Airport Construction of a Budget/LCC Terminal	↗	7,070	3,949	3,121	2,357	2,357	2,357	Committed: Some projects committed while others awaiting project approvals.
3	Feasibility Study of a New NAIA	c	50	50		50			Proposed: Feasibility of another airport location closer to Metro Manila, to emerge as the New NAIA (transfer of the existing NAIA) compared to the Clark option, fully-costed.
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	Committed: Project sector (MNHPI)) investment commitments

	Name of Project		Amount (PHP Million)	Public	Private	2014	2015	2016	Remarks
2	Projects for South Harbor		1,000		1,000	400	400	200	Committed: Project sector (ATI) investment commitments
3	MICT		4,000		4,000		800	1,600	Committed: Project sector (ICTSI) plans
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

4.24 Some comments or explanations are in order about the above program, viz.:

(i) It is possible that not all the interchanges and flyovers can be built, or signed off, before 2016. But the reason will not be financial. Objections from other sectors could derail the timetable, as well as delays in right-of-way acquisitions.

(ii) Expressways and other projects with PPP potentials, but are not yet committed, are assumed to require 50% funding from the government. This may be the key to speeding up financial closing and ground-breaking.

(iii) Except for timing, there is no substantial difference between the DPWH-submitted program and the Study's recommended short-term TRIP. The latter is more aggressive in proposing sooner (rather than later) execution.

(iv) The biggest risk to the realization of the short-term transport investment program (TRIP) is the capacity of the public sector agencies to deliver them. While DPWH has demonstrated significant gains in this regard, the DOTC is still struggling.

(v) The private sector is showing a strong appetite for the projects on the PPP track. This is a window of opportunity arising from the confluence of high liquidity in the domestic market and anemic yields in Europe and USA.

(vi) Through moral suasion, the terminal operators in North and South Harbors, as well as MICT, could be persuaded to scale down their expansion plans (involving PHP10 billion investments in the next three years) in order to cap port capacities in Manila. However, this would entail much more than policy pronouncements.

(vii) As a matter of policy, the building of rail projects should take precedence over elevated roads on the same corridor, i.e., public transport needs ought to be addressed first before private cars. For example, the MRT-4 and MRT-7 should be built ahead of the R-7 Expressway on Quezon Boulevard-Commonwealth Avenue.

(viii) The proposed program recognizes that MRT-7 is committed. However, since it has not yet gained financial closing, much less broken ground, it can still be modified. Instead of North Avenue, the line should end at EDSA/Quezon Avenue where it would have a common station with MRT-3. Its future extension (Stage 2) should be along the R-4 corridor on Quezon Boulevard, terminating at the Claro M. Recto where it would have interchange with LRT-2. Because of this modification, it may be convenient to rename the entire line – from CM Recto to San Jose del Monte – as the Green Line. Accordingly, LRT-1 can be renamed as Yellow Line, LRT-2 as the Purple Line, and MRT-3 as the Blue Line – consistent with the dominant colors in their rolling stocks and station motifs.

(ix) A major change in the submitted or proposed program of DOTC is the removal of the Airport Express project (about PHP94 billion) and its substitution by the Suburban Railway project (about PHP25 billion). The former is not urgent in the light of the dual gateway airports compromise. Its implement ability is also highly doubtful. On the other hand, the suburban railway (i.e., PNR commuter) is at a stage where it can be tendered within 12 months.

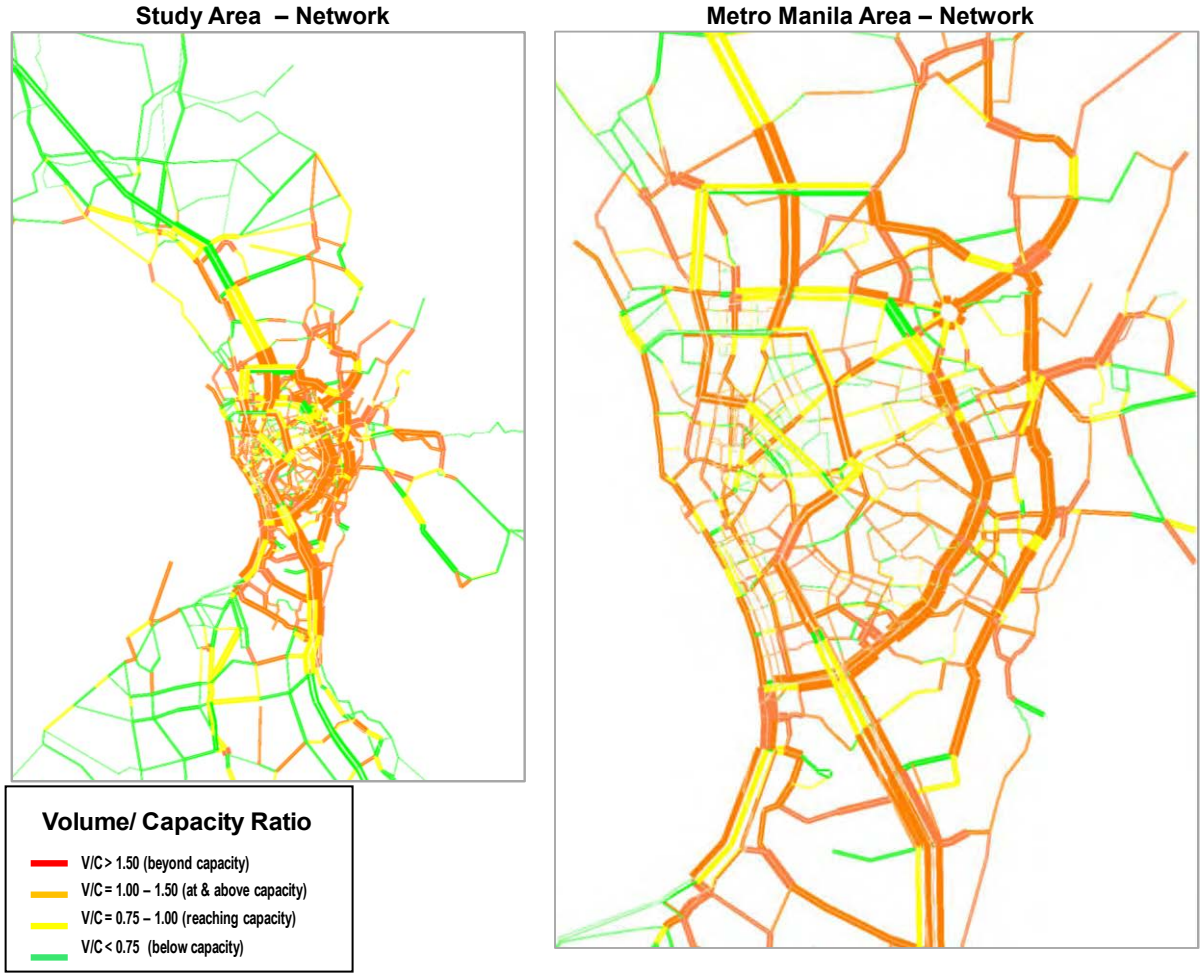
(x) Projects worth more than PHP178 billion (33.5%) would not be in the program, based on the criteria. They are not ready for implementation. However, they have been included on the premise that the agencies could fast-track the foundational studies that could support their early tendering.

4.25 A sequencing of project implementation is worked out based the consolidated investment program (refer to Table 4.3.2). Likewise, an iteration of these projects was done on the traffic model for assessment of their network performance. It revealed that the first drawdown of benefits from these projects is the 9% reduction in transport cost. This means total transport cost in 2016 will go down to PHP3.1 billion per day (i.e., from cost of PHP180/trip in 2012 to PHP158/trip in 2016), and a fair reduction of GHG in air quality by 10% in Metro Manila and 6% in surrounding provinces (refer to Table 4.3.3). Figure 4.3.1 illustrates the road conditions of Mega Manila with these projects in place.

Table 4.3.2 Indicative Implementation Schedule for the Short Term TRIP[1] (2013–2016)

	Name of Project		2013	2014		2015		2016		Beyond 2016	Implementing Agency
			Q4	SA-1	SA-2	SA-1	SA-2	SA-1	SA-2		
A. HIGHWAYS	1. Missing Links of C5	a. Flyover on C.P. Garcia in Sucat									DPWH
		b. Coastal Road/C5 Ext. South Flyover									DPWH
		c. C5 South Ext. Flyover at SLEX									DPWH
	2. Global City to Ortigas Center Link Road										DPWH
	3. Skyway–FTI - C5 Connector										DPWH
	4. C3 Missing Links (San Juan to Makati)										DPWH
	5. Rehabilitation of EDSA										DPWH
	6. Arterial Road Bypass Project Phase II, Plaridel Bypass										DPWH
	7. EDSA – Taft Flyover										
	8. MM Interchanges/ Flyovers	a. C2 (Gov. Forbes)/R-7 (Espana)									DPWH
		b. C3(Araneta Ave.)/ E. Rodriguez Sr.									DPWH
		c. C5/Lanuza St.- Julia Vargas Ave.									DPWH
		d. EDSA/ North/West/ Mindanao Ave./Roosevelt									DPWH
		e. C5/Kalayaan Ave.									DPWH
		f. C5: Green Meadows/ Acropolis/CalleIndustria									
		g. P. Tuazon/ Katipunan									
B. EXPRESSWAYS	1. DaangHari–SLEX Link										DPWH
	2. NLEX–SLEX Connectors	a. Link Expressway									DPWH
		b. Skyway Stage 3									TRB
		c. Segments 9 & 10, connection R10									DPWH
	3. NAIA Expressway, phase II										DPWH
	4. Cavite –Launga Expressway									2017	DPWH
	5. CLLEX Phase I									2017	DPWH
	6. Calamba–Los Baños Expressway										DPWH
	7. C6 Extension–Lakeshore Dike Road									2017	DPWH
	8. Segment 8.2 of NLEX to Commonwealth										MNTC
	9. STAR (Batangas – Lipa)										
C. OTHER ROADS	1. Bulacan Road Packages 1 and 2										DPWH
	2. Cavite Secondary Roads										DPWH
	3. Sucat Road Upgrade										DPWH
	4. Quirino Road (Paranaque)										DPWH
	5. Paranaque Road Package										DPWH
	6. Prepared studies for several projects										DPWH
	7. Other Central Luzon Road Projects										DPWH
	8. Other Southern Luzon Road Projects										DPWH
D. RAILWAYS	1. LRT 1–Cavite Extension and O&M									2017	DOTC
	2. LRT 2–East Extension										DOTC
	3. MRT 3 Capacity Expansion										DOTC
	4. MRT 7 stage1 (Quezon Ave–Commonwealth Ave.)									2018	DOTC
	5. Contactless Automatic Fare Collection System										DOTC
	6. Line 1 and Line2 System Rehabilitations										DOTC
	7. Manila – Malolos Commuter Line					TBD					NLRC/PNR
	8. Metro Manila CBD Transit System Project Study					TBD					DOTC
	9. Mega Manila Subway Study						TBD				DOTC
	10. Common Station for LRT 1, MRT3 and MRT 7										DOTC
E. ROAD-BASED PT	1. Integrated Provincial Bus Terminal System										DOTC
	2. Road-based Public Transport Modernization Study						TBD				DOTC
	3. BRT System 1										DOTC
F. TRAFFIC MGT.	1. Modernization of Traffic Signaling System										MMDA
	2. Systematic Road Safety Interventions										MMDA
	3. Comprehensive Traffic Management Study										MMDA
G. AIRPORTS	1. NAIA	a. NAIA Improvement – airside package									MIAA
		b. NAIA improvement–landside package									MIAA
	2. Clark International Airport Construction of a Budget/LCC Terminal										CIAC
	3. Feasibility Study of a New NAIA					TBD					DOTC
H. PORTS	1. Projects for North Harbor										PPA
	2. Projects for South Harbor			TBD							PPA
	3. MICT			TBD							PPA
	4. F/S of NH Redevelopment					TBD					PPA
	5. Other Ports										PPA

Source: JICA Study Team.
Notes: SA 1= Semi-annual from January to June; SA 2= Semi-annual from July to December; Q4 = 4th quarter of the year; blue cell = pre-construction activities; orange cell = construction
[1] Refer to report volume on Roadmap Projects for detailed activities.



Source: JICA Study Team, Study Area Traffic Model, Network Image from CUBE Software.

Figure 4.3.1 Traffic Demand on Mega Manila Road Network, 2016 Short Term

Table 4.3.3 Traffic Demand and Impacts for Short Term Program (2014–2016)

Indicators			2016	Change from 2012
Metro Manila	Traffic demand (mil. trips/day)		13.3	3.9
	Transport cost (PHP bil./day)		2.16	-8.5
	Air quality	GHG (mil. Tons/year)	4.3	-10.2
		NOx (mil. Tons/year)	0.043	-12.2
Bulacan, Rizal, Laguna, Cavite	Traffic demand (mil. trips/day)		6.5	8.3
	Transport cost (PHP bil./day)		0.94	-5.1
	Air quality	GHG (mil. Tons/year)	3.0	-6.2
		NOx (mil. Tons/year)	0.029	-6.5

Source: JICA Study Team.

4.4 Tentative Medium and Long Term Transport Investment Program (TRIP)

4.26 For the next six-year Philippine Development Plan 2017–2022, a recommended transport investment program is shown in Table 4.4.1. For projects beyond the 2022 horizon but till 2030, these are relegated in the long-term TRIP. The main consideration is to realize the "dream plan" as soon as possible, within the forecasted budget envelope. As mentioned in previous chapters of this Report, the dream plan is the set of projects that will establish a balance between demand for and supply of transport infrastructure by 2030. The focus is on future problems, so that systemic traffic congestion disappears by 2030.

4.27 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. Most of it will survive and form the core program of the next six-year infrastructure investment portfolio. Without diminishing the right of the next administration to change priorities, there is very little it can do in terms of the composition. It could not put into tender those projects bereft of pre-implementation details like feasibility studies and engineering designs. The tendering for projects in 2017 will be dependent on studies conducted on or before 2016.

Table 4.4.1 Indicative Medium and Long Term TRIP

	Project	Plan	Length (km)	Total Cost (PHP mil.)	Remarks
A	**National Roads**				
1	Navotas/ Malabon/ Valenzuela Package	Medium	85.6	23,920	
2	Marikina Package	Medium	51.8	8,720	
3	Ortigas Avenue Upgrade	Medium	9.5	8,910	
4	Amang Rodriguez Av. & Pres. Manuel Quezon	Long	15.3	9,930	
5	Alabang-Zapote	Medium	11.4	9,470	Can piggyback on Laguna Lake dikes
6	Rosario Package	Long	13.4	4,010	
7	Sta. Rosa - Tagaytay - Nasugbu	Long	66.6	11,330	
8	Marcos Highway	Medium	1.7	420	
9	Marcos Highway	Long	5.2	1,030	
10	Calamba Package	Medium	12.4	3,090	
11	Bay - Antipolo	Medium	86.4	11,230	
12	Sto Tomas - San Pablo - Lucena	Medium	68.0	8,840	
13	San Pablo - Majayjay	Medium	26.4	3,440	
14	San Simon (Bulacan) - Gapan (Nueva Ecija)	Long	44.9	6,740	
15	Other Central Luzon Roads	Medium	-	30,000	Conditional on prior road network analysis
16	Other CALABARZON Roads	Medium	-	60,000	Conditional on prior road network analysis
17	Preparatory Studies	Medium	-	4,774	
Sub-total				**205,854**	
B	**Expressways**				
1	Pasay - Makati - BGC	Medium	9.3	24,180	Maybe difficult to secure right-of-way
2	Sta. Mesa - Pasig (Shaw Boulevard) R-4 Expressway	Medium	7.1	23,430	Reconfiguration of an old proposal
3	Manila City - Quezon City (Quezon Av.) R-7 Expressway	Long	10.2	24,480	
4	MRT-7 Access Link (C-6) - Bocaue - SJose Del Mote	Medium	10.5	4,330	Assumes that MRT-7 gets built
5	CAVITEX - C-5 - San Jose Del Monte (Bulacan)	Medium	46.7	13,640	
6	CALA Expressway	Medium	47.2	30,210	Assumes Stage 1 is started before 2016.
7	CAVITEX Extension West to Rosario	Long	10.5	12,710	A job for existing concessionaire
8	Guiginto - Bustos Expressway	Long	24.6	10,140	
9	NLEX Extension West (Subic - San Fernando)	Long	29.0	11,950	
10	North Luzon Expressway (SJ Del Monte-Cabanatuan-San Jose)	Medium	99.4	24,850	
11	SLEX Extension East (Calamba - Lucena)	Long	47.8	12,520	ROW issue could derail this project

	Project	Plan	Length (km)	Total Cost (PHP mil.)	Remarks
12	STAR - (Batangas-Lipa)	Medium	18.8	4,360	
13	SLEX (Lipa - Sta Tomas)	Medium	28.8	4,490	
14	NLEX North(Sta. Rita - Dau)	Medium	53.0	8,270	
15	SCTEX (Subic-)	Medium	12.3	2,840	
16	SCTEX - North	Long	83.9	13,080	De-bottlenecking of sections of existing tollways
Sub-total				**225,480**	
C	**Railways**				
1	LRT-1 South Ext. - Ph-II	Long	18.4	69,440	
2	LRT-1 North Ext.	Medium	2.7	9,960	If MRT-3 takes over the existing North Loop
3	LRT-2 East Ext. Ph-II	Long	9	49,640	
4	LRT-2 West Ext.	Medium	4.7	30,840	Can end at Divisoria, without NH re-development
5	MRT-3 Ext. - South	Medium	2.2	21,880	
6	MRT-3 Ext. - West	Long	7.2	46,720	Only feasible if North Loop is folded into MRT-3
7	MRT-7 (Underground)	Long	2.1	23,440	Assumes Phase 1 (C4-SJdM) is completed. Includes 2-km UG to meet LRT2 and LRT1
8	MRT-7 (Elevated)	Long	24	104,920	
9	Mega Manila Subway	Medium	74.6	390,000	
10	Ortigas	Medium	13.7	31,720	Dependent on FS
11	Marikina Line	Medium	16.8	31,480	
12	Alabang	Medium	9.3	13,400	
13	Cavite	Long	20.6	25,560	Assumes prior completion of Stage 1
14	South Ext.– Commuter Line	Long	47.7	18,880	Critical intersections are elevated
15	North Ext.– Commuter Line	Long	81.1	28,800	Assumes that Airport Express Service is deferred
16	Railway Preparatory Studies	Medium		38,508	
Sub-total				**935,188**	
D	**Road Based Public Transport**				
1	BRT System 2 (EDSA-Binagonan)	Medium	-	3,500	Assumes BRT System 1 was successful
2	Bus Modernization Project	Medium	-	25,000	Low-emission buses under ITS, to replace old PUBs
3	Jeepney Modernization Project	Medium	-	30,000	New-generation units under ITS, to replace old PUJs
Sub-total				**58,500**	
E	**Traffic Management**				
1	Smart Signalization Phase 6	Medium	-	3,500	Expansion of the computerized system
2	ITS: Traffic Management	Medium	-	1,000	Wider applications of ITS in traffic management
3	ITS: Public Transport	Medium	-	750	Central control system for bus and jeepneys
Sub-total				**5,250**	
F	**Airports**				
1	New NAIA Airport	Medium	-	435,900	Assumes successful F/S in previous period
2	Clark Airport	Medium	-	40,000	New international passenger terminal building
Sub-total				**475,900**	
G	**Ports**				
1	North Harbor Port Conversion	Medium	-	40,000	Assumes domestic shipping is moved to Batangas
2	South Harbor (capacity capped)	Medium	-	-	
3	MICT (capacity capped)	Medium	-	-	
Sub-total				**40,000**	
Grand Total				**1,877,672**	

Source: JICA Study Team.

4.28 More than 55 km of new secondary lines are envisaged in the medium-term program. The choice of rail technology as well as final alignments and station locations will have to be confirmed by their respective feasibility studies. The corridors are narrow as to preclude LRT. Using the ground level for a BRT system, as an alternative, may also prove difficult as it would eat up lanes that could generate heavy resistance from motorists.

4.29 Several elevated expressways appeared in the list. Most are outside the urban core. The longest expressway in the dream plan -- the Cavitex–C5-San Jose del Monte – may not take off. One reason is the technical difficulty of doing such a structure,

considering the many flyovers that are to be built at an earlier period. Secondly, it would make the urban landscape unattractive. Not unlike C-4, it would be more cost-effective to put a mass transit system above that highway than a road that caters to private cars. Thirdly, an underground metro (if built) could obviate the need for such an expressway or an elevated LRT.

4.30 The proposed investments on road-based public transport presuppose a radical government shift – from benign neglect of buses and jeepneys to a more direct intervention. The amounts are indicative, but imply replacement of the public transport fleet with low-emission vehicles that are interconnected under a metro-wide ITS-framework and a new business model. In short, these projects represent technological and organizational transformations.

4.5 Financing Strategy

1) Short-Term Outlook

4.31 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.

4.32 From 2014 to 2022, the spending target for all types of infrastructure is set at 3.5% (and 5.0% thereafter) of GDP. Historically, government's allocation for infrastructure has not gone beyond 2.2% of GDP since 1995.

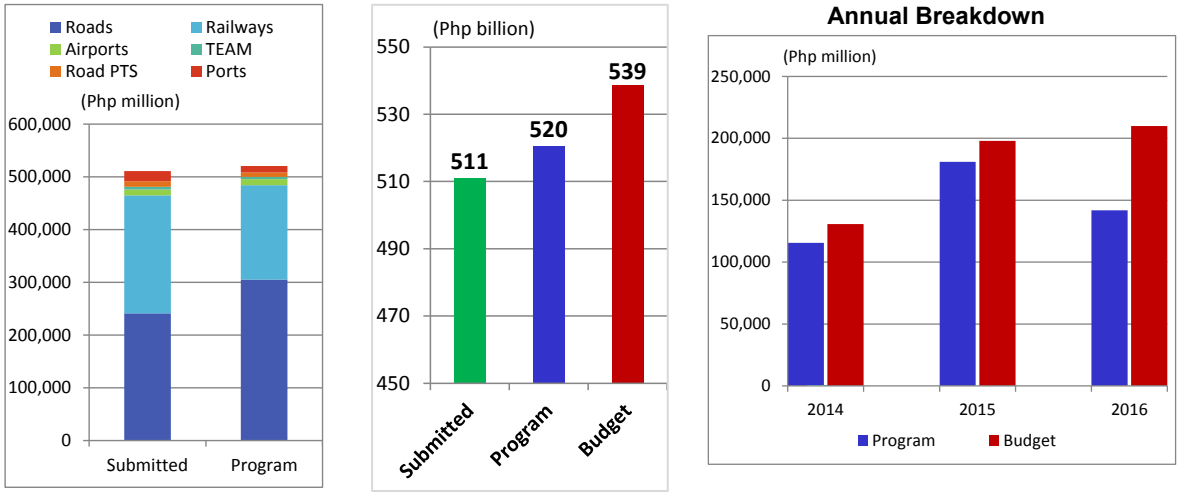
4.33 The 6% growth rate for 2013 is likely to be exceeded, as the 1st quarter already recorded a high of 7.8%. Analysts foresee the Philippine economy growing more than 6% in 2014 and 2015. Since 2016 would be an election year, the 2016 level could be higher than 2015 due to the stimulus from election-related spending. Accordingly, the budget envelope for transport infrastructure should hit PHP538 billion, or an annual average PHP180 billion from 2014–2016 (see Table 4.5.1).

Table 4.5.1 Estimated Budget Envelope, 2014–2016

	2014	2015	2016	3-year Total	Ave
Total – All Infrastructure	7,471	7,919	8,394	23,783	7,928
Transport Infrastructure	131	198	210	539	180
Public funds (70%)	92	139	147	377	126
Private funds (30%)	39	59	63	162	54

Source: Calculated from NSCB (2012) GRDP by Region and NSO (2012); projection by JICA Study Team.

4.34 On the other hand, the demand side (Table 4.3.1) showed total transport investments of PHP520 billion, which already included a soft package of PHP178 billion. Supply exceeds demand. This implies that funding will not be a problem. There are not enough projects to get out of the planning doors of the agencies. Figure 4.5.1 shows the investment supply-demand outlook for transport infrastructure.



Source: JICA Study Team.

Figure 4.5.1 Short-Term Program vs. Budget Envelope and Project Mix

2) A Bigger Role for PPP

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

(i) Best Case Scenario (optimistic) -- 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; and

(ii) Worst Case Scenario (pessimistic) – where the economy grows slower at 4.0% per annum and the infrastructure investment ratio also dips to 3% of GDP.

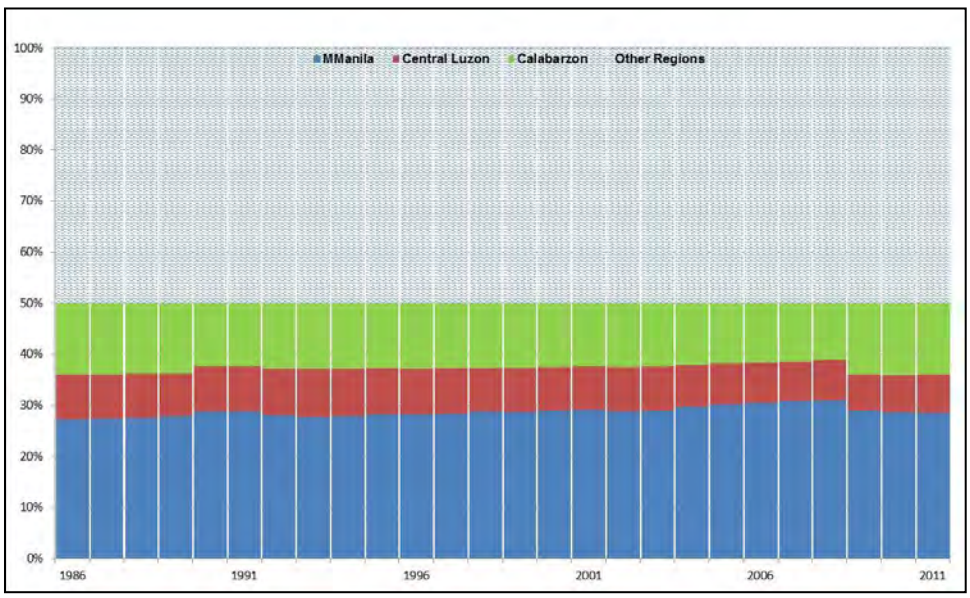
4.36 In both cases, the transport sector gets 50% of the total investment for infrastructure. In the optimistic scenario, the dominance of the three regions in the Study Area is assumed to decline by 1.0% a year. This means that regional growth rates would be lower than the country as a whole by 2.0%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

4.37 How realistic are the above assumptions?

4.38 The annual average growth rate (AAGR) of 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.

4.39 Historically, infrastructure investment has been very low relative to GDP (at about 2% of GDP) compared to other Asian countries. This has been recognized as the main reason for the prevailing infrastructure gaps. To correct this, the current Development Plan seeks to raise the investment ratio to 5% by 2016. It had already inched up to 2.6% in 2011 and 2.4% in 2012. In keeping with this ambitious target, the 5% ratio was retained for the optimistic case, and 3% for the pessimistic case. The latter is still higher than past levels of expenditures.

4.40 From 1986 to 2012, the GRDP for the three regions ranged from a low of 52.5% (in 1986) to a high of 62.4% (in 2010). The dominance of these regions went up in the last three years (see Figure 4.5.2).



Source: JICA Study Team.

Figure 4.5.2 Share of Greater Capital Region to GRDP, 1986-2011

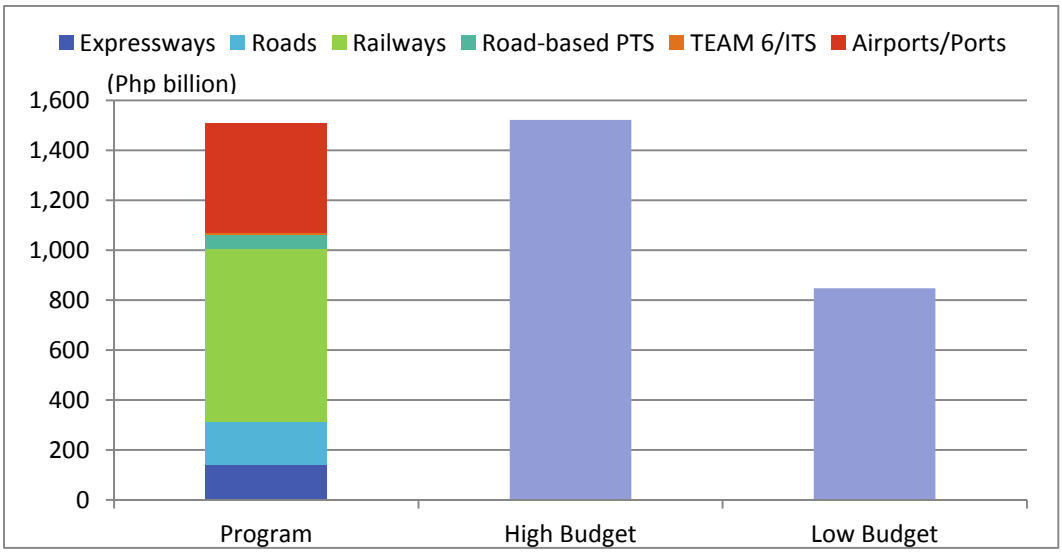
4.41 The resulting budget envelopes for these two scenarios are shown in Table 4.5.2 below.

Table 4.5.2 Budget Envelope under Two Scenarios (in 2012 prices)

	2016	2017	2018	2019	2020	2021	2022	6-Yr Total
Scenario 1: High								
GDP Philippines in PHP Trillion	13,604	14,624	15,721	16,900	18,167	19,530	20,995	
Share of 3 Regions	60.2%	60.2%	59.2%	58.2%	57.2%	56.2%	55.2%	
% Allocation for Transport		2.5%	2.5%	2.5%	2.5%	2.5%	2.5%	
Budget for Transport, PHP billion		220.1	232.7	245.9	259.8	274.4	289.7	1,523
Scenario 2: Low								
GDP Philippines in PHP trillion	13,862	14,148	14,714	15,302	15,914	16,551	17,213	
Share of 3 Regions	60.2%	60.2%	60.2%	60.2%	60.2%	60.2%	60.2%	
% Allocation for Transport		1.5%	1.5%	1.5%	1.5%	1.5%	1.5%	
Budget for Transport		127.8	132.9	138.2	143.7	149.5	155.4	847

Source: JICA Study Team.

4.42 The estimated demand of PHP1,509 billion can therefore be afforded under Optimistic Case (PHP1,523 billion), but has to be scaled down under Pessimistic Case (PHP847 billion). It should be noted that the medium-term TRIP (see Table 4.4.1) already includes 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 institutional capacity to generate implementable projects will be the constraint, rather than financing.



Source: JICA Study Team.

Figure 4.5.3 Medium-Term Program vs. High and Low Budget Envelopes

4.43 In keeping with the development strategy for the Study Area to reduce its dependence on public sector coffers, a large part of the proposed investment should be sourced from the private sector. This means Public-Private Partnership.

4.44 The short-term TRIP has the potential of 37% funding from the private investors. That represents about PHP200 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 40% of the available investment money from the national government.

4.45 A similar prognosis can be made about the medium-term TRIP. Private capital can

share 1/3 of the proposed investments.

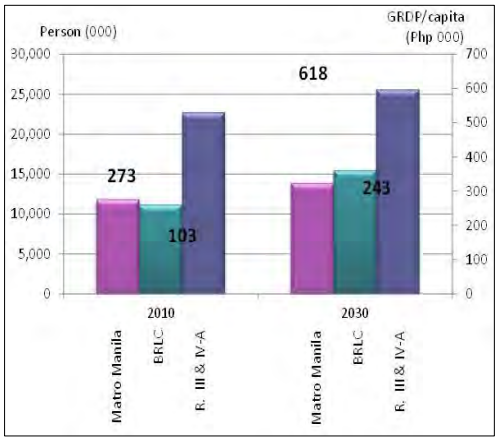
4.46 With a bigger slice for PPP, coupled with the high foreign exchange reserves of the country, it becomes possible to scale down its historical reliance on ODA funding. Expressways, in particular, should be taken out of the ODA pipeline and rely more on domestic technical and financial resources.

5 CONCLUSIONS AND RECOMMENDATIONS

1) The Roadmap Context

(a) Spatial Development Orientation

5.1 Metro Manila, Central Luzon (Region III), and CALABARZON (Region IV-A) are the three leading regions of the country, accounting for more than 60% of the country's GRDP. This dominance is due to the agglomeration economies of a highly urbanized region in combination with a favorable geographic location, its role as gateway to international trade and innovation, and as the political center of the Philippines. 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 shall have ballooned by 1.3 times and the combined GRDP by 2.8 times, by 2030. Unless these problems are addressed properly, now and not later, the engine of growth could falter and drag down the country's economic development.



Source: JICA Study Team

Figure 5.1 GRDP and Population

5.2 Managing the distribution and spatial allocations of social and economic activities will go a long way in mitigating the ills. 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, 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.

5.3 Many serious urban issues facing Metro Manila such as traffic congestions, resettlement of households away from high hazard areas, provision of affordable housing, expansion of urban lands, decongestion of high populated areas, among others, can no longer be solved within Metro Manila alone. At the same time, ample opportunities exist where Region III and Region IV-A could be benefited from the urban development pressure of Metro Manila, when the three regions are connected through efficient transport system and projects and actions of other related sectors are integrated.

(b) Road Transport

5.4 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.

5.5 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.

5.6 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

5.7 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 268 km of main lines (in 6 corridors) and 60 km of secondary lines (in 4 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.

5.8 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.

5.9 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

5.10 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

5.11 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) Investment Funding

5.12 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.

5.13 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

5.14 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.

5.15 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.

5.16 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.

5.17 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.

5.18 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.

5.19 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

5.20 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.

5.21 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 CIA 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 or expropriating land to create a 2nd runway on NAIA 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[1] 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

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

emerge into fragmented lines, a railway network development plan should be articulated with particular focus on common statio**ns.**

(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.