PART II

METRO MANILA
AND ITS 200KM RADIUS SPHERE

CHAPTER 7

GENERAL PROFILE OF THE STUDY AREA

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7.1 PHYSICAL PROFILE

The area defined by a sphere of 200 km radius from Metro Manila is bordered on the northern part by portions of Region I and II, and for its greater part, by Region III. Region III, also known as the reconfigured Central Luzon Region due to the inclusion of the province of Aurora, has the largest contiguous lowland area in the country. Its total land area of 1.8 million hectares is 6.1 percent of the total land area in the country. Of all the regions in the country, it is closest to Metro Manila. The southern part of the sphere is bound by the provinces of Cavite, Laguna, Batangas, Rizal, and Quezon, all of which comprise Region IV-A, also known as CALABARZON.

7.1.1 Geomorphological Units

The prevailing landforms in Central Luzon can be described as a large basin surrounded by mountain ranges on three sides. On its northern boundary, the Caraballo and Sierra Madre mountain ranges separate it from the provinces of Pangasinan and Nueva Vizcaya. In the eastern section, the Sierra Madre mountain range traverses the length of Aurora, Nueva Ecija and Bulacan. The Zambales mountains separates the central plains from the urban areas of Zambales at the western side. The region's major drainage networks discharge to Lingayen Gulf in the northwest, Manila Bay in the south, the Pacific Ocean in the east, and the China Sea in the west.

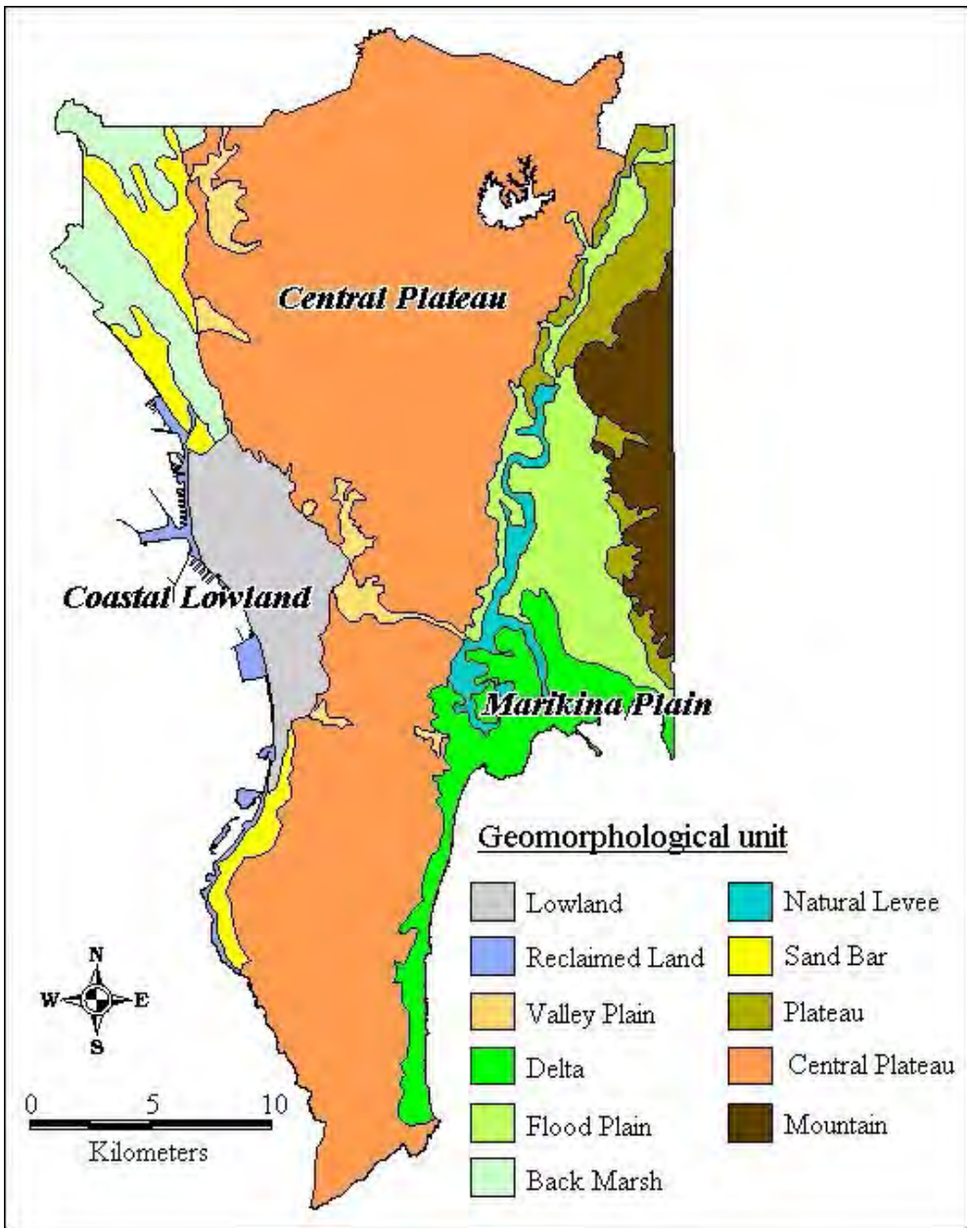
CALABARZON, particularly the Cavite-Batangas-Laguna areas, on the other hand, can be generally described as part of the Macolot Corridor, delineated by Oles and others, 1991; Defant and others, 1988, as a structural feature corresponding to a NNE-SSW trending corridor, on the basis of the petrology and alignment of active and recent volcanoes that include Taal, Banahaw, Makiling, Malipunyo and the maars of Laguna province. The corridor's northern structural boundary is defined by the Tagaytay Ridge, and the southern by Mt. Macolot. Recent GPS measurements (Ohkura and others, 2001) suggest that the corridor is a broad left-lateral fracture zone, an observation corroborated by Pubellier and others (2000) after integrating results of seismotectonic studies and radar imagery interpretation. Among a list of 22 active volcanoes in the country, two (2) can be found in this region. These are, Mt. Banahaw, located in Laguna and Quezon provinces, and Taal, in Batangas.

Metropolitan Manila, or the **National Capital Region**, is divided morphologically into three major parts. These are the: (i) Central Plateau, (ii) Coastal Lowland and (iii) Marikina Valley (Please refer to **Fig. 7.1.1-1**).

The **Central Plateau** is mainly residential and includes the highly dwelling town area of Metropolitan Manila such as San Juan, Makati and Quezon cities. The ground elevation ranges almost 20m to 40m and gradually becomes lower at the west side. The area becomes narrower along Pasig River. In the northwest area the ground elevation ranges from 70m to over 100m.

The **Coastal Lowland** is a flat and low plain facing Manila Bay. The City of Manila as well as its suburban areas are located here. Ground elevation ranges from zero on Manila Bay to five (5) meters at the west side of the Cities of Mandaluyong and Makati. This morphological unit can be subdivided into sand bar, backmarsh including tidal flat, Pasig River delta and reclaimed land.

Marikina Valley consists of flood plains along Marikina River and a delta along the Laguna de Bay. Its elevation ranges from two (2) meters on the Laguna de Bay side to 30 m on its north side at Montalban. It is surrounded by the Central Plateau and mountains.



Source: PHIVOLCS

FIGURE 7.1-1 GEOMORPHOLOGICAL MAP OF METRO MANILA

7.1.2 Geology

(1) General Geologic Setting

Based on the "*Geology and Mineral Resources of the Philippines"* (DENR – Mines and Geosciences Bureau, Revised Edition 2004"), the Philippine archipelago can be divided into two main geologic entities, namely: the **Philippine Mobile Belt** (Gervasio, 1966) and the **North Palawan Block**. Each of these two entities are composed of different types of lithologic units

that can be classified into four (4) general groups, namely: 1) *metamorphic rocks*, 2) *ophiolites and ophiolitic rocks*, 3) *magmatic rocks and active volcanic arcs*, and 4) *sedimentary basins*.

The **Philippine Mobile Belt** (PMB) is an actively deforming zone located between the Philippine Sea Plate and the eastern margin of the Eurasian Plate. As presented in **Figure. 7.1.2-1**, the subduction zones surrounding the PMB are with opposing polarities; i.e., subduction zones west of the mobile belt have eastward vergence while those on the east are subducting westward.

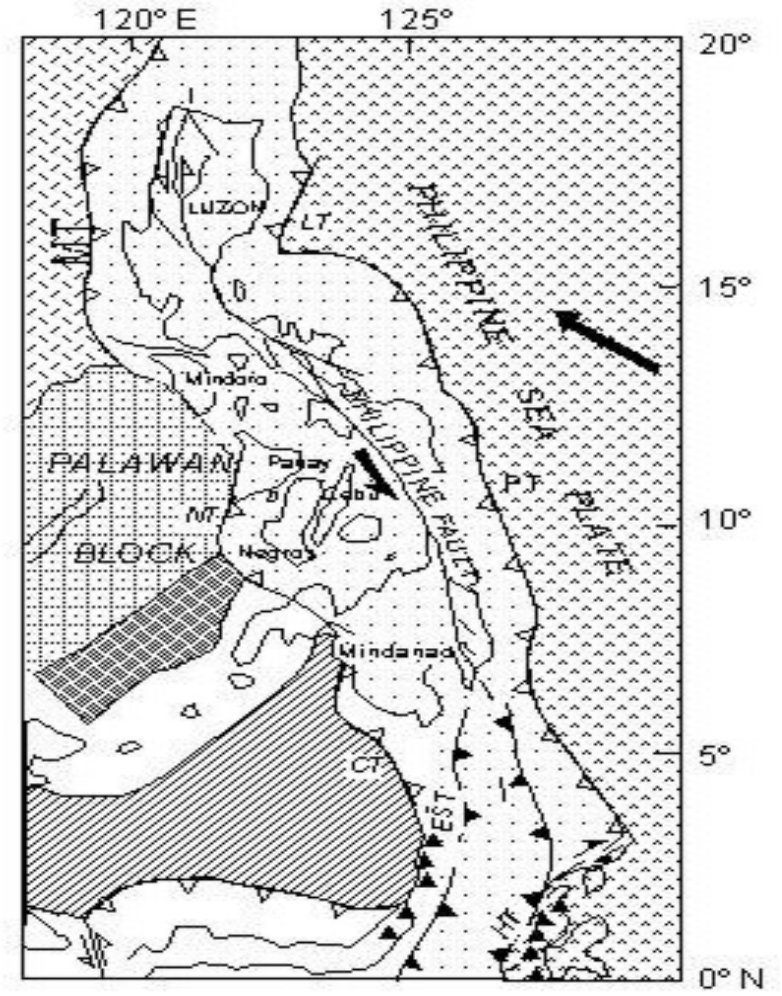


FIGURE. 7.1.2-1 THE PHILIPPINE MOBILE BELT

As can be discerned from **Figures. 7.1.2-2**, **7.1.2-3**, **7.1.2-4**, and **7.1.2-5**, the areas covered by the 200 km sphere mainly consists of the third and fourth types of lithologic unit, which are the ***magmatic rocks*** and ***sedimentary basins.*** In the island of Luzon, as depicted in **Figure. 7.1.2-4**, ancient (Oligocene to Miocene) magmatic belts extend from Ilocos Norte to Marinduque island (Zanoria and others, 1984). These consist mostly of dioritic instrusive rocks and appear to be displaced left-laterally by the Philippine Fault north of the Southern Sierra Madre Range (Mitchell and others, 1986; Pinet and Stephan, 1990).

As shown in **Figure. 7.1.2-5**, nine (9) individual basins can be distinguished within the PMB. Except for some located in the central Philippines like the Mindoro and Southern Luzon basins, the axis of the sedimentary basins of the mobile belt is generally oriented N-S. Thickness of the sedimentary cover ranges from 4,000 to 12,000 meters while the surface area is between 1 million m² and 4.7 million m² (Ranneft and others, 1960; BMG, 1976, 1982; Saldivar-Sali, 1978).

The Ilocos-Central Luzon Basin

The Ilocos-Central Luzon Basin flanks western Luzon island along a generally N-S axis. Filled with a thick (8,000 m) sedimentary sequence (Saldivar-Sali, 1978), the northern part of the basin (Ilocos) is filled with Upper Oligocene - Middle Miocene marine detrital sediments (mostly conglomerates and sandstones) derived from the Luzon Central Cordillera Range located to the east.

Said sedimentary sequence is overlain by an Upper Miocene - Pliocene sedimentary sequence dominated by sandstones, shales and shallow water carbonates and tuffaceous deposits. The eastern and western flanks of the Central Luzon Basin are stratigraphically distinguished from each other.

On the southern part, sediments on the east are characterized by a significant amount of volcanic sources (volcanic sandstones and shales, tuffs) and by a shallow marine depositional environment (carbonates). To the west, Neogene sediments dominated by Middle Miocene turbidites, overly directly the Eocene ophiolites of Zambales.

The Ilocos - Central Luzon Basin is structurally controlled by main branches of the northern segment of the Philippine Fault, notably the Vigan-Aggao Fault (Maleterre, 1989; Pinet, 1990). The rock formations which make up these lithologic units, as well as its stratigraphic sequence are described in more detail in the following section.

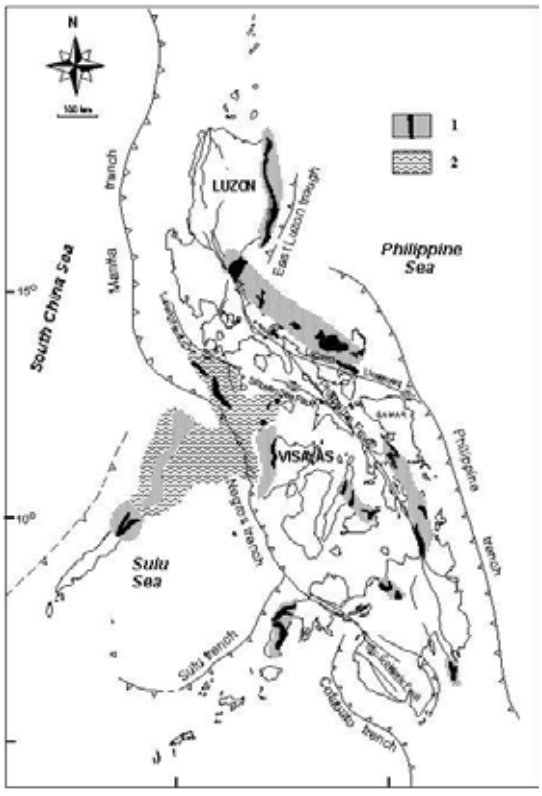


FIGURE 7.1.2-2 GENERALIZED DISTRIBUTION MAP OF METAMORPHIC ROCKS

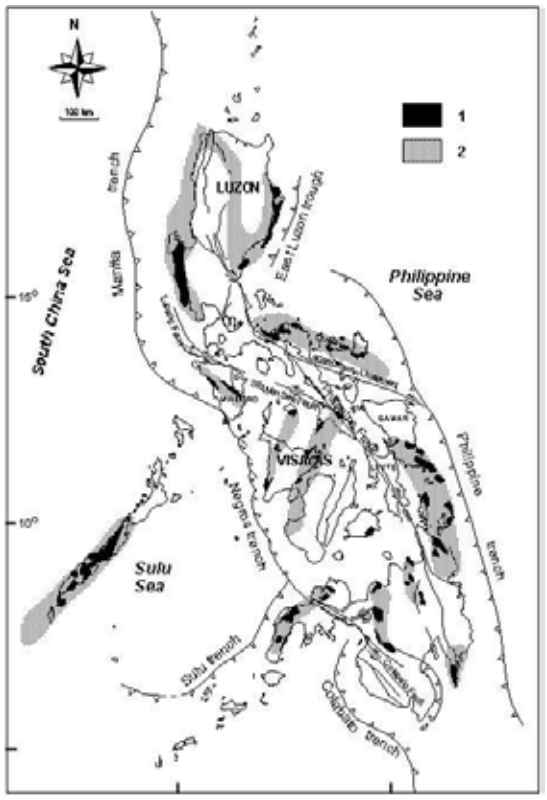


FIGURE 7.1.2-3 GENERALIZED DISTRIBUTION MAP OF OPHIOLITES AND OPHIOLITIC ROCKS

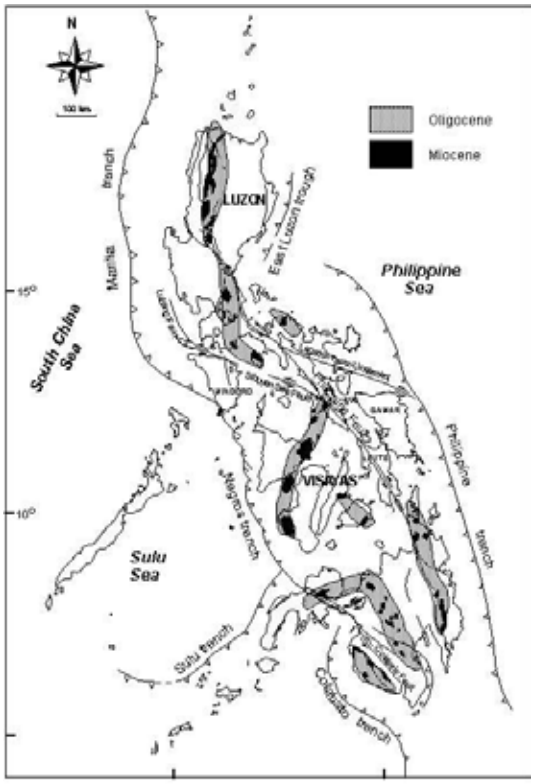


FIGURE 7.1.2-4 GENERALIZED DISTRIBUTION MAP OF OLIGOCENE-MIOCENE MAGMATIC BELTS

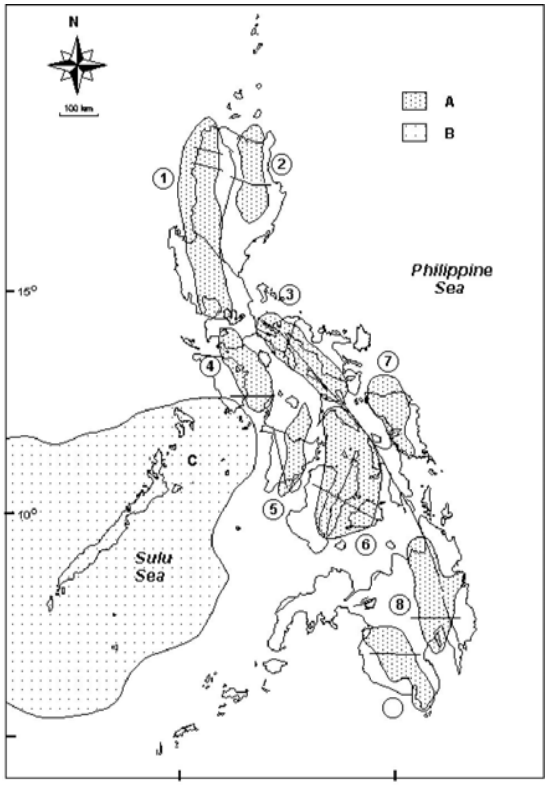


FIGURE 7.1.2-5 GENERALIZED DISTRIBUTION MAP OF SEDIMENTARY BASINS

(2) Stratigraphy of the Central Luzon Basin

The Central Luzon Basin (CLB) stratigraphic column is shown in **Figure. 7.1.2-6.** The **East Side** of the CLB consist of, from the oldest at the bottom, the (i) Barenas-Baito Formation, (ii) Bayabas Formation, (iii) Angat Formation, (iv) Madlum Formation, (v) Lambak Formation, (vi) Makapilapil Formation, (vii) Tartaro Formation, and (viii) Guadalupe Formation. The **West Side**, on the other hand consist of, also from the bottom and oldest, the (i) Aksitero Formation, (ii) Moriones Formation, (iii) Malinta Formation, (iv) Tarlac Formation, (v) Amlang Formation, (vi) Cataguintingan Formation, (vii) Damortis Formation, and (viii) Banban Formation.

(3) Geology of Metropolitan Manila

Various reports from PHIVOLCS revealed that Metropolitan Manila in general is underlain by the following lithologic types: (i) Quaternary alluvial deposits, (ii) pyroclastic flow deposits or ignimbrites, and (iii) tuff and tuffaceous deposits. Based on stratigraphic studies, there are several units of pyroclastic flow deposits observed in Metropolitan Manila, but these do not necessarily come from a single source and from the same event. In areas adjacent to Manila, other lithologic units were also reported. These are: (iv) pyroclastic deposits from Taal Caldera which underlies the southern border of Metropolitan Manila, (v) conglomerate units that have been observed north of Quezon City in Novaliches, (vi) old lava flows that were observed outcropping northeast of Quezon City, i.e., in Rodriguez (formerly Montalban), Rizal, and (vii) old basement complex in Rodriguez, Rizal, east of Quezon City.

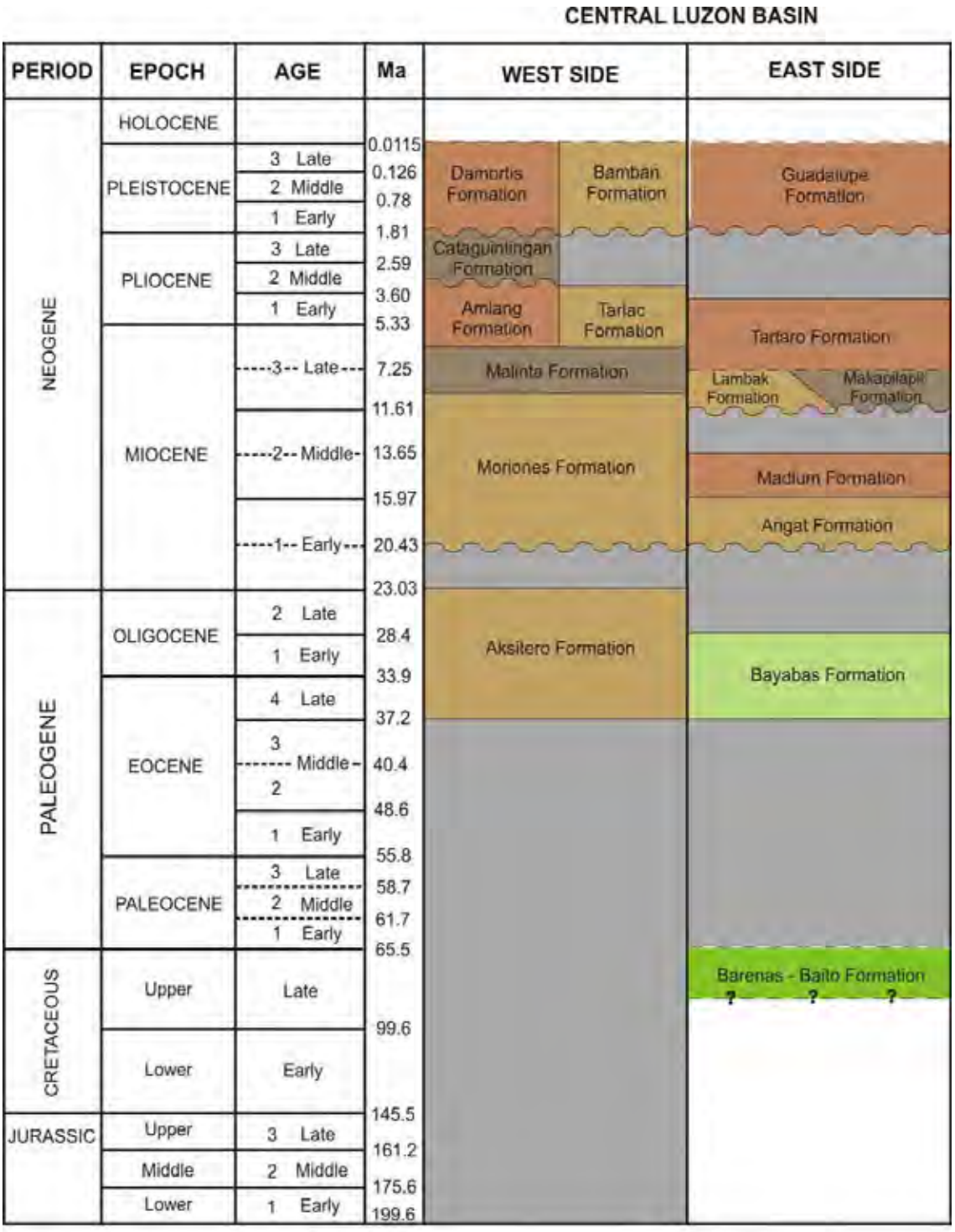


FIGURE 7.1.2-6 STRATIGRAPHIC COLUMN OF THE CENTRAL LUZON BASIN

Quaternary Alluvium

Unconsolidated sediments underlie most part of the cities of Manila, Caloocan, Pasig, Pasay and Taguig. From borehole data, interbeds of sandstone-siltstone-mudstone/claystone and channel-fill conglomerates with or without shell fragments are the dominant lithology. Marikina City which is situated within the Marikina Valley east of Quezon City is underlain by unconsolidated alluvial deposits composed of clay, silt and sand.

Pyroclastic Flow Deposits

A pyroclastic flow deposit is a type of volcanic rock unit deposited by turbulent mixture of flowing mass of fragmental materials and hot gases that cascade down the slope of a volcano at high speed during an explosive eruption. There are at least two types of pyroclastic flow deposits underlying Metropolitan Manila. These are the, (i) mixed scoria-pumice pyroclastic flow and (ii) dominantly fine-grained pumice-rich pyroclastic flow. These pyroclastic flow deposits are asssociated with calderagenic eruptions of either Taal Caldera or Laguna Caldera, which are the nearest calderas to Metropolitan Manila. Based on stratigraphic analysis of outcrops, there are several units of pyroclastic flow deposits underlying Metropolitan Manila, which could come from either these sources during several different events.

Tuff and Tuffaceous Sediments

There are three types of true volcanic tuff found in the UP Balara area, Quezon City. The first two tuffs consist of light gray colored fine grained materials. They overlie the third tuff which is a coarse grained volcanic breccia or the pyroclastic flow deposit. The first tuff layer is well lithified, fine grained and in some areas dark prismatic minerals and pumice may be seen. The second tuff layer is finer grained and is composed mostly of volcanic ash. Its main characteristic is the presence of accretionary lapilli. In some places planar laminations and concentrations of sand-size scoria and pumice can be seen in this type of volcanic tuff.

Reworked deposits of primary tuff and pyroclastic flow deposits are widely distributed within and around Metropolitan Manila. An example of this is seen along C-5 in Pasig City, where the pumice-scoria pyroclastic flow deposit laterally changes to laharic facies. Tuffaceous reworked deposits can also be found beneath pyroclastic flow units such as in the excavation for Valerio Towers in Makati that shows the pyroclastic flow unit to overlie a sequence of epiclastic sediments that are part marine.

Pyroclastic Deposits From Taal Caldera

The southern edge of Metropolitan Manila is underlain by pyroclastic materials from Taal Caldera. The extent of Taal Caldera deposits were delineated based on geomorphologic expression on the topographic map. Topographic face shows gentle slopes to northwards starting from Tagaytay Ridge. Very few descriptions regarding these deposits are available.

Conglomerates

Conglomerates in Metropolitan Manila are usually channel-fill deposits such as those found in an outcrop along Commonwealth Avenue. The lens-shaped channel-fill conglomerates are interbedded with finer tuffaceous sediments. This deposit ranges from being matrix-supported to clast-supported and consists of pebble to cobble clasts of basaltic and andesitic rocks. Its matrix usually consists of sand-size particles with minor pumice fragments. Farther north, thicker deposits can be found in Caloocan City and Novaliches, Lagro, and Fairview areas in Quezon City.

Old Lava Flows

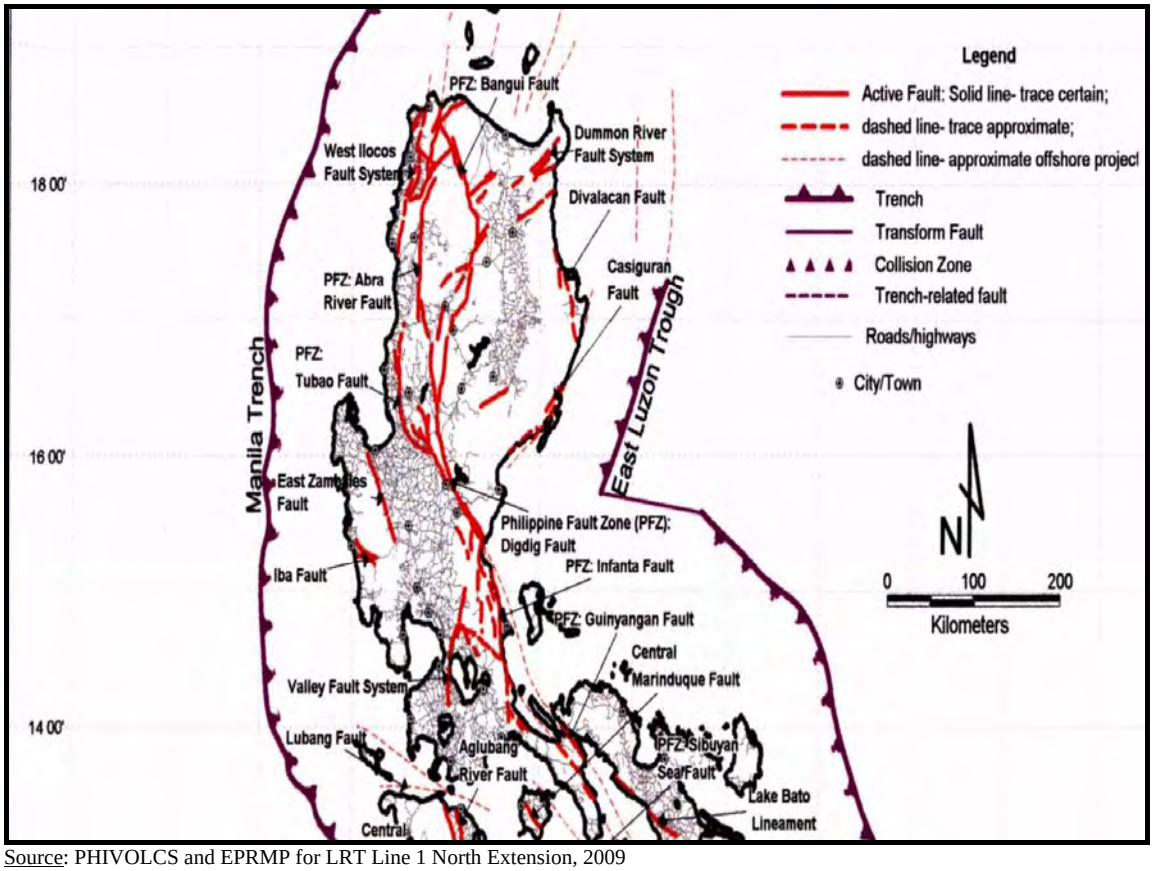
The northeastern portion of Metropolitan Manila is underlain be metamorphosed volcanics classified as porphyritic andesite and basalt. The andesitic unit is thoroughly weathered, brecciated and faulted while the basaltic unit is epidotized and crisscrossed by numerous striations and veinlets of calcite. These old volcanics have been observed outcropping in Rodriguez, Rizal north of Quezon City.

Basement Complex

The Basement Complex consist of a sequence of pillow basalts, pillow basalt breccias, reworked pillow basalts transitional to hyaloclastic sediments interbedded with laminated reddish brown radiolarian cherts and mudstones that underlie the Sierra Madre Range. These rock types are considered older than the oldest overlying sedimentary unit in the region. The Basement Complex can be observed in the area of Cainta, Taytay and Montalban all in the Province of Rizal, east of Metropolitan Manila.

7.1.3 Potential Earthquake Generators

There are five (5) major geotectonic features that can affect the study sphere, in terms of generating significant earthquakes (Dayanghirang, 2009). These are the: (i) Manila Trench and its related structures, (ii) East Luzon Trough (iii) Philippine Fault Zone, (iv) Seismic and volcanic activity from Taal Volcano, and (v) the Valley Fault System (VFS) (Please refer to **Figure. 7.1.3-1**).



Source: PHIVOLCS and EPRMP for LRT Line 1 North Extension, 2009

FIGURE 7.1.3-1 POTENTIAL EARTHQUAKE GENERATORS (ACTIVE FAULTS AND TRENCHES) IN LUZON

Subduction Zones

The **Manila Trench** is a subduction related feature that parallels the western shore of Luzon Island. Along this trench, the oceanic crust of South China Plate subducts eastward beneath the Luzon landmass. On the other side of the island, the Philippine Sea Plate subducts westward

under the arc along the **East Luzon Trench**. This subduction process is marked by the depression of the ocean floor and by the intense and westward-deepening region of earthquakes. Because of this complex tectonic setting, Luzon Island shows high seismic activity.

Considered by some geologist to be an extension of the Manila Trench is **Lubang Fault**. It is traced along the western shores of Mindoro where a branch of the structure is suggested by the branch of the Manila Trench that verges into the northern shores of Mindoro, along the Verde Island Passage. The structure is represented in most maps as Lubang Fault; some maps show this to extend farther east near Verde Island, being termed Verde Island Fault.

The Philippine Fault Zone

Parallel to the subduction trenches lies the long, inland **Philippine Fault Zone** (PFZ). The PFZ is a northwest-trending fault zone whose branches have been mapped for 1,200 km from northern Luzon to the eastern part of Mindanao. Its trace passes through Ragay Gulf and Alabat Island. Seismic activity along this fault zone is also among the most destructive in the country.
As it traverses the whole length of the archipelago, the PFZ presents at least three varying structural regimes. Three major segments can be distinguished according to structural character and data availability. These are the (i) Northern Segment – NW Luzon to Lamon Bay, (ii) Central Segment – Bondoc Peninsula to Leyte, and (iii) Southern Segment – Mindanao and the Moluccas.

Activities along the PFZ is evidenced by displacement of drainage systems (Allen, 1962) (Fig. 1.37) and elongated depressions at the foot of fault scarps (Acharya, 1980). In March 17, 1973, southern Luzon was struck with a magnitude 7.3 earthquake with epicenter located at Ragay Gulf (Morante and Allen, 1973; Allen, 1975). The most recent activity is the great July 16, 1990earthquake of Luzon. This Ms 7.8 earthquake was caused by movement of the **Digdig Fault** in the vicinity of Cabanatuan. Rupture was observed for over 90 km with left-lateral displacements of as much as 5 m.

In Luzon, the PFZ is not restricted to a narrow zone like in its central segment in the Visayas. It branches out into several, generally N-S oriented strike-slip faults North of Dingalan Bay. From west to east, these branches include the **San Manuel-Vigan-Aggao Fault** system, **Pugo Fault**, **Tuba Fault**, **Tebbo-Abra River Fault System**, and the **Digdig-Kabugao Fault System**.

The **Sibuyan Sea Fault** is a branch of the Philippine Fault identified through its alignment on geomagnetic anomaly maps. The fault branches from the PFZ near Masbate and traverses westward across the Sibuyan Sea and then merges with other structures north of Marinduque Island. Data shows it to veer westerly from Tayabas Bay, and merge with the Verde Island and Lubang Faults, forming a continuous transfer zone between the Philippine Fault-Philippine Trench and the Manila Trench-Lubang Fault system. (E. Ramos 2000).

Seismic and Volcanic Activity

Taal Volcano is an active volcanic system characterized by numerous historic violent eruptions which produced extensive volcanic deposits in the surrounding area and generated significant earthquakes in and around Metro Manila. Some of the seismic activities associated with its eruptions caused fissures and liquefaction in the coastal area of Balayan Bay.

The Valley Fault System

The **Valley Fault System** runs from the foothills of Montalban Mountains in Rizal, southerly along the western coast of Laguna de Bay, and through the eastern edges of Tagaytay Ridge. The

fault system is composed of two north-trending parallel structures dipping towards each other, where the block in between had shifted down causing the formation of the Marikina Valley. The eastern segment of the fault borders the edge of the Marikina Valley from the Antipolo and Montalban mountains. Due to its proximity, it is thought to pose the greatest threat to Metropolitan Manila.

The VFS consists of two sub-parallel faults, namely the **West Valley Fault** (WVF) which lies between Marikina Valley and Central Plateau, and another is the East Valley Fault (EVF) which lies between Marikina Valley and the mountains. The West Valley Fault runs from Montalban in the north, passes through east of Metropolitan Manila and west of the Laguna de Bay and extends southwards possibly as far as Tagaytay Ridge. On the east side of the Marikina Valley, the **East Valley Fault**, extends from San Rafael, down to Montalban south to Pasig area, then becomes a subtle tonal contrast southwards.

7.1.4 Climate

Climate over any particular area in the country is due to what is called, climatic controls interacting in various intensities and in different combinations. Among these are the (i) topography and geography of the place, (ii) the prevailing wind regimes (the northeast monsoon, southwest monsoon, and the North Pacific trades), (iii) semi-permanent cyclones and anticyclones which produce/cause wind regimes over the country, (iv) ocean currents, (v) various linear systems, and (vi) various tropical cyclones occurring in/affecting the country.

Using the Updated Modified Corona's classification, four (4) types of rainfall distribution in the country are defined with the use of the average monthly distribution of rainfall at the different stations. **Figure 7.1.4-1** shows a graphical presentation of these four (4) types.

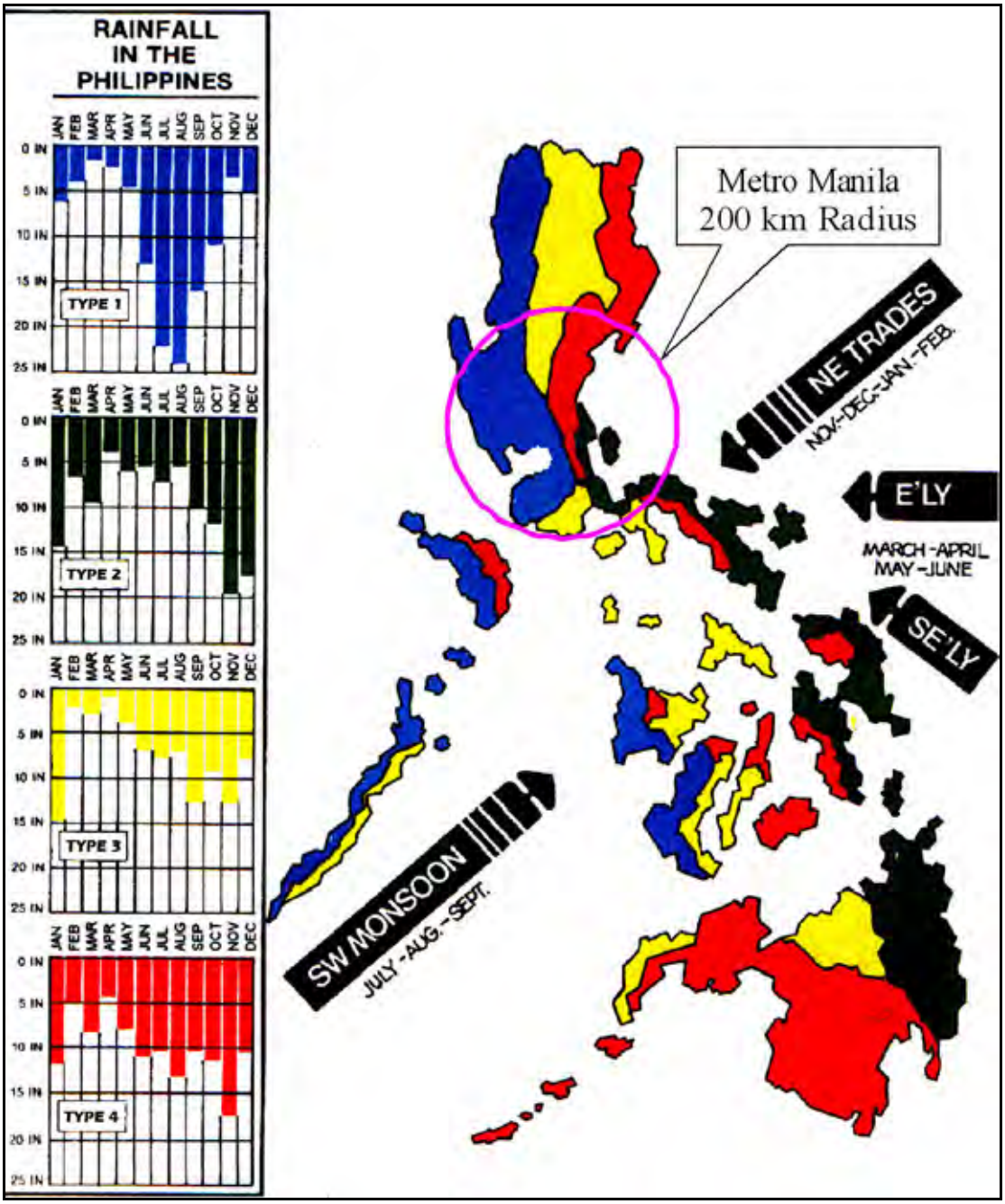
(1) Types of Rainfall Distribution in the Philippines

Type 1 refers to areas with two pronounced season, dry from December to May, and wet from June to November. Maximum rain period is from June to September. Areas characterized by this type are in general exposed to the southwest monsoon and get a fair share of rainfall brought about by tropical cyclones, occurring particularly during the maximum rain period. These are generally found along the western portions of the country.

Type 2 are for those areas with no dry season with very pronounced maximum rain period in December and January, although there is not a singly dry month. Areas characterized by this climatic type are exposed to the northeast monsoon being generally located along or very near the eastern coasts.

Type 3 refers to areas with no pronounced maximum rain period, with a short dry season lasting only from one to three months. This type is intermediate between Types I and 2, although it resembles the first more closely because of its short dry season. Areas of this type are partly shielded from the northeast monsoon but are exposed to the southwest monsoon, and also benefit from rainfall caused by tropical cyclones.

Type 4 are for those areas with rainfall more or less evenly distributed throughout the year. This resembles the second type more closely since it has no dry season.



Source: Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA).

FIGURE 7.1.4-1 CLIMATE MAP OF THE PHILIPPINES BASED ON THE UPDATED MODIFIED CORONAS CLASSIFICATION

As shown on the Climate Map, the provinces of Pangasinan, Tarlac, Nueva Ecija, Zambales, Bataan, Pampanga, Bulacan, Cavite, and Metro Manila belong to Type 1; Nueva Viscaya, Laguna and Batangas belong to Type 3, Rizal, Aurora, and Quirino belong yo type 4, and the province of Quezon, to Type 2.

Rainfall and Temperature

Based on a recent study by PAGASA, about 50% of the annual average rainfall in the Philippines is attributed to the occurrence of tropical cyclones in its vicinities. Wettest parts consist of the

northernmost part of Cagayan, Infanta, Polilio Island, eastern coasts of Leyte Island, Siargao Island, and Surigao del Sur with annual average rainfall of more than 4,000 mm.

On the other hand, driest are the valleys in the Cordillera and the Sierra Madre ranges, the Central Plains of Luzon, Bataan, Batangas, Palawan, most parts of Region VII (southern portion of Cebu, most parts or Negros Oriental, and Bohol), the entire southern part of Mindanao including the southern tip of Zamboanga provinces and Basilan, Lanao del Norte, Misamis Occidental and parts of Misamis Oriental.

Average monthly and annual rainfall obtained from various weather stations in the Metro Manila and 200 km radius study sphere are presented in **Table 7.1.4-1**. Average monthly and annual temperatures are provided in **Table 7.1.4-2**.

TABLE 7.1.4-1 AVERAGE MONTHLY AND ANNUAL RAINFALL IN THE 200 KM SPHERE

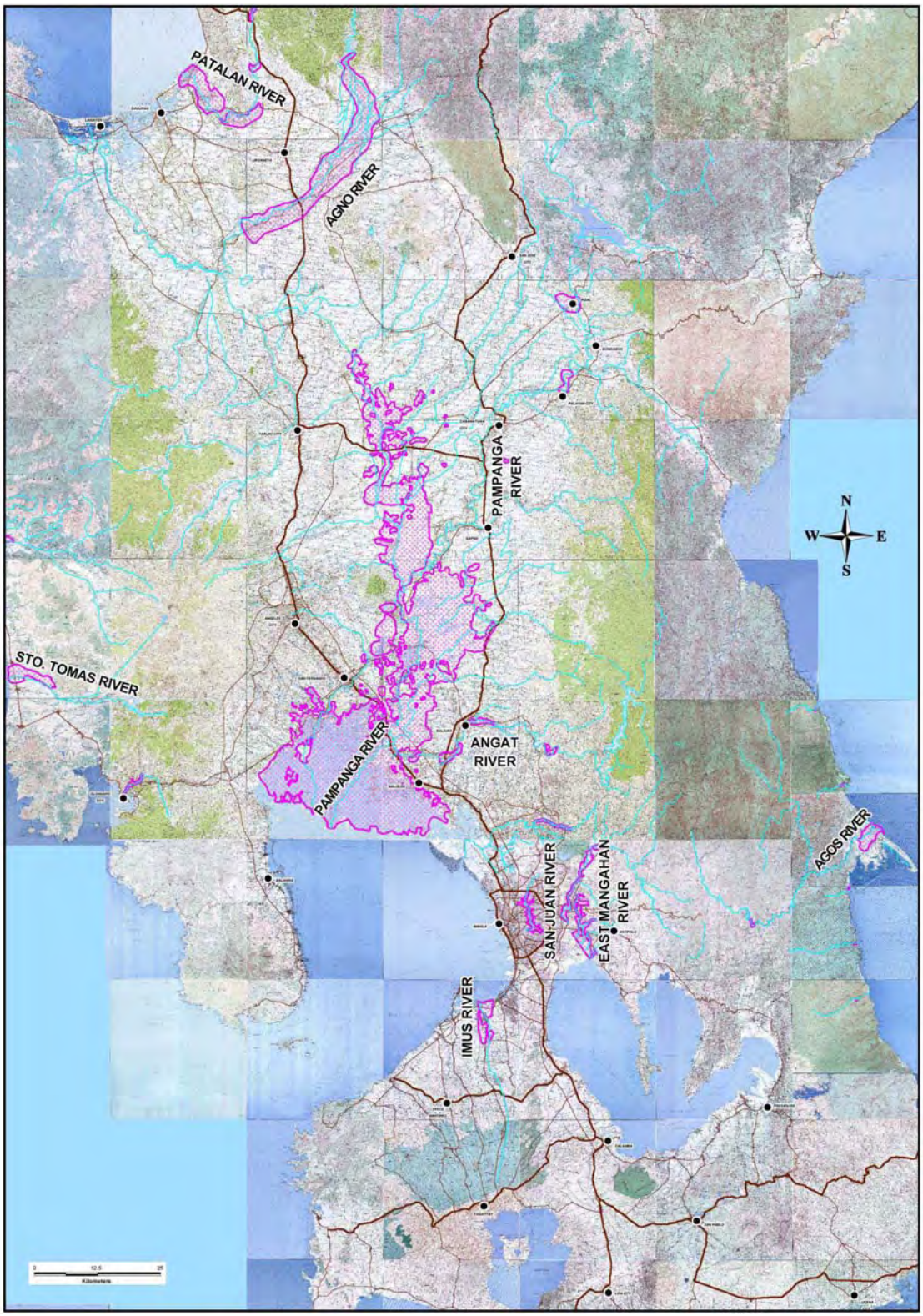
Month	PAGASA Weather Stations			
	Baguio City Benguet	Dagupan City Pangasinan	Cabanatuan Nueva Ecija	Science Garden Quezon City
Period	1971-2000	1971-2000	1971-2000	1971-2000
January	12.1	7.8	8.3	19.5
February	11.7	6.1	9.8	8.9
March	29.3	17.5	17.3	22.9
April	92.3	52.8	29.7	35.1
May	354.7	204.4	179.1	160.4
June	436.4	331.8	250.4	311.6
July	838.4	536.1	370.4	504.1
August	911.8	608.6	380.7	526.8
September	581.0	362.2	307.3	391.7
October	461.8	200.6	207.3	312.0
November	124.6	53.4	104.1	155.5
December	23.7	10.4	40.6	83.9
ANNUAL	**3877.9**	**2391.7**	**1905.1**	**2532.3**

TABLE 7.1.4-2 MEAN MONTHLY AND ANNUAL TEMPERATURE IN THE 200 KM SPHERE

Month	PAGASA Weather Stations			
	Baguio City Benguet	Dagupan City Pangasinan	Cabanatuan Nueva Ecija	Science Garden Quezon City
Period	1971-2000	1971-2000	1971-2000	1971-2000
January	18.0	25.9	25.8	25.4
February	18.6	26.7	26.4	26.1
March	19.7	28.0	27.4	27.4
April	20.7	29.7	29.0	29.1
May	20.6	29.5	29.5	29.5
June	20.5	28.9	28.8	28.6
July	19.8	28.2	28.1	27.8
August	19.3	27.7	27.6	27.5
September	19.7	28.0	27.8	27.6
October	19.8	27.9	27.7	27.3
November	19.5	27.4	27.2	26.7
December	18.6	26.3	26.3	25.8
ANNUAL	**19.5**	**27.9**	**27.6**	**27.4**

7.1.5 Flood Potential Area

Flood potential area of Region III, Metro Manila and part of Region IV-A is shown in **Figure 7.1.5-1**.



Source: Study Team

FIGURE 7.1.5-1 FLOOD POTENTIAL AREA

7.2 PRESENT REGIONAL AND URBAN DEVELOPMENT

7.2.1 General

Over the years, the Philippine government has considered the geographical pattern and the socioeconomic and urban development formation of the country in defining its framework for economic development and growth. The approaches and strategies varied by administration, however, the framework remains the same. The current administration portrayed its development framework based on super regions. The socioeconomic framework of the Philippines is characterized by the geographical features of the country and its predominant development movements.

Being an archipelagic country, the land use patterns influence the socioeconomic development of the Philippines, as reflected by its agricultural, industrial and tourism products, which are anchored on its land, forest, marine and aquatic resources. Similarly, being a tropical country, the Philippines's economy is agriculture-based and as such its principal development is influenced mainly by it. Furthermore, with the advent of technology and information, the country has also capitalized on this, thus the creation of a cyber corridor as part of the super regions of the present administration. The urbanization (and its growth) of the country still follows the same trend and has shown the rapid sprawl of metropolitan regions.

To address this and at the same time spur economic growth in the regions, strategic economic zones, growth areas and corridors were developed, which support the socioeconomic development of the country. With passage of the country's tourism act, tourism zones were likewise identified and the necessary infrastructure and related facilities were identified in support of this.

The rapid growth and economic development necessitated the expansion of urban areas, notably the existing metropolitan areas, such as Metro Manila, Metro Cebu, Metro Davao, Metro Cagayan De Oro, Metro Naga and Metro Iloilo, among others. These growing metropolitan areas provide the necessary service industries and infrastructure facilities for the economic development of the country. As already cited, the socioeconomic framework of the Philippines is indeed characterized by the formation of development areas in the country.

Given the above, therefore, the formulation of land use plans and development plans at the regional level is characterized by the agglomeration and clustering of economic activities through the formation of economic and industrial zones. As already mentioned above, development zones specific to tourism are also being established and expected to complement the economic and industrial zones. Preparation for the 2010-2016 MTDP is anticipated to be depicted by this as mentioned.

The Luzon study area comprising the 200 kilometer radius from Metro Manila is portrayed as a contiguous mixed land use configuration with urban formation character covering three regions in Luzon. These three regions are considered to be the most developed ones and also where the main concentration of population in the country. The succeeding section will further elaborate on this.

7.2.2 Existing Regional and Urban Development

As cited in the previous section, the concentration of the study in Luzon is those regions covered within the 200 kilometer radius from Metro Manila. Following the current regional and urban development formation of Luzon, this area is depicted as the urban beltway of the country, with Metro Manila as the core. Basically, this is because of the influence of Metro Manila to the areas

within the 200 kilometer radius reaching Central Luzon to the north and Southern Luzon (Tagalog) to the south.

Development, in terms of economic, infrastructure, logistics, is still concentrated in the areas covered by the 200 km. radius. This is mainly due to the fact that major economic, social, political and cultural activities are still in Metro Manila and its influence areas. Furthermore, major logistics and physical infrastructure facilities, such as international ports, airports and depots, are located in those areas.

In terms of land use patterns, the Luzon study area is also defined as a clustering of agro-forestry development in the south, with mix of industrial developments and agri-industrial in the north with Metro Manila serving as the service and institutional land uses. Complementing this land use pattern formation is the presence of tourism areas, mainly anchored on coastal and forest tourism products, notably in the south. Over the recent years, development of coastal tourism in the north, notably in Central Luzon facing China Sea has increased. The proximity of these tourism developments to Subic and Clark is another factor for the growing economic activities north of Metro Manila.

Another feature of land use developments, notably at the regional level is the clustering of economic activities geographically. This is another feature of regional development planning being adopted by the government over the years and is still found to be appropriate and responsive. This resulted to the creation of industrial zones, economic zones and parks notably south of Metro Manila. The concentration of such economic and industrial zones and parks necessitated the creation of the CALABARZON (Cavite, Laguna, Batangas, Rizal, Quezon), which now comprises Region IV-A. The integrated or clustering development planning approach is still being adopted. These land use developments are supported by basic and logistics infrastructure facilities, which are not yet fully developed.

Another development approach that promotes mixed use development is being initiated by the private sector that encourages urban development with rural setting and concerns on the environment. This development approach also complements the economic and industrial zones and parks, notably south of Metro Manila. As already cited above, another economic activity, which also affects land use patterns is tourism development. For this end, tourism zones were also designated that will have effect on development planning. This should also be considered in the planning and provision of infrastructure facilities, particularly road and transport infrastructure and support facilities to ensure accessibility of tourism spots and mobility

7.2.3 Current Economic Framework for the Luzon Study Area

The Luzon study area basically is considered as the primary economic driving force of the country. The major political, economic and socio-cultural activities of the country are located in the area. Similarly, principal logistics hubs of the country are in the area, such as the international airport and sea ports. Similarly, conglomeration of major industrial and manufacturing concentrations is still in the Luzon study area, as indicated by the industrial and economic/zones parks, particularly in region IV-A and Subic, Clark and Bataan in Central Luzon. The increase in employment in the industrial sector supports this observation. As already cited in the previous sections, tourism development is a key factor in the study area's economic growth. The passage of the Tourism Act is a strong indication of the role of tourism in economic development of the Luzon study area and the country in general.

Hence, at a nut shell, it can be surmised that the economic framework of the study area, which is also the reflection of the country, is anchored on the following:

a) urban development,
b) industrial development,
c) agricultural development, and
d) tourism development

The urban development is characterized by mixed use, residential, commercial and institutional development with strong private sector participation. The industrial development component of the economic framework is the creation if heavy and light industrial parks, including economic zones, SME promotion, service industries and the growing proliferation of BPOs (business processing offices). The BPOs are clear indication of the contribution of ICT (information and communication technologies) that contribute in improving efficiency in economic activities and in reducing seam in the intermodal logistics network. ICT also provides faster and reliable systems in the in the delivery of services and commodities in the supply chain and trade transactions. As such, through ICT, BPOs provide third party logistics services and reduce costs transactions for between customers and companies. The development of BPOs therefore is considered a welcome economic opportunity for the Philippines and notably in the study area, where such services are now proliferating.

On the other hand, the agricultural development, which is basically in the areas in Region IV-A, notably those surrounding Laguna de Bay, and Region III, is characterized by rice agriculture, agri-industry, agri-fishery, agro-forestry, aqua-marine and coastal agriculture. These are considered as inputs to the study area's economy. On the other hand, the tourism development, which is considered now to have significance in the formulation of the economic framework, is related to the types of tourism products in the study area. These are agro-forestry-eco-tourism in Region IV-A, coastal tourism in the provinces of Region IV-A and Region III, facing the China Sea. Another tourism development that has contributed economically is related to theme parks developed in Laguna, Metro Manila, Clark and Subic. These theme parks have stimulated domestic tourism and promoted local tourism products. Health related tourism products, such as herbal medicines, therapeutic massage and home for the aged, notably in Region IV-A, are also contributing to tourism development.

Complementing the above economic developments is the promotion of local products that are considered home industries, which are medium to small scale enterprises and are anchored on agricultural, forestry and fishery/aquatic and tourism products. The OTOP (one town, one product) concept of the DTI (Dept. of Trade) is anchored on this.

The economic framework, as described above, characterizes the trends and regional development in the study area. This will be further elaborated in Chapter 8.

7.3 SOCIO-ECONOMIC PROFILE

7.3.1 Demographic Trend

Past demographic trend is shown in **Table 7.3.1-1**. Average annual population growth rate between census years is shown in **Figure 7.3.1-1.** Shares of population and land area of the Study Area to the Philippines and population density are graphically shown in **Figure 7.3.1-2**. Characteristics of the demographic trend of the Study Area are as follows:

National Capital Region (NCR) or Metro Manila

- Population reached 11.6 million in 2007 and shared 13% of the Philippine population.
- Population density is extremely high at 187 persons/ha.

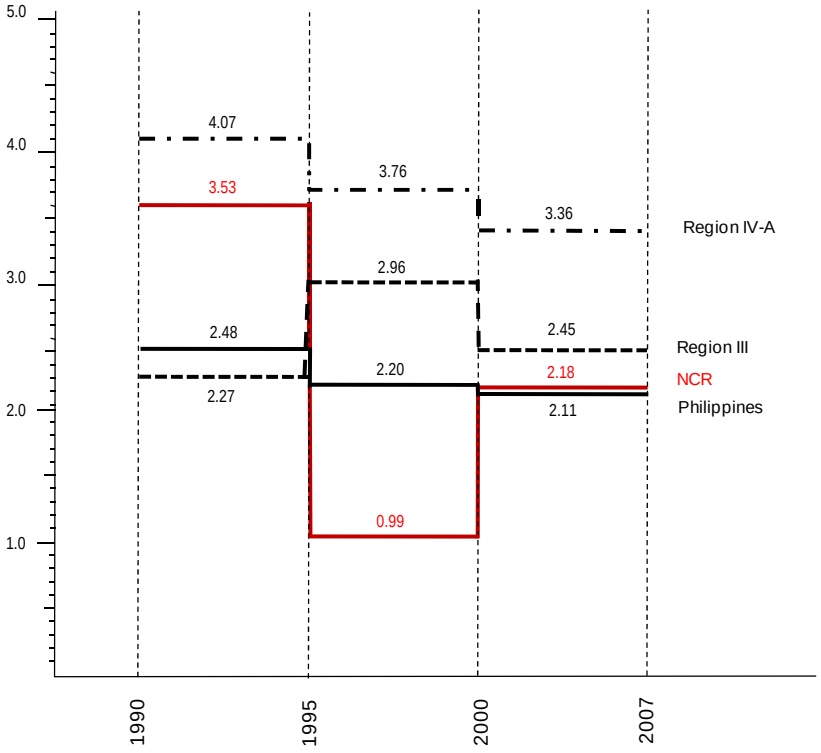
- Population growth rate drastically dropped at 0.99% between 1995 and 2000, but again grew at the rate of 2.18% from 2000 to 2007. This may be due to high-rise apartments/condominiums where people were starting to reside.

Region III (Central Luzon)

- Population in 2007 is 9.7 million and shared 11% of the Philippine population.
- Population density is 4.5 persons per ha., much lower than NCR.
- The Region recorded high population growth rate between 1995 and 2000 at 2.96%, however, it reduced to 2.45% between 2000 and 2007.
- There is a steady trend of population increase at a high rate, because spilled over population from NCR are moving to this Region.

Region IV-A (CALABARZON)

- Population in 2007 reached to 11.7 million and shared 13% of the country.
- Population density is 7.1 person/ha. which is much lower than NCR.
- The Region recorded high population growth rates at 4.07% from 1990 to 1995, 3.76% from 1995 to 2000, and 3.36% from 2000 to 2007. Spilled over population from NCR moved to this Region. This trend is still continuing.



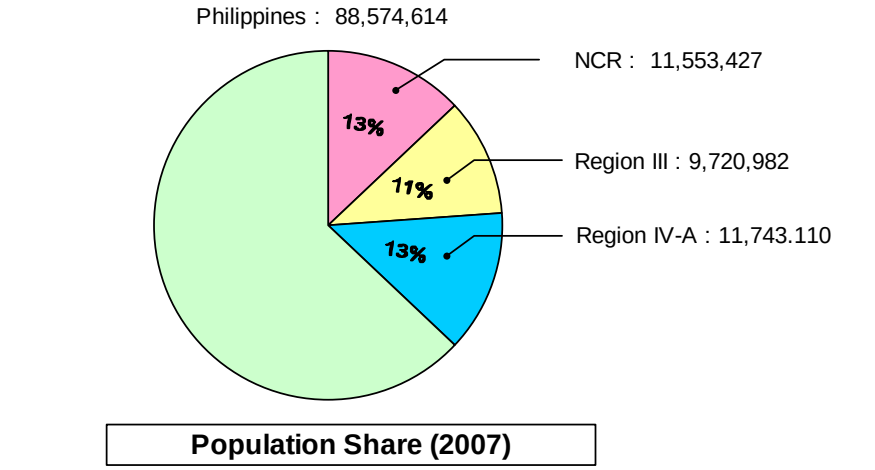
Source: NSO, 2008

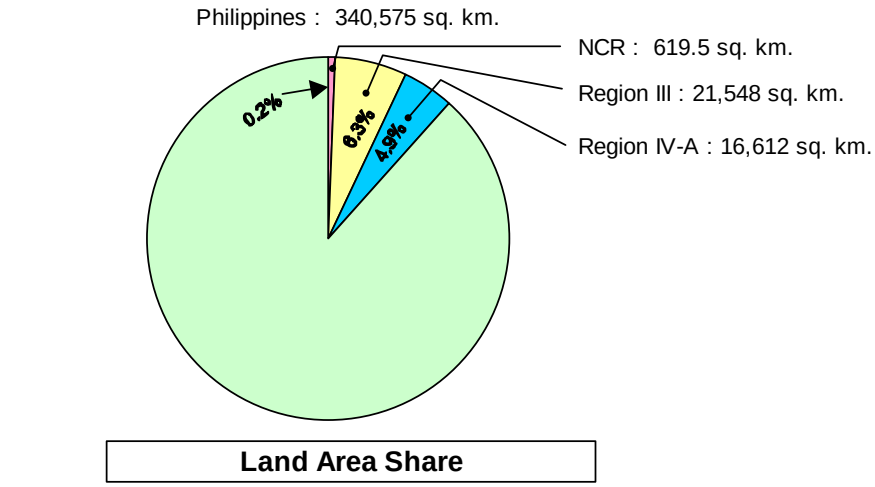
FIGURE 7.3.1-1 PAST POPULATION GROWTH RATE: NCR, REGION III AND REGION IV-A

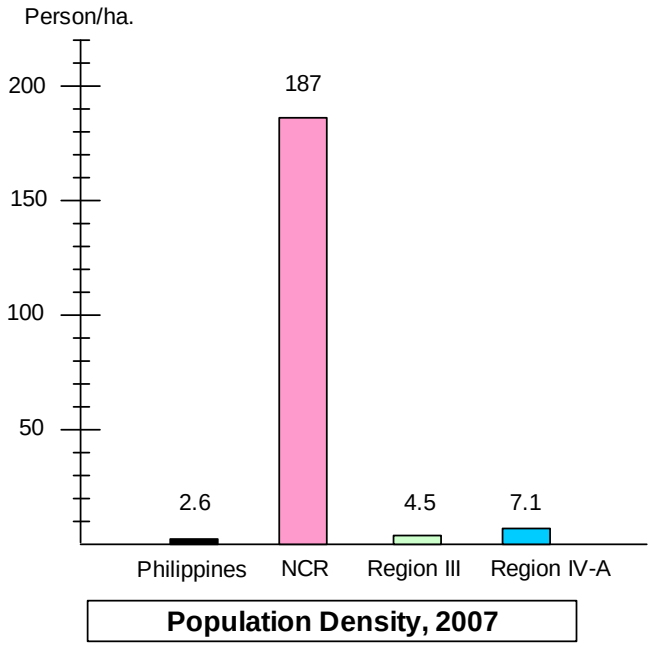
TABLE 7.3.1-1 PAST DEMOGRAPHIC TREND: LUZON ISLAND

Region	Province	Actual Population				Land Area	Density (persons/sq km)				Past Annual PGR		
		1990	1995	2000	2007	(sq km)	1990	1995	2000	2007	1990-1995	1995-2000	2000-2007
Philippines		60,703,206	68,616,536	76,504,077	88,574,614	340,575	178	201	225	260	2.48	2.20	2.11
National Capital Region		7,948,392	9,454,040	9,932,560	11,553,427	620	12,830	15,261	16,033	18,650	3.53	0.99	2.18
	City of Manila	1,601,234	1,654,761	1,581,082	1,660,714	38	41,808	43,205	41,282	43,361	0.66	(0.91)	0.70
	Kalookan City	763,415	1,023,159	1,177,604	1,378,856	56	13,681	18,336	21,104	24,711	6.03	2.85	2.28
	Las Pinas City	297,102	413,086	472,780	532,330	42	7,159	9,954	11,392	12,827	6.81	2.74	1.71
	Makati City	453,170	484,176	444,867	510,383	30	15,156	16,193	14,878	17,070	1.33	(1.68)	1.98
	Malabon	280,027	347,484	338,855	363,681	23	11,967	14,850	14,481	15,542	4.41	(0.50)	1.02
	Mandaluyong City	248,143	286,870	278,474	305,576	26	9,544	11,033	10,711	11,753	2.94	(0.59)	1.34
	Marikina City	310,227	357,231	391,170	424,610	39	7,975	9,183	10,056	10,915	2.86	1.83	1.18
	Muntinlupa City	278,411	399,846	379,310	452,943	47	5,962	8,562	8,122	9,699	7.51	(1.05)	2.57
	Navotas	187,479	229,039	230,403	245,344	3	72,107	88,092	88,617	94,363	4.09	0.12	0.90
	Parañaque City	308,236	391,296	449,811	552,660	38	8,048	10,217	11,744	14,430	4.89	2.83	2.99
	Pasay City	368,366	408,610	354,908	403,064	14	26,501	29,396	25,533	28,997	2.10	(2.78)	1.83
	Pasig City	397,679	471,075	505,058	617,301	13	30,591	36,237	38,851	47,485	3.45	1.40	2.91
	Pateros	51,409	55,286	57,407	61,940	10	4,943	5,316	5,520	5,956	1.46	0.76	1.09
	Quezon City	1,669,776	1,989,419	2,173,831	2,679,450	166	10,047	11,970	13,080	16,122	3.57	1.79	3.03
	San Juan	126,854	124,187	117,680	125,338	10	12,198	11,941	11,315	12,052	(0.42)	(1.07)	0.90
	Taguig	266,637	381,350	467,375	613,343	34	7,912	11,316	13,869	18,200	7.42	4.15	3.96
	Valenzuela City	340,227	437,165	485,433	568,928	47	7,239	9,301	10,328	12,105	5.14	2.12	2.29
Cordillera Administrative Region		1,146,191	1,254,838	1,365,220	1,520,743	19,422	59	65	70	78	1.83	1.70	1.55
1 Ilocos Region		3,550,642	3,803,890	4,200,478	4,545,906	13,013	273	292	323	349	1.39	2.00	1.14
2 Cagayan Valley		2,340,545	2,536,035	2,813,159	3,051,487	28,229	83	90	100	108	1.62	2.10	1.17
3 Central Luzon		6,338,590	7,092,191	8,204,742	9,720,982	22,015	288	322	373	442	2.27	2.96	2.45
	Aurora	139,573	159,621	173,797	187,802	3,147	44	51	55	60	2.72	1.72	1.11
	Bataan	425,803	491,459	557,659	662,153	1,373	310	358	406	482	2.91	2.56	2.48
	Bulacan	1,505,219	1,784,441	2,234,088	2,826,926	2,796	538	638	799	1,011	3.46	4.60	3.42
	Nueva Ecija	1,312,680	1,505,827	1,659,883	1,853,853	5,751	228	262	289	322	2.78	1.97	1.59
	Pampanga	1,295,929	1,401,756	1,618,759	1,911,951	2,063	628	680	785	927	1.58	2.92	2.41
	Tarlac	859,708	945,810	1,068,783	1,243,449	3,054	282	310	350	407	1.93	2.47	2.19
	Zambales	369,665	289,512	433,542	493,085	3,831	96	76	113	129	(4.77)	8.41	1.86
	Angeles City	236,686	234,011	263,971	314,493	60	3,925	3,881	4,378	5,215	(0.23)	2.44	2.53
	Olongapo City	193,327	179,754	194,260	227,270	103	1,872	1,740	1,881	2,200	(1.45)	1.56	2.27
4A Calabarzon		6,349,452	7,750,203	9,320,629	11,743,110	16,873	376	459	552	696	4.07	3.76	3.36
	Batangas	1,476,783	1,658,567	1,905,348	2,245,869	3,120	473	532	611	720	2.35	2.81	2.38
	Cavite	1,152,534	1,610,324	2,063,161	2,856,765	1,574	732	1,023	1,311	1,815	6.92	5.08	4.76
	Laguna	1,370,232	1,631,082	1,965,872	2,473,530	1,918	714	850	1,025	1,290	3.55	3.80	3.34
	Quezon	1,221,831	1,359,991	1,482,955	1,646,510	9,070	135	150	164	182	2.17	1.75	1.51
	Rizal	977,448	1,312,489	1,707,218	2,284,046	1,192	820	1,101	1,432	1,916	6.07	5.40	4.25
	Lucena City	150,624	177,750	196,075	236,390	69	2,199	2,595	2,862	3,451	3.37	1.98	2.71
5 Bicol		3,910,001	4,325,307	4,674,855	5,109,798	18,156	215	238	257	281	2.04	1.57	1.28
Luzon Total		31,583,813	36,216,504	40,511,643	47,245,453	118,327	14,125	16,727	17,709	20,604			

Source: NSO, 2008





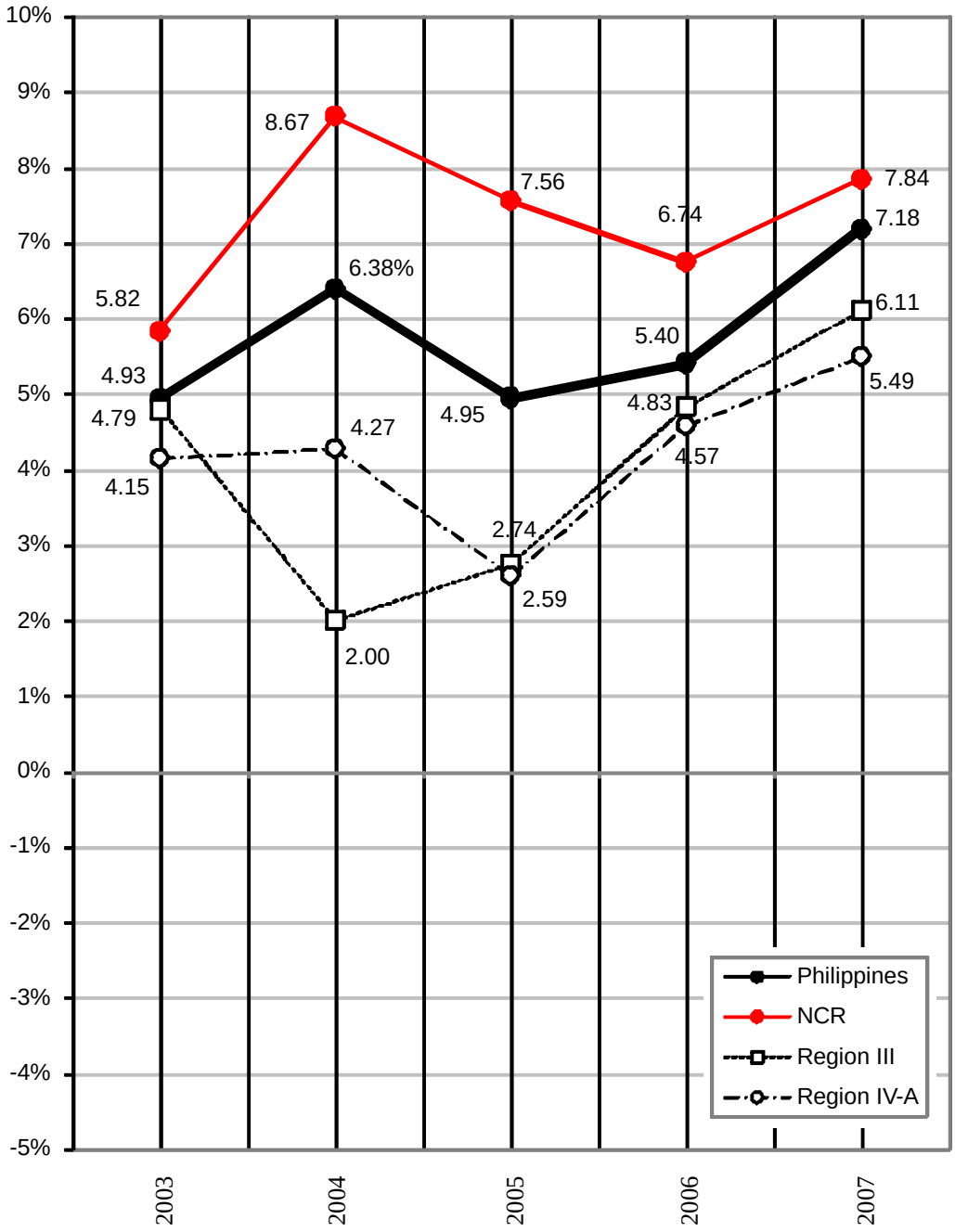


Source: NSCB, 2008

FIGURE 7.3.1-2 SHARES OF POPULATION, LAND AREA AND POPULATION DENSITY

7.3.2 Economic Trend

GDP and GRDP of the Study Area and industrial structure of the country and the Study Area is shown in **Table 7.3.2-1** and **7.3.2-2**, respectively. GDP/GRDP growth rate and sectoral growth rates is shown in **Figures 7.3.2-1** to **7.3.2-4**.



Source: NSCB, 2008

FIGURE 7.3.2-1 GDP AND GRDP GROWTH RATE

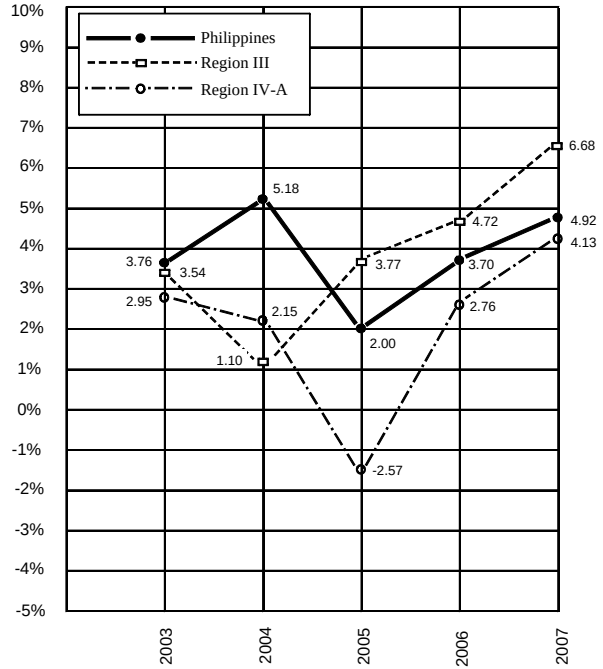
TABLE 7.3.2-1 GDP AND GRDP : METRO MANILA AND SURROUNDING REGIONS

		GDP & GRDP in Billion Pesos at Current Price					Regional Share (%)				
		2003	**2004**	**2005**	**2006**	**2007**	**2003**	**2004**	**2005**	**2006**	**2007**
GDP		4,316.4	4,871.6	5,444.0	6,032.8	6,648.2	100%	100%	100%	100%	100%
GRDP	NCR	1,556.8	1,767.8	2,015.9	2,244.9	2,478.9	36.1%	36.3%	37.0%	37.2%	37.3%
	Region III	347.4	381.4	423.9	464.3	501.4	8.0%	7.8%	7.8%	7.7%	7.5%
	Region IV-A	518.1	576.0	628.3	693.9	752.4	12.0%	11.8%	11.5%	11.5%	11.3%
	Sub-total	2,422.3	2,725.2	3,068.1	3,403.1	3,732.7	56.1%	55.9%	56.3%	56.4%	56.1%

Source: 2008 Philippine Statistical Yearbook

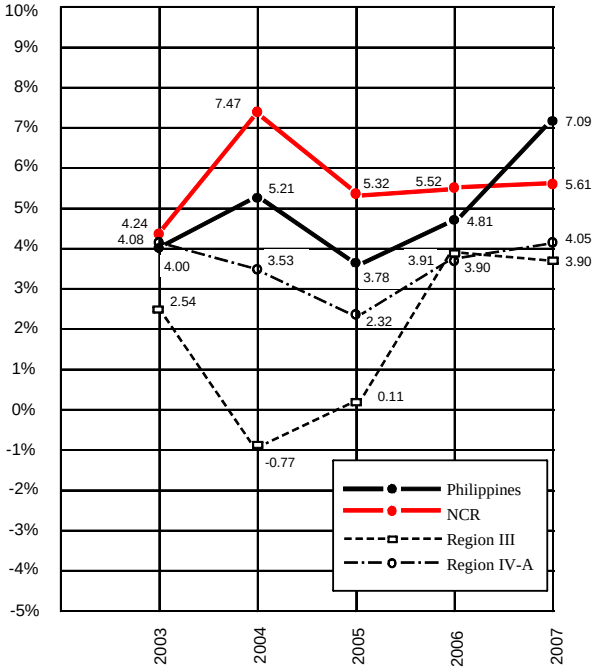
TABLE 7.3.2-2 ECONOMIC TREND AND INDUSTRIAL STRUCTURE: METRO MANILA AND SURROUNDING REGIONS

	Section	GDP/GRDP (Billion Peso at Constant Price)					Industrial Structure (Sectional Share) in %					Sectoral Economic Growth Rate (%)				
		2003	2004	2005	2006	2007	2003	2004	2005	2006	2007	2002-03	2003-04	2004-05	2005-06	2006-07
Philippines	Total	1,085.1 (100%)	1,154.3 (100%)	1,211.5 (100%)	1,276.9 (100%)	1,368.6 (100%)	100%	100%	100%	100%	100%	4.93	6.38	4.95	5.40	7.18
	Primary	215.3 (100%)	226.4 (100%)	230.9 (100%)	239.5 (100%)	251.3 (100%)	19.8	19.6	19.0	18.8	18.4	3.76	5.18	2.00	3.70	4.92
	Secondary	363.5 (100%)	382.4 (100%)	396.9 (100%)	416.0 (100%)	445.5 (100%)	33.5	33.1	32.8	32.6	32.5	4.00	5.21	3.78	4.81	7.09
	Tertiary	506.3 (100%)	545.5 (100%)	583.6 (100%)	621.4 (100%)	671.9 (100%)	46.7	47.3	48.2	48.6	49.1	6.12	7.73	7.00	6.47	8.13
NCR	Total	332.1 (30.6%)	360.9 (31.3%)	388.2 (32.0%)	414.3 (32.4%)	446.8 (32.6%)	100%	100%	100%	100%	100%	5.82	8.67	7.56	6.74	7.84
	Primary	- (0%)	- (0%)	- (0%)	- (0%)	- (0%)	0	0	0	0	0	-	-	-	-	-
	Secondary	119.8 (33.0%)	128.7 (33.7%)	135.6 (34.2%)	143.1 (34.4%)	151.1 (33.9%)	36.1	35.7	34.9	34.5	33.8	4.24	7.47	5.34	5.52	5.61
	Tertiary	212.3 (41.9%)	232.2 (42.6%)	252.5 (43.3%)	271.2 (43.6%)	295.7 (44.0%)	63.9	64.3	65.1	65.5	66.2	6.73	9.35	8.78	7.39	9.02
Region III	Total	97.8 (9.0%)	99.8 (8.6%)	102.5 (8.5%)	107.4 (8.4%)	114.0 (8.3%)	100%	100%	100%	100%	100%	3.79	2.00	2.74	4.83	6.11
	Primary	23.9 (11.1%)	24.1 (10.7%)	25.0 (10.8%)	26.2 (10.9%)	28.0 (11.1%)	24.4	24.2	24.4	24.4	24.5	3.54	1.10	3.77	4.72	6.68
	Secondary	37.8 (10.4%)	37.5 (9.8%)	37.5 (9.5%)	39.0 (9.4%)	40.5 (9.1%)	38.6	37.6	36.6	36.3	35.5	2.54	-0.77	0.11	3.91	3.90
	Tertiary	36.2 (7.1%)	38.2 (7.0%)	39.9 (6.8%)	42.2 (6.8%)	45.5 (6.8%)	37.0	38.2	39.0	39.3	40.0	5.28	5.50	4.66	5.77	7.79
Region IV-A	Total	140.7 (13.0%)	146.8 (12.7%)	150.6 (12.4%)	157.4 (12.3%)	166.1 (12.1%)	100%	100%	100%	100%	100%	4.15	4.27	2.59	4.57	5.49
	Primary	28.4 (13.2%)	29.0 (12.8%)	28.3 (12.2%)	29.1 (11.1%)	30.3 (12.0%)	20.2	19.8	18.8	18.5	18.2	2.95	2.15	-2.57	2.76	4.13
	Secondary	59.4 (16.3%)	61.5 (16.1%)	62.9 (15.8%)	65.3 (9.1%)	68.0 (15.3%)	42.2	41.9	41.8	41.5	40.9	4.08	3.53	2.32	3.90	4.05
	Tertiary	53.0 (10.5%)	56.3 (10.3%)	59.4 (10.2%)	63.1 (6.8%)	67.9 (10.1%)	37.6	38.3	39.4	40.0	40.9	4.89	6.25	5.54	6.13	7.61



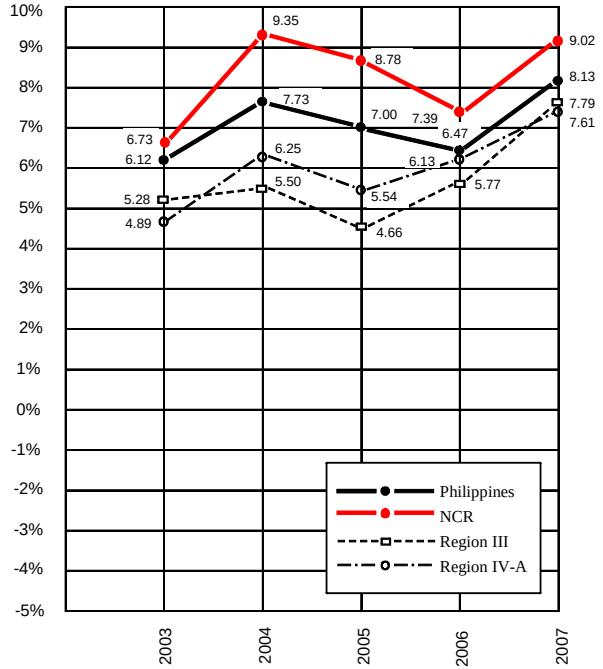
Source: NSCB, 2008

FIGURE 7.3.2-2 PRIMARY SECTOR GROWTH RATE



Source: NSCB, 2008

FIGURE 7.3.2-3 SECONDARY SECTOR GROWTH RATE



Source: NSCB, 2008

FIGURE 7.3.2-4 TERTIARY SECTOR GROWTH RATE

Philippines

- The Philippines recorded high economic growth from 2003 to 2007, ranging from 4.9% to 7.2%.

- However, the country's economy was seriously affected by the international economic crisis in 2008. The economic growth rate in 2008 was reported to be 3.8%. It is also predicted that economic growth in 2009 would be low at 0.8% to 1.8%.

NCR

- NCR produces about 37% of the country's economic output.

- NCR recorded higher economic growth rate than that of the country. Economic growth rate ranged from 5.8 to 8.7%.

- Industrial structure of NCR is as follows:

Primary Sector	- - - - - - - - - -	0%
Secondary Sector	- - - - - - - - - -	34%
Tertiary Sector	- - - - - - - - - -	66%

- Sectoral economic growth rate showed higher growth rate of the country, except the secondary sector in 2007, which was lower than that of the country.

- The country's economy is highly depending upon economic performance of NCR where economic activities are highly concentrating.

Region III

- Region III shares about 7.5% of the country's economic output.

- Region III's economic growth was lower than that of the country, ranging 2.0% to 6.1% for the period of 2003 to 2007.

- Region III's industrial structure is as follows;

Primary Sector	- - - - - - - - - -	24.5%
Secondary Sector	- - - - - - - - - -	35.5%
Tertiary Sector	- - - - - - - - - -	40.0%

- Sectoral economic growth rate was as follows;

Primary Sector	- - - - - - - - - -	higher than the country's growth except 2003 and 2004
Secondary Sector	- - - - - - - - - -	lower than the country's growth rate
Tertiary Sector	- - - - - - - - - -	lower than the country's growth rate

- Since the Region is located close to Metro Manila and has high potential areas of Subic and Clark, it is expected that the Region will produce more and economic growth rate higher than that of the country will be achieved.

Region IV-A

- Region IV-A produces about 11.3% of the country's economic output.
- The Region recorded the lower economic growth rate than that of the country.
- Industrial share of the Region is as follows;
  Primary Sector - - - - - - - - - - 18.2%
  Secondary Sector - - - - - - - - - - 40.9%
  Tertiary Sector - - - - - - - - - - 40.9%
- All sectors recorded lower growth rate than that of the country.
- It is hoped that the Region's economic performance will be improved, taking advantageous of proximity to Metro Manila.

7.3.3 Employment

(1) Employed Persons by Major Industrial Group

Employed persons by major industry group is shown in **Table 7.3.3-1** and summarized in **Table 3.3.3-2.**

TABLE 7.3.3-1 EMPLOYED PERSONS BY MAJOR INDUSTRY: LUZON

(in thousands)

Major Industry	Year 2007				Year 2005			
	Philippines	NCR	Region III	Regin IVA	Philippines	NCR	Region III	Regin IVA
Industry	33,672	4,128	3,396	4,197	32,875	4,166	3,203	3,891
Agriculture, Hunting and Forestry	10,768	13	745	646	10,763	25	746	593
Fishing	1,393	16	59	143	1,408	15	53	143
Sub - Total (Primary)	12,161	29	804	789	12,171	40	799	736
Mining and Quarrying	135	2	5	4	116	1	4	8
Manufacturing	3,060	524	416	801	3,043	568	419	751
Electricity, Gas and Water	141	27	17	22	108	18	12	16
Construction	1,740	299	252	274	1,616	277	229	279
Sub - Total (Secondary)	5,076	852	690	1,101	4,883	864	664	1,054
Wholesale and Retail, Repair of Motor Vehicles, *	6,176	1,059	743	848	6,215	1,149	678	797
Hotel and Restaurants	907	255	124	135	871	245	112	138
Transport, Storage and Communication	2,600	507	375	390	2,471	470	345	390
Financial Intermediation	384	123	45	54	337	105	47	41
Real Estate, Renting and Business Activities	881	329	82	172	736	306	72	122
Public Administration & Defense, Compulsory Social Security	1,569	195	126	186	1,494	209	116	146
Education	1,043	116	123	128	989	128	112	104
Health & Social Work	396	102	50	58	362	80	27	45
Other Community, Social & Personal Service Activities	779	168	83	125	781	187	96	105
Private Household With Employed Persons	1,699	391	151	211	1,561	383	135	214
Extraterritorial Organizations & Bodies	3	2	-	-	3	1	-	*
Sub - Total (Tertiary)	16,437	3,247	1,902	2,307	15,820	3,263	1,740	2,102

Source: NSCB, 2008

TABLE 7.3.3-2 SUMMARY OF EMPLOYED PERSONS BY MAJOR INDUSTRY GROUP

Unit: 1,000 persons

	Philippines		NCR		Region III		Region IV-A	
	2005	2007	2005	2007	2005	2007	2005	2007
Primary Sector	12,171 (1.00)	12,161 (1.00)	40 (1.00)	29 (0.73)	799 (1.00)	804 (1.01)	736 (1.00)	789 (1.07)
Secondary Sector	4,883 (1.00)	5,076 (1.04)	864 (1.00)	852 (0.99)	664 (1.00)	690 (1.04)	1,054 (1.00)	1,101 (1.04)
Tertiary Sector	15,820 (1.00)	16,437 (1.04)	3,263 (1.00)	3,247 (1.00)	1,740 (1.00)	1,902 (1.09)	2,102 (1.00)	2,307 (1.10)
Total	32,875 (1.00)	33,672 (1.02)	4,166 (1.00)	4,128 (0.99)	3,203 (1.00)	3,396) (1.06)	3,891 (1.00)	4,197 (1.08)

Source: NSCB, 2008

Relation between economic growth and employment growth for the period from 2005 to 2007 is shown in **Table 7.3.3-3**. For the secondary and tertiary industries, it can be generally said that about ½ of economic growth rate is the employment growth rate

TABLE 7.3.3-3 ECONOMIC GROWTH AND EMPLOYMENT GROWTH FROM 2005 TO 2007

		Philippines	NCR	Region III	Region IV-A
Primary Sector	Economy	1.09	-	1.12	1.07
	Employment	1.00	0.73	1.01	1.07
Secondary Sector	Economy	1.12	1.11	1.08	1.08
	Employment	1.04	0.99	1.04	1.04
Tertiary Sector	Economy	1.15	1.17	1.14	1.14
	Employment	1.04	1.00	1.09	1.10
Total	Economy	1.13	1.15	1.11	1.10
	Employment	1.02	0.99	1.06	1.08

(2) Number of Establishments

NSO annually undertakes the establishment survey. **Table 7.3.3-4** shows number of establishments and number of employed persons at establishments, which can be good indices for traffic attraction. To be noted is that there is big discrepancy in "Employed Persons by Major Industry" and "Number of Employed Persons at Establishment", thus, the latter needs to be adjusted.

TABLE 7.3.3-4 NUMBER OF ESTABLISHMENTS AND EMPLOYMENTS BY REGION/PROVINCE: LUZON

REGION/PROVINCE	No. of Establishments			No. of Employments		
	2005	2006	2007	2005	2006	2007
PHILIPPINES	782,980	783,065	783,869	5,479,297	4,984,883	5,187,793
NATIONAL CAPITAL REGION	195,412	195,632	196,426	1,976,359	1,869,507	2,025,751
NCR 1 (Manila)	37,634	37,661	37,747	287,754	266,732	272,660
NCR 2 (Quezon City)	39,860	39,883	40,094	402,518	381,929	422,294
NCR 3 (Mandaluyong, Marikina, Pasig, San Juan)	29,409	29,448	29,561	333,778	320,165	335,525
NCR 4 (Caloocan, Malabon, Navotas, Valenzuela)	35,236	35,212	35,238	219,928	195,436	195,428
NCR 5 (Makati, Pateros, Taguig)	24,744	24,866	25,124	447,625	437,391	504,738
NCR 6 (Las Piñas, Muntinlupa, Parañaque, Pasay)	28,529	28,562	28,662	284,756	267,854	295,106
CORDILLERA ADMINISTRATIVE REGION	14,762	14,744	14,738	70,444	61,717	62,731
1 ILOCOS REGION	44,134	44,117	44,082	175,325	144,269	144,495
2 CAGAYAN VALLEY	23,978	23,982	23,932	88,827	69,271	69,052
3 CENTRAL LUZON	84,368	84,344	84,361	480,020	419,320	421,962
BATAAN	6,026	6,027	5,982	39,501	36,796	34,686
BULACAN	23,152	23,135	23,139	129,883	113,827	113,674
NUEVA ECIJA	18,239	18,228	18,148	65,273	49,198	49,006
PAMPANGA	19,104	19,091	19,165	136,087	120,074	125,567
TARLAC	9,172	9,169	9,158	51,587	45,697	44,071
ZAMBALES	7,335	7,355	7,431	53,865	50,629	51,936
AURORA	1,340	1,339	1,338	3,824	3,099	3,022
4-A CALABARZON	114,182	114,114	114,208	924,867	857,361	856,193
BATANGAS	19,606	19,579	19,599	128,134	113,700	109,162
CAVITE	28,737	28,705	28,709	286,300	266,149	261,334
LAGUNA	27,028	27,015	27,059	318,264	311,564	322,732
QUEZON	16,219	16,223	16,223	67,586	53,952	52,475
RIZAL	22,592	22,592	22,618	124,583	111,996	110,490
5 BICOL REGION	31,619	31,666	31,647	129,893	116,960	116,993
LUZON TOTAL	508,455	508,599	509,394	3,845,735	3,538,405	3,697,177

Source: List of Establishmens, NSO, 2000

7.3.4 Per Capita GDP and GRDP

Per capita GDP and GRDP at current price and constant price is shown in **Table 7.3.4-1** and **7.3.4-2**, respectively.

TABLE 7.3.4-1 PER CAPITA GRDP IN CURRENT PRICE: 2003-2007

unit: Peso

Region		2003	2004	2005	2006	2007	
Philippines		52,718	58,149	63,556	69,365	74,947	1.00
NCR	National Capital Region	148,743	165,814	184,758	205,117	223,332	2.98
CAR	Cordillera Administrative	66,749	71,247	75,556	82,523	85,319	1.14
Region I	Ilocos	27,943	30,725	33,405	35,996	38,063	0.51
Region II	Cagayan Valley	26,829	30,474	30,369	33,799	36,605	0.49
Region III	Central Luzon	39,407	42,256	45,789	49,469	52,351	0.70
Region IV-A	CALABARZON	50,997	55,213	59,320	63,640	67,466	0.90
Region IV-B	MIMAROPA	36,538	38,710	43,406	45,420	49,331	0.66
Region V	Bicol	21,991	24,277	26,316	27,983	31,314	0.42
Region VI	Western Visayas	42,556	46,875	51,872	56,523	61,382	0.82
Region VII	Central Visayas	48,573	54,008	59,272	64,261	69,797	0.93
Region VIII	Eastern Visayas	25,743	29,225	31,223	33,480	33,645	0.45
Region IX	Zamboanga Peninsula	31,946	34,678	38,386	41,899	45,864	0.61
Region X	Northern Mindanao	52,436	58,329	62,850	69,197	75,883	1.01
Region XI	Davao Region	48,176	54,419	59,971	64,520	71,100	0.95
Region XII	SOCCSKSARGEN	39,960	45,019	47,826	52,384	57,708	0.77
Region XIII	Caraga	12,193	14,050	15,161	32,493	40,012	0.53
ARMM	Muslim Mindanao	24,531	26,449	28,194	16,303	16,829	0.22

Source: NSCB, 2008

Per capita GRDP of NCR is higher by about 3 times than the national average, whereas that of Region III and Region IV-A is lower than national average.

Per capita GDP grew at about 3% per annum from 2003 to 2007. NCR recorded higher growth rate than national average and recorded 4.9% for the same period. Growth rate of per capita GRDP of Region III and Region IV-A was lower than the national average.

TABLE 7.3.4-2 PER CAPITA GRDP IN CONSTANT PRICE: 2003-2007

unit: Peso

Region		Per Capita GRDP					Growth Rate
		2003	2004	2005	2006	2007	2003-2007
Philippines		13,252	13,789	14,186	14,681	15,429	3.87
NCR	National Capital Region	31,730	33,867	35,742	37,856	40,252	6.13
CAR	Cordillera Administrative	17,848	18,111	17,919	18,208	19,120	1.74
Region I	Ilocos	7,209	7,442	7,727	7,988	8,286	3.54
Region II	Cagayan Valley	7,590	8,228	7,649	8,122	8,511	2.91
Region III	Central Luzon	11,092	11,054	11,142	11,448	11,904	1.78
Region IV-A	CALABARZON	13,853	14,068	14,159	14,439	14,891	1.82
Region IV-B	MIMAROPA	12,120	12,284	12,735	12,603	13,431	2.60
Region V	Bicol	6,214	6,442	6,632	6,691	7,067	3.27
Region VI	Western Visayas	11,699	12,347	12,825	13,100	13,842	4.29
Region VII	Central Visayas	12,419	13,010	13,518	13,917	14,829	4.54
Region VIII	Eastern Visayas	6,362	6,555	6,678	6,846	6,922	2.13
Region IX	Zamboanga Peninsula	9,482	9,672	10,159	10,147	10,679	3.02
Region X	Northern Mindanao	13,904	14,587	14,829	15,651	16,537	4.43
Region XI	Davao Region	12,842	13,455	13,892	14,157	14,866	3.73
Region XII	SOCCSKSARGEN	11,112	11,487	11,477	11,982	12,505	3.00
Region XIII	Caraga	6,516	6,589	6,690	6,994	7,452	3.41
ARMM	Muslim Mindanao	3,290	3,382	3,433	3,479	3,582	2.15

Source: NSCB, 2008

CHAPTER 8

PRESENT TRAFFIC CONDITIONS

CHAPTER 8
PRESENT TRAFFIC CONDITIONS

8.1 DISTRIBUTION OF TRAFFIC GENERATION SOURCES

8.1.1 Distribution of Population

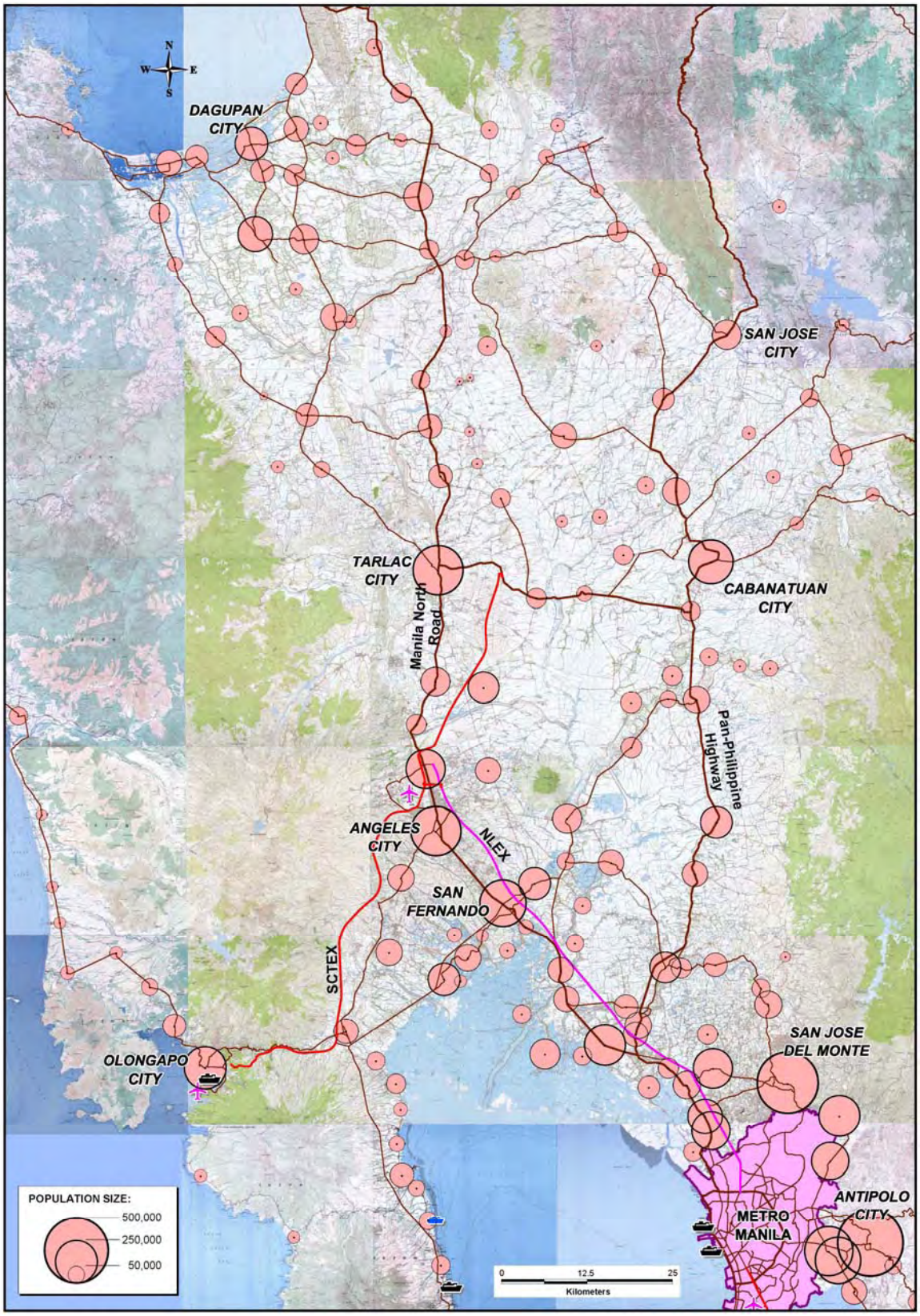
The population's distribution in the north and south of Metro Manila is plotted in **Figures 8.1.1-1** (1/2) and (2/2) respectively. From these figures, the following can be deduced:

North of Metro Manila (Figure 8.1.1-1 (1/2))

- Major cities are mainly distributed along the Pan-Philippine Highway and Manila North Road.
- Small and medium cities are clustered around the major cities of Dagupan, Tarlac, Cabanatuan, Angeles and San Fernando.
- Major cities are also located at the outskirt of Metro Manila, which suggests that a circumferential high standard highway along the boundary periphery of Metro Manila is required in order to connect the cities and to disperse traffic from the north areas going to Metro Manila.
- From the view point of distribution of population, roads connecting north-south are to be more important than ones connecting west-east.

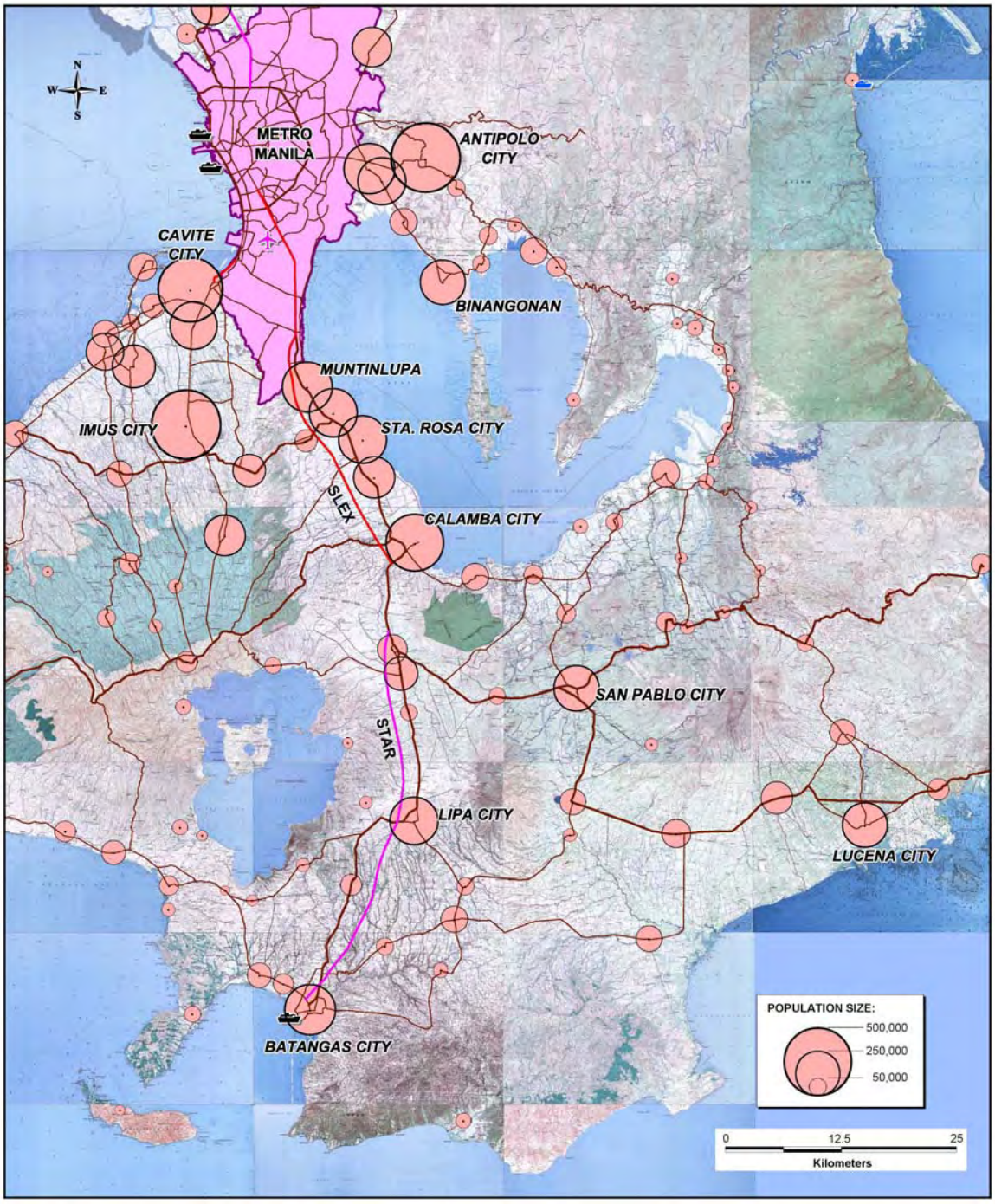
South of Metro Manila (Figure 8.1.1-1 (2/2))

- South of Metro Manila has higher number of major cities compared to the north of Metro Manila. In particular, area of Cavite is host to several major cities.
- Many medium cities are located along the South Luzon Expressway.
- Taking into account the distribution of population, development of high standard highway network is effective to solve traffic congestion and to facilitate socio-economic activities in this area.



Source: Prepared by the Study Team based on NSO 2007 data

FIGURE 8.1.1-1 (1/2) DISTRIBUTION OF POPULATION IN NORTH OF METRO MANILA



Source: Prepared by the Study Team based on NSO 2007 data

FIGURE 8.1.1-1 (2/2) DISTRIBUTION OF POPULATION IN SOUTH OF METRO MANILA

8.1.2 Major Transport Facilities

(1) International Ports

There are 5 international ports under the study area in Luzon, namely Manila North Harbor, Manila South Harbor, Manila International Container Terminal (MICT), Batangas Port and Subic Bay Free Port.

Number of ship calls, cargo traffic and passenger traffic are shown in **Table 8.1.2-1** and graphically shown in Figure 8.1.2-1, Figure 8.1.2-2 and Figure 8.1.2-3 respectively.

TABLE 8.1.2-1 STATISTICS OF PORTS: LUZON (2007)

	No. of Ship calls			Cargo Traffic (1,000 M.T.)			No. of Passengers (1,000)
	Domestic	Foreign	Total	Domestic	Foreign	Total	
Manila North	4,287	-	4,287	14,131	-	14,131	1,046
Manila South	731	1,855	2,586	1,543	5,803	7,346	1,250
MICT	87	2,061	2,148	686	16,566	17,252	-
Sub-Total	5,105	3,916	9,021	16,360	22,369	38,729	2,296
Batangas	26,927	162	27,089	193	420	613	4,291
Subic Bay	1,007	886	1,893	-	-	1,868	1

Source: Port Interview by JICA Study Team

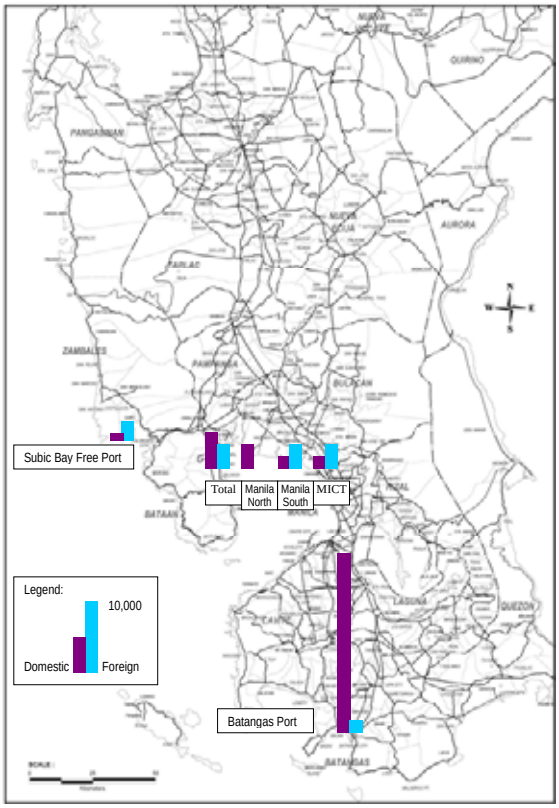


FIGURE 8.1.2-1 NUMBER OF SHIP CALLS

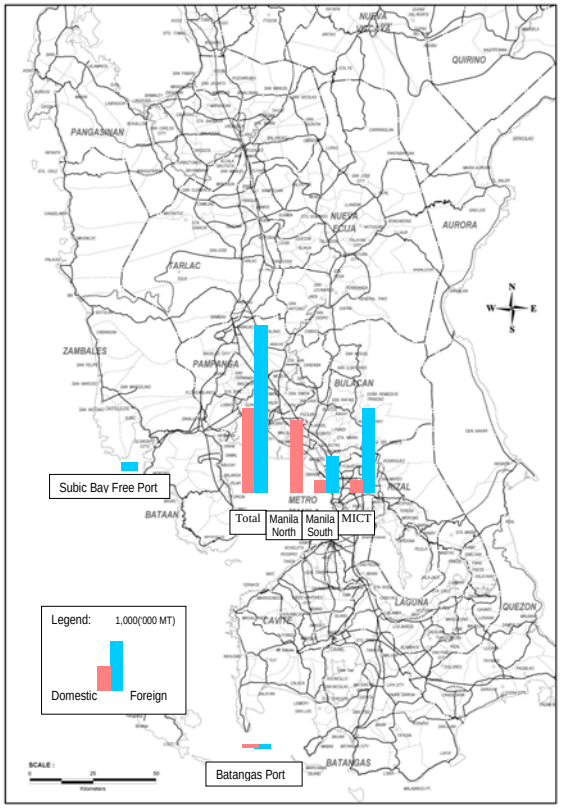


FIGURE 8.1.2-2 CARGO TRAFFIC

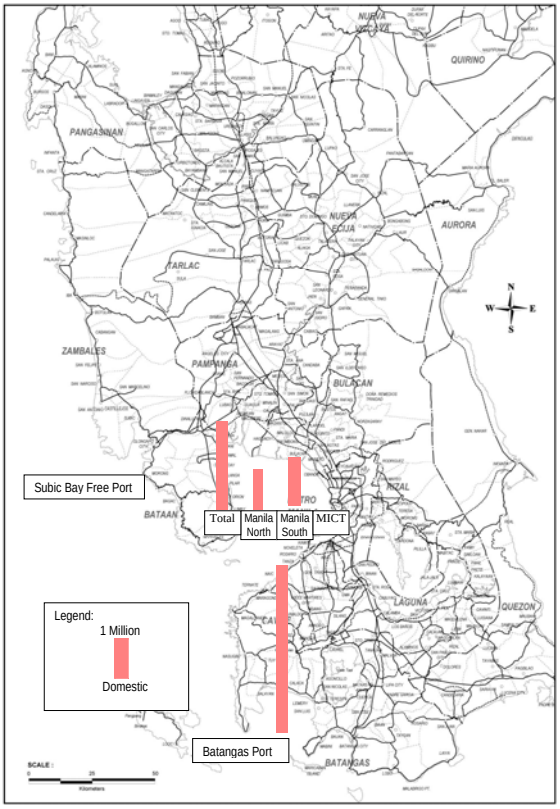


FIGURE 8.1.2-3 NUMBER OF PASSENGERS

(2) International Airport

There are three (3) international airports within the study area in Luzon, namely Ninoy Aquino International Airport (NAIA), Diosdado Macapagal International Airport (formerly Clark International Airport) and Subic Bay International Airport (SBIA).

Number of flights, number of passengers and cargo traffic are presented in Table 8.1.2-2 and graphically shown Figure 8.1.2-4, Figure 8.1.2-5 and Figure 8.1.2-6 respectively.

Since NAIA's full capacity is expected to be reached within a few years, the strategy to cope with this problem has been studied through a JICA-assisted study entitled "Master Plan Study on the Strategy for the Improvement of National Airports". More on this study is available in Annex 8.1.

TABLE 8.1.2-2 AIRPORT STATISTICS (2007)

		NAIA	DMIA
No. of Flights	Domestic	93,648	621
	Foreign	54,643	1,975
	Total	148,291	2,596
No. of Passengers (in 1,000)	Domestic	9,707	44
	Foreign	10,718	490
	Total	20,245	534
Cargo Traffic (M.T.)	Domestic	93,917	16,904
	Foreign	294,634	127,008
	Total	388,551	143,912

Note: Data of SBIA is not available.
Source: Airport Interview by JICA Study Team

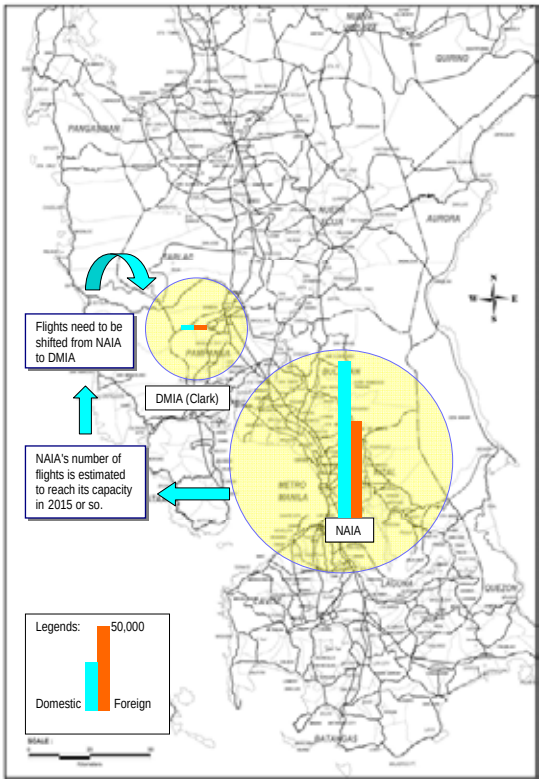


FIGURE 8.1.2-4 NUMBER OF FLIGHTS

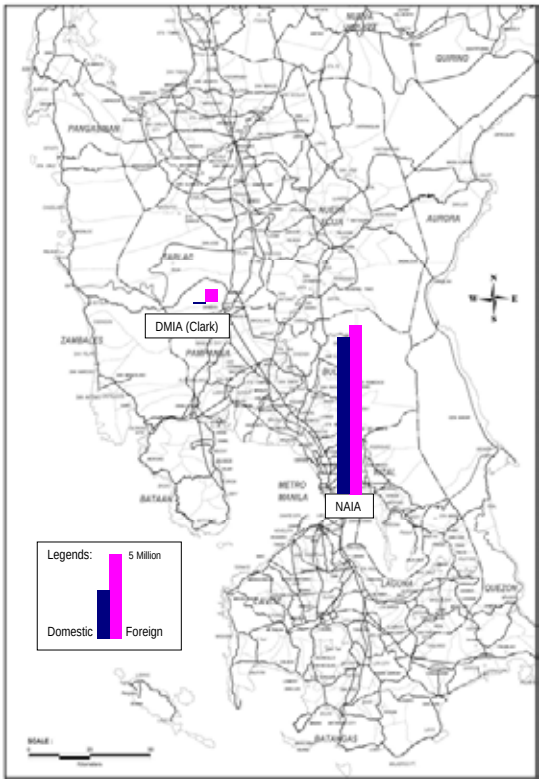


FIGURE 8.1.2-5 NUMBER OF PASSENGERS

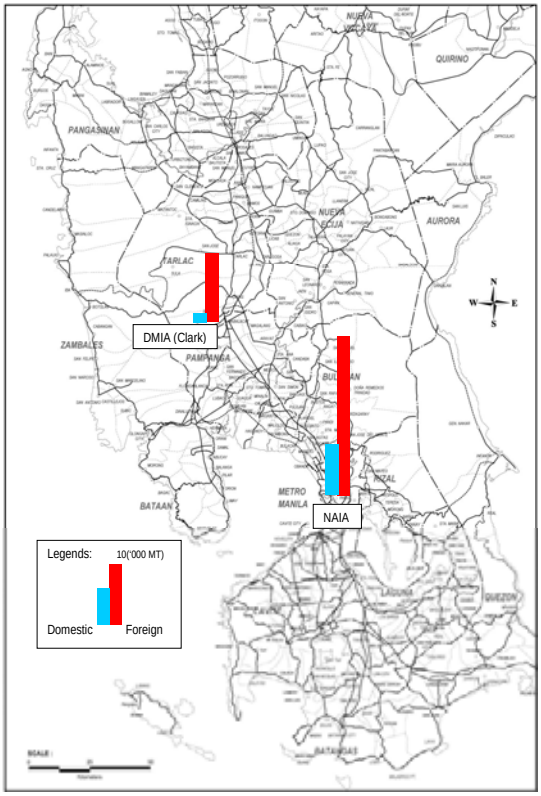
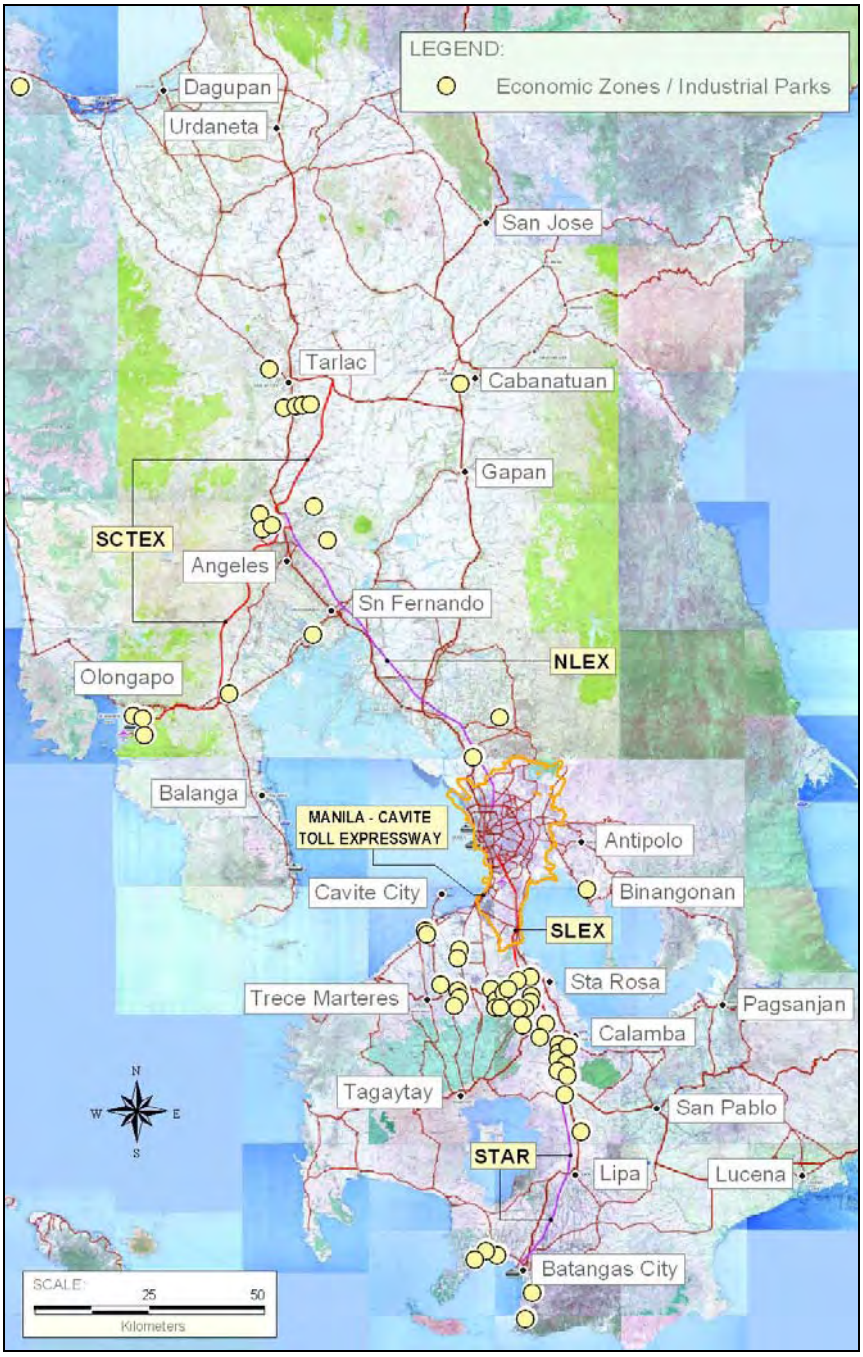


FIGURE 8.1.2-6 CARGO TRAFFIC

8.1.3 Location of Economic Zones, Major Shopping Malls, and Interest Spots

The distribution of economic zones / industrial parks in the north of Metro Manila is plotted in **Figures 8.1.3-1** and in the south of Manila is shown in **Figure 8.1.3-2**. Recognizing the importance of transport infrastructure to locator companies, most ecozones are located closer to expressway or national road for easy transportation of raw materials and finished products. Aside from ecozones and industrial parks, locations of interest spots such as shopping malls and beach resorts were also plotted and available in Annex 8.2.



Source: Prepared by the Study Team based on the data of Philippine Economic Zone Authority (PEZA), 2008

FIGURE 8.1.3-1 ECONOMIC ZONES / INDUSTRIAL PARKS IN NORTH AND SOUTH OF METRO MANILA

8.2 ROAD AND TRAFFIC CONDITIONS

8.2.1 Road Conditions

The number of lanes of national roads under the jurisdiction of the DPWH are shown in **Figures 8.2.1-1** (1/3 – 3/3), while the road surface conditions are described in Section 3.2 of Chapter 3 according to road function. The number of lanes, as well as lane and shoulder widths is to be utilized as road carrying capacities in a series of traffic analyses.

FIGURE 8.2.1-1 (1/3) NUMBER OF LANES (NORTH OF METRO MANILA)

FIGURE 8.2.1-1 (2/3) NUMBER OF LANES (SOUTH OF METRO MANILA)

FIGURE 8.2.1-1 (3/3) NUMBER OF LANES OF METRO MANILA ROAD (DPWH JURISDICTION)

8.2.2 Traffic Condition

(a) Metro Manila

Traffic Volume

The traffic volume on the road network of Metro Manila is presented in **Figure 8.2.2-1**. EDSA remains the heavily travelled road with 153,503 vehicles although other circumferential roads such as C5, C3 and C2 have also registered high volume of traffic. Roads connect Metro Manila to provinces of Rizal, Bulacan, and Cavite such as Ortigas Avenue, Marcos Highway, Manila North Road, and Aguinaldo Highway also have significant traffic. This is despite the presence of NLEX and SLEX which serve as the two main arterials linking Metro Manila to north and south respectively.

Hourly Variation of Traffic

The hourly variation of traffic is presented in **Figure 8.2.2-2** and **Figure 8.2.2-3** (Annex 8.3 for hourly variation of other traffic survey sites). From these figures, the following are observed:

- High volume of traffic is continuous at EDSA throughout the daytime (6AM to 6PM) as well as other circumferential roads of Metro Manila (C2, C3 and C5).
- In contrast, radial roads (e.g. Ortigas Avenue and Marcos Highway) linking Metro Manila to neighboring provinces are observed to peak in the morning (from 6AM to 9AM) and then gradually decrease. Peak hour are observed again in the afternoon from 5PM to 6PM.
- In terms of traffic flow direction, traffic entering Metro Manila is substantially high in the morning compared to traffic exiting at the radial roads. These can be explained by the movement of commuters where they enter Metro Manila in the morning to attend their work (or activities) and they exit in the afternoon.

Travel Time

Observed travel speed is depicted in **Figure 8.2.2-4**. As seen in the figure, except from the NLEX and SLEX, the results of the survey depict a congested network where some sections registered a travel speed of less 10 km/hr. Radial roads such as Ortigas Avenue which connect Metro Manila to residential areas in Rizal are also experiencing severe traffic congestions. EDSA also have substantial sections where travel speed is less than 10 km/hr. Some sections of EDSA with less than 10km/hr travel are:

- Harrison Street - Taft avenue (4.5 km/hr)
- Buendia Avenue - Guadalupe MRT Station (8.9 km/hr)
- Guadalupe MRT Station - Boni Avenue (3.8 km/hr)
- Boni Avenue - Shaw Blvd. (2.7 km/hr)
- Shaw Blvd. - Ortigas Avenue (10.8 km/hr)
- Project 7 / Bagobantay - Munoz / Roosevelt (8.9 km/hr)

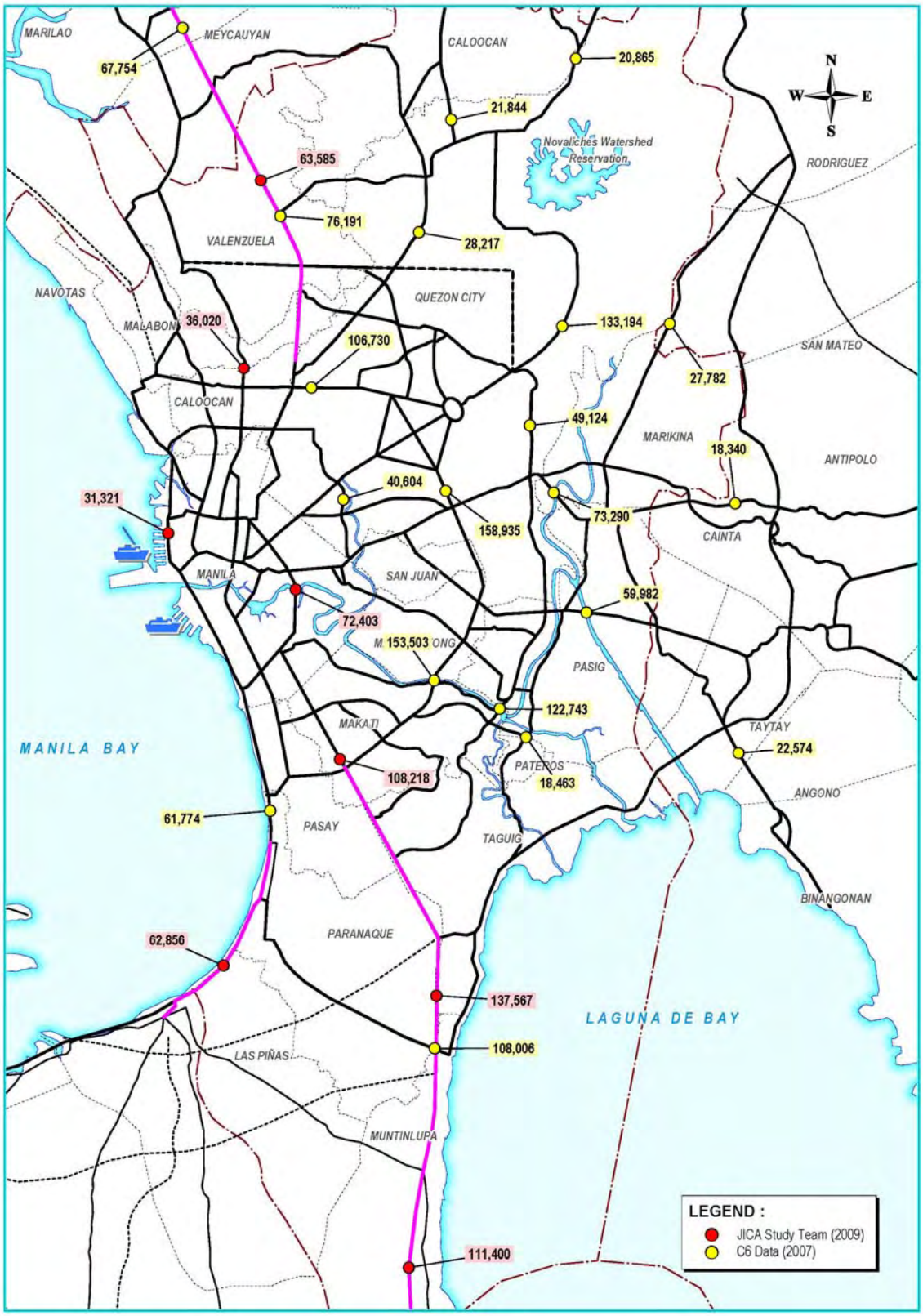


FIGURE 8.2.2-1 TRAFFIC VOLUME – METRO MANILA (AADT)

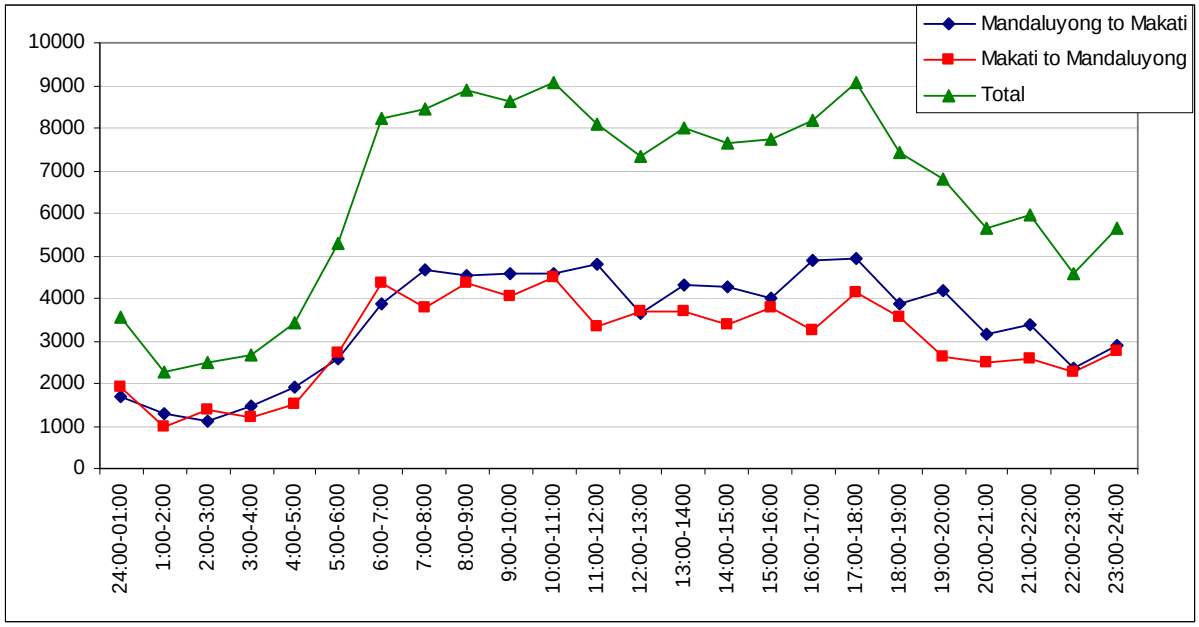


FIGURE 8.2.2-2 HOURLY VARIATION OF TRAFFIC AT EDSA (1)

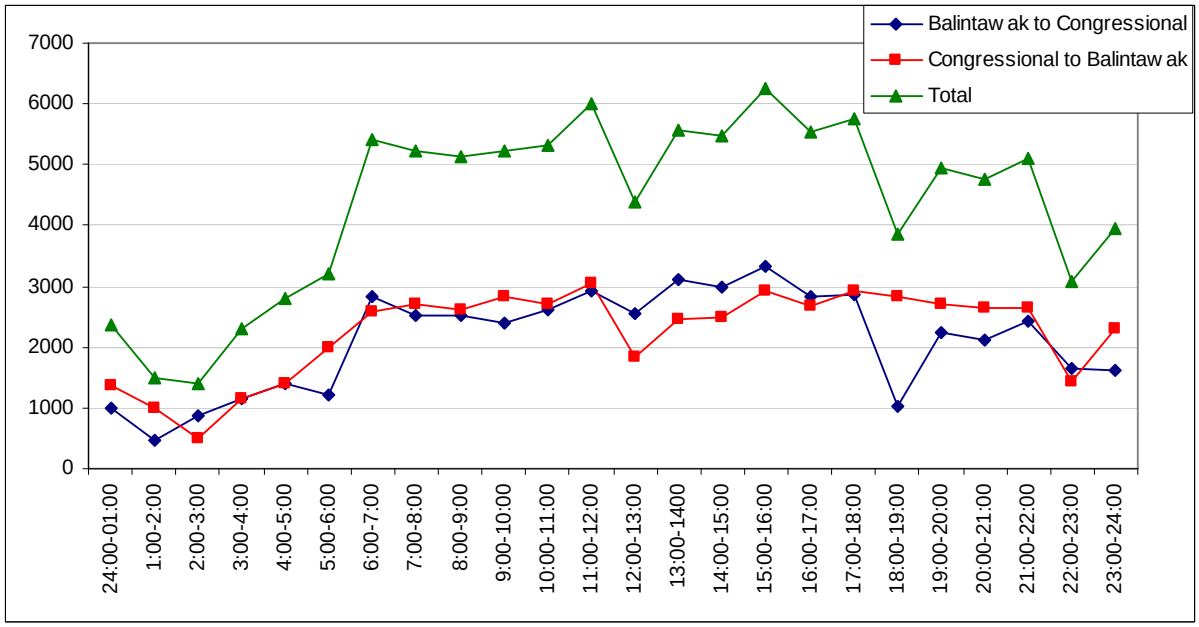


FIGURE 8.2.2-3 HOURLY VARIATION OF TRAFFIC AT EDSA (2)

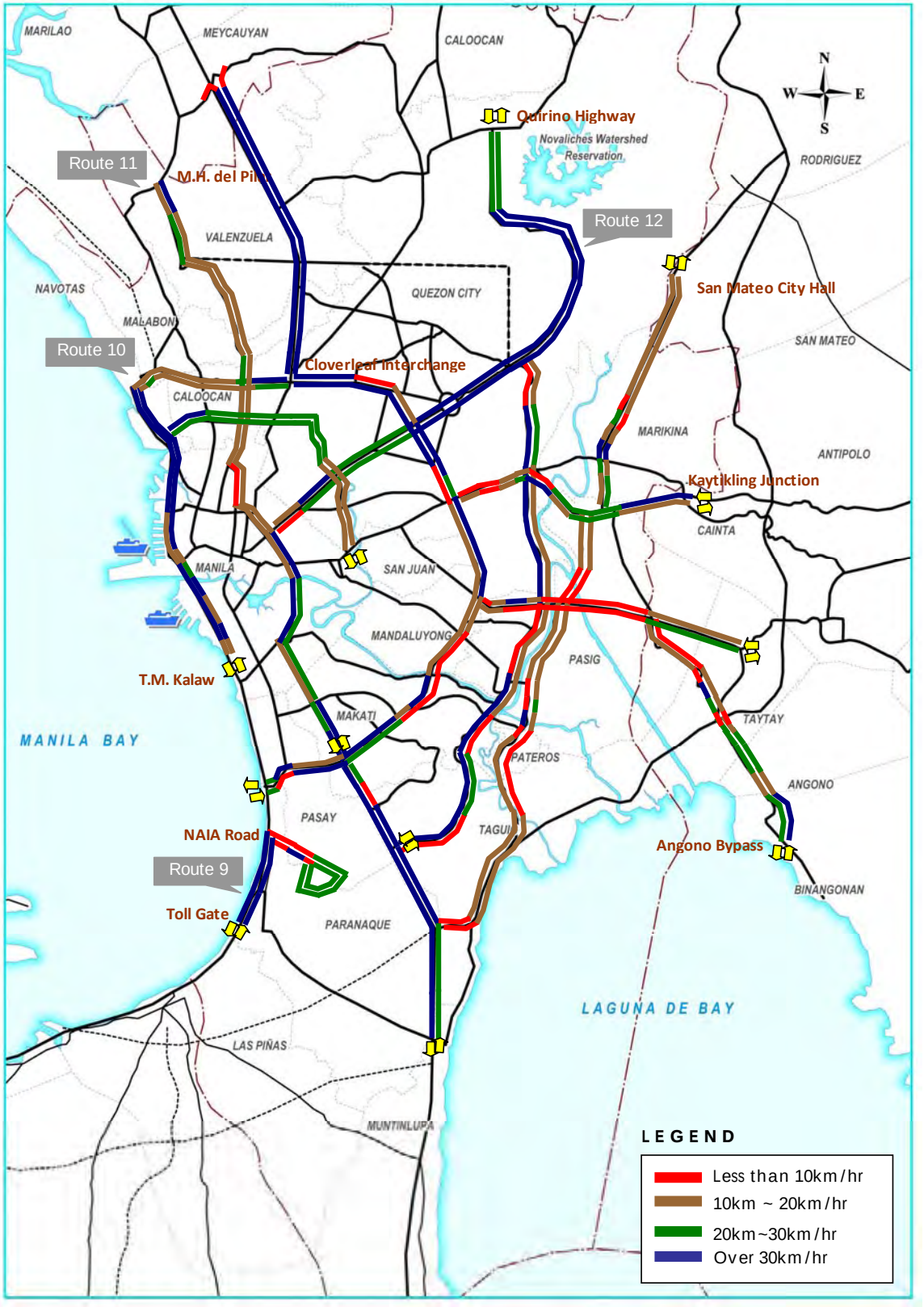


FIGURE 8.2.2-4 TRAVEL SPEED IN METRO MANILA

(b) Outside of Metro Manila

Traffic Volume

Traffic volume on the major roads in Central Luzon is presented in **Figure 8.2.2-5** and that in the southern part is shown in **Figure 8.2.2-6**. As expected, traffic stations positioned in a national road inside a city (e.g. Cabanatuan, Urdaneta, Tiaong, Candelaria) registered high traffic volume. Likewise, roads connecting major cities such Olangapo-Gapan road, Manila North Road (Tarlac – Capas Section) have also exhibit considerable traffic. Concerning the traffic volume at NLEX, sections closer to Metro Manila have high number of vehicle users while those sections located closer to the other end have little traffic. Most users of sections closer to the metropolis are believed to be residents of cities located just at the northern outskirt of Metro Manila that have their work inside the capital.

Hourly Variation of Traffic

The hourly variation of traffic is presented in **Figure 8.2.2-7** and **Figure 8.2.2-8** (Annex 8.3 for hourly variations of other traffic survey sites)**.** Unlike the figures recorded on Metro Manila's traffic where high vehicular movement continued all day long, traffic flow's characteristics outside the metropolis are rather different. These are:

- Traffic flow at the NLEX entering Metro Manila is higher than those in the opposite direction in the morning. This pattern is opposite however in the afternoon where significant volume of traffic is moving away from Metro Manila. The same traffic pattern is observed on the vehicle users of SLEX (see Hourly Variation of Traffic at NLEX and SLEX in Annex 8.3). As mentioned, traffic movement is caused by the commuters having their work in Metro Manila but residing outside of the metropolis.
- Almost there is no traffic fluctuation on the traffic flow inside the city which starts at 7AM and begins to shrink at 5PM (see Hourly Variation of Traffic Inside Urdaneta City and Cabanatuan City). This can be attributed to the mixing of local traffic to the through traffic.

Travel Time

The travel time of selected routes are depicted in **Figure 8.2.2-9** for Central Luzon and illustrated in **Figure 8.2.2-10** for South Luzon. General observation appears that serious traffic congestions are experienced while the national road is passing a city center. Congestion is also experienced when a road is about to merge with another important road. A closer look to **Figure 8.2.2-9** reveals the following:

- Route 1 – Severe congestions are experienced in Tarlac City and Urdaneta City. Traffic is also slowed down in the towns of Rosales, Vilassis, Binalonan and Rosario.
- Route 2 – Both directions of the road from the entrance of NLEX to the town of Baliuag are experiencing traffic congestion. Congestion is again felt when traveler is getting closer to the town of San Ildefonso.
- Route 3 – Roads approaching the towns of Sta. Rosa, Cabanatuan, Talavera, Sta. Domingo and San Jose are observed to be congested.
- Route 13 – There is a long stretch of the road where travel speed is between 20 km/hr to 30 km/hr. A travel speed of less than 20 km/hr is observed at the portion of San Jose Del Monte.
- Route 14 – Travel speed in this route is comparable good except to the approach section to NLEX and the section inside the Olongapo City. Road at the town of Dinalupian is also observed to produced a slower travel speed.

For the Figure 8.2.2-10, the following are observed:

- Route 4 – Slow movement of vehicles are observed in the sections passing Lucena, San Pablo and to lesser extent, in the towns of Tiaong and Alaminos.

- Route 5 – Section at Lipa City is the most congested with average speed of only 18 km/hr. Other sections where motorists encounter slow movement of vehicles are in Malvar, Tanuan and Sto. Tomas.

- Route 6 – This route is rather congested particularly in the sections of Carmona, Gen. Alvarez and the approach section to Aguinaldo Highway.

- Route 7 – The section between Terona Highway and Palico Daanan Road is very congested and had registered a travel speed of just 8.6 km/hr.

- Route 8 – Only section at the junction to General Trias registered a travel speed of less 20 km/hr.

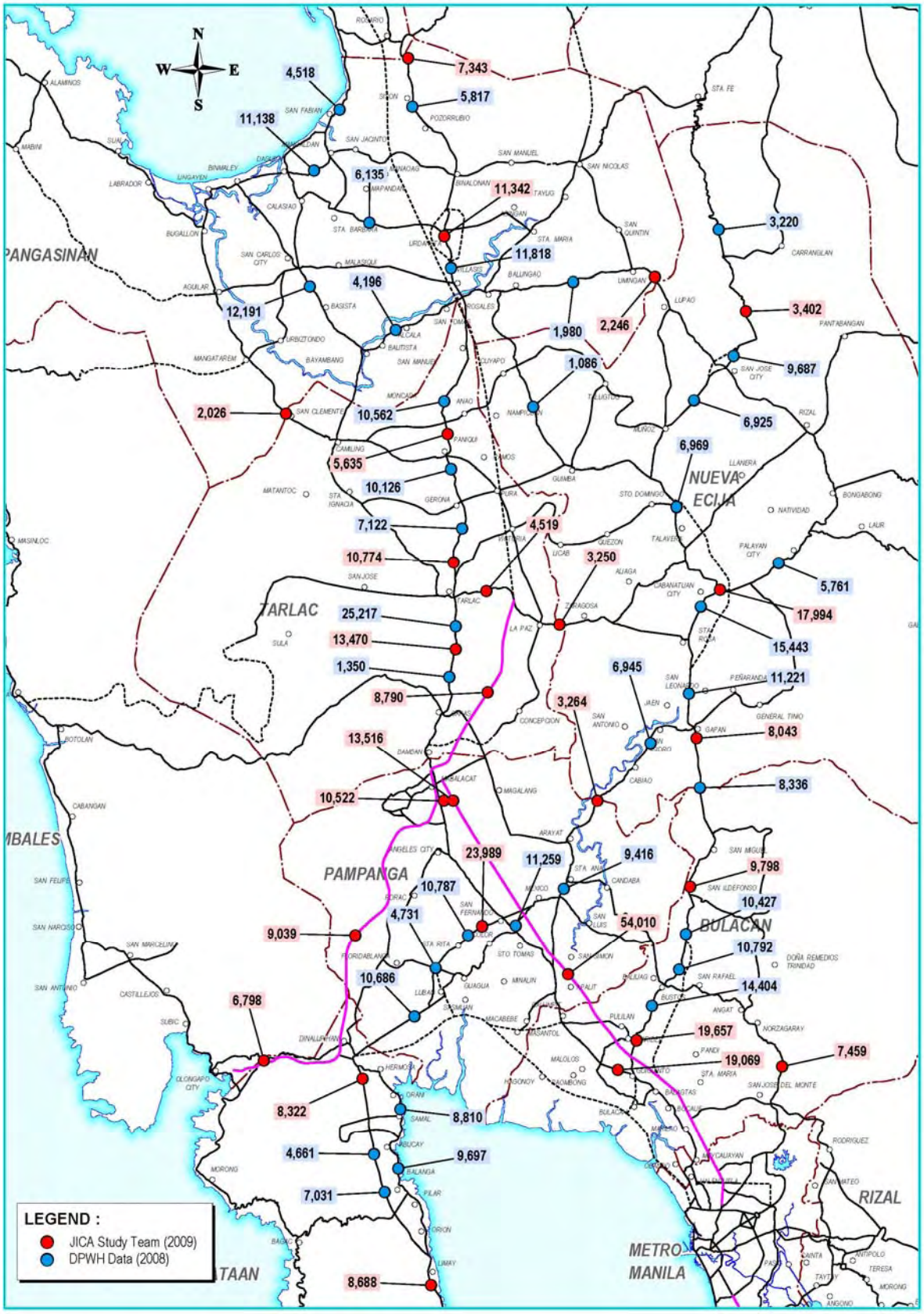


FIGURE 8.2.2-5 TRAFFIC VOLUME (NORTH OF MANILA)

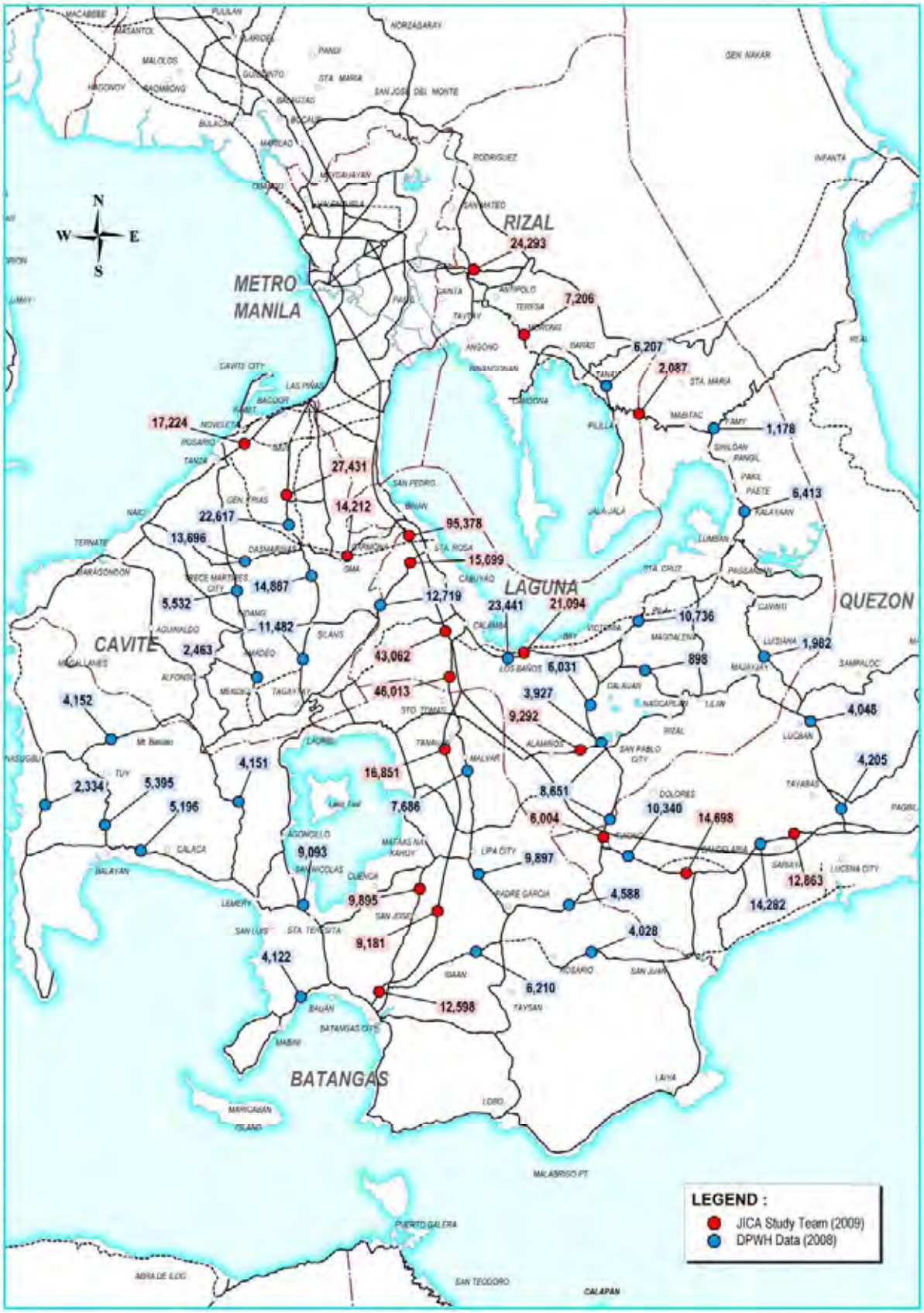


FIGURE 8.2.2-6 TRAFFIC VOLUME (SOUTH OF MANILA)

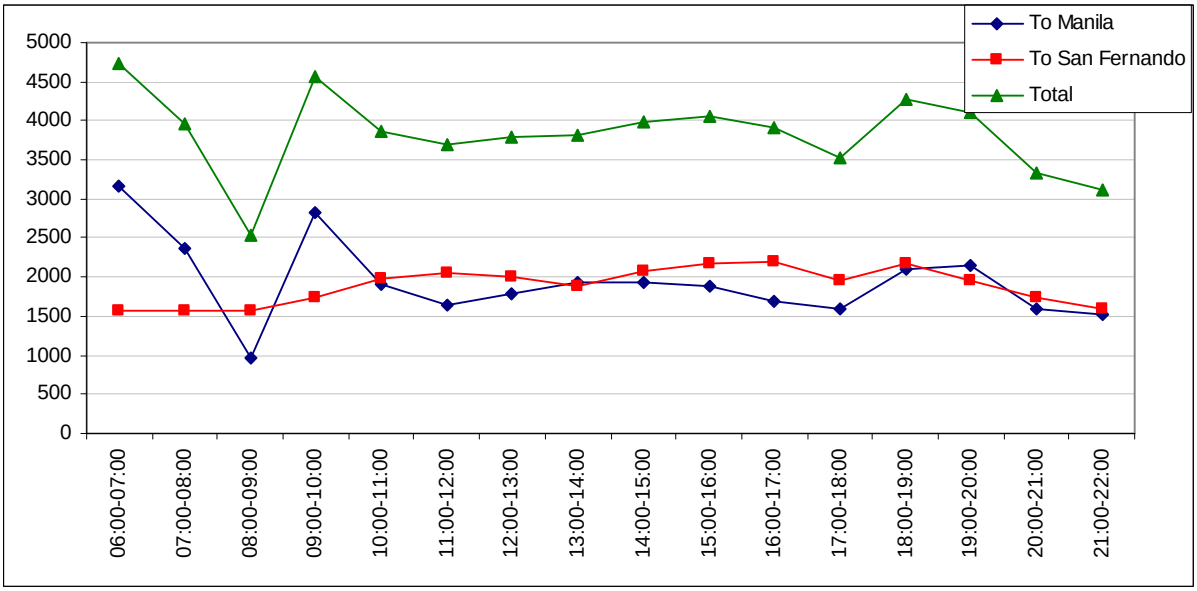


FIGURE 8.2.2-7 HOURLY VARIATION OF TRAFFIC AT NLEX (MEYCAUAYAN SECTION)

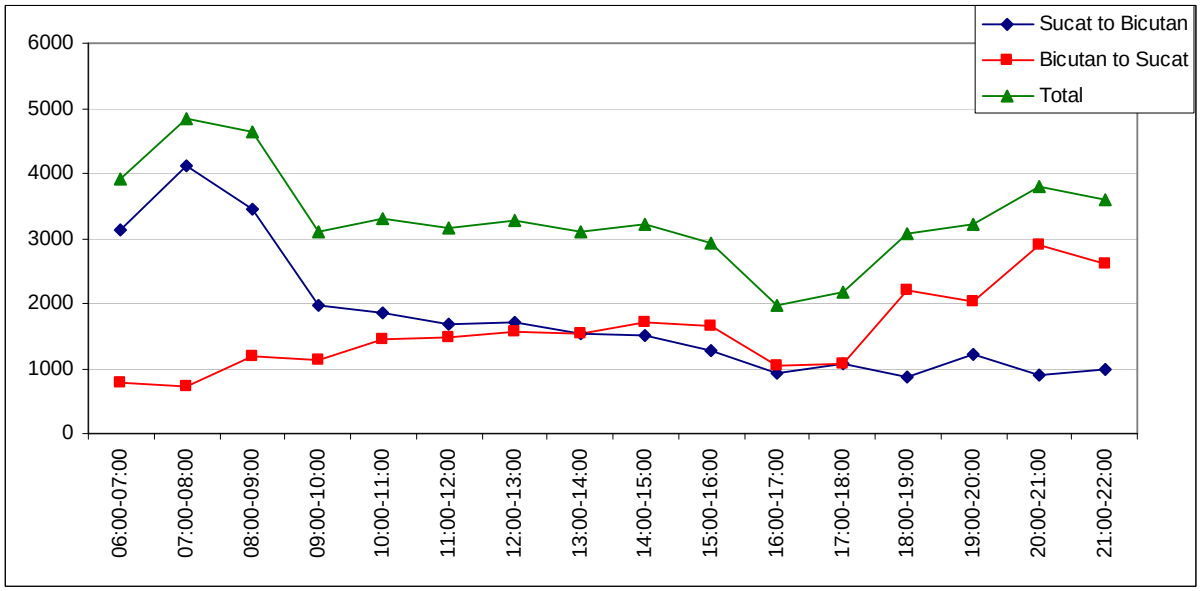


FIGURE 8.2.2-8 HOURLY VARIATION OF TRAFFIC AT SLEX (BICUTAN AND SUCAT SECTION)

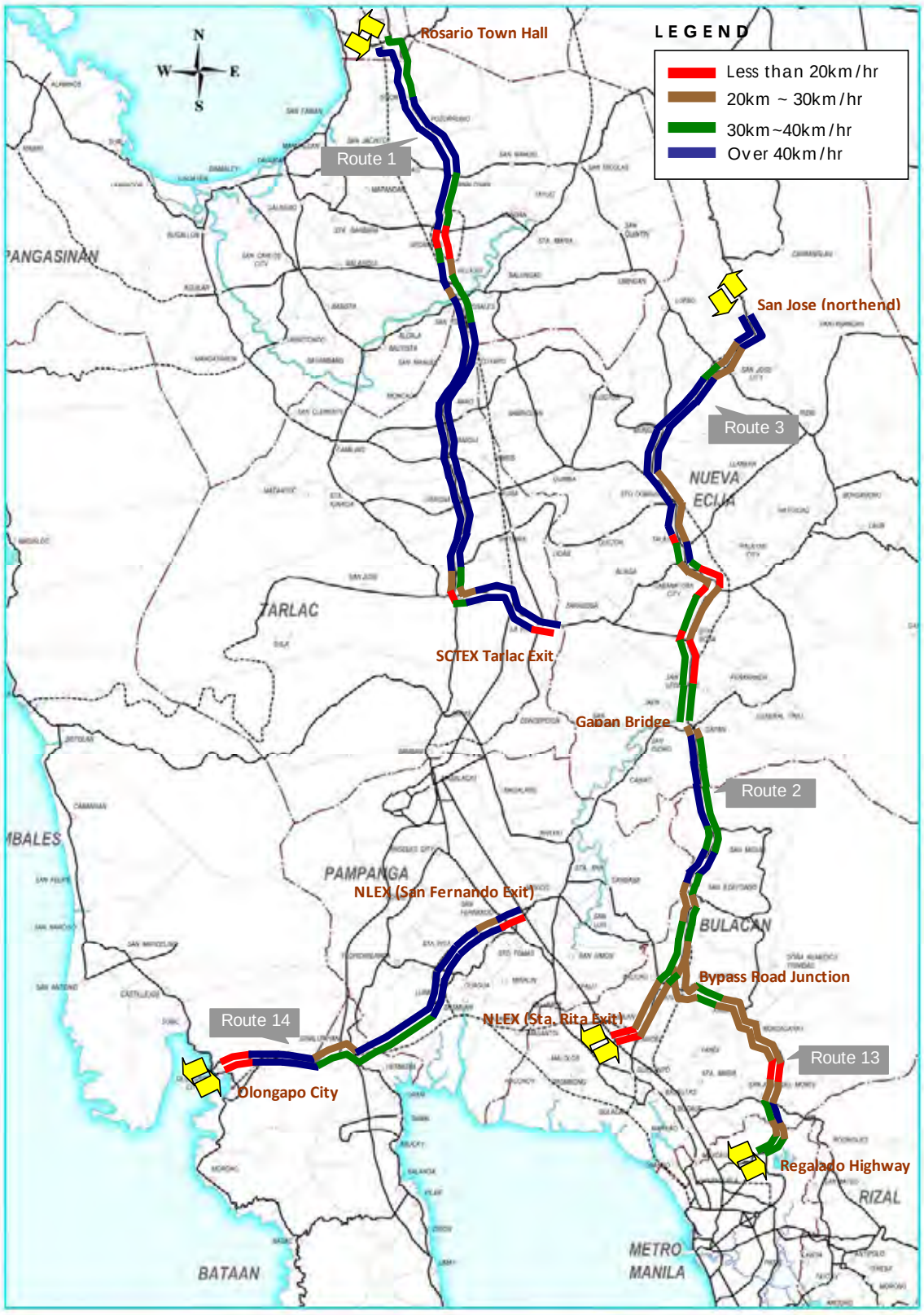


FIGURE 8.2.2-9 TRAVEL SPEED (NORTH OF MANILA)

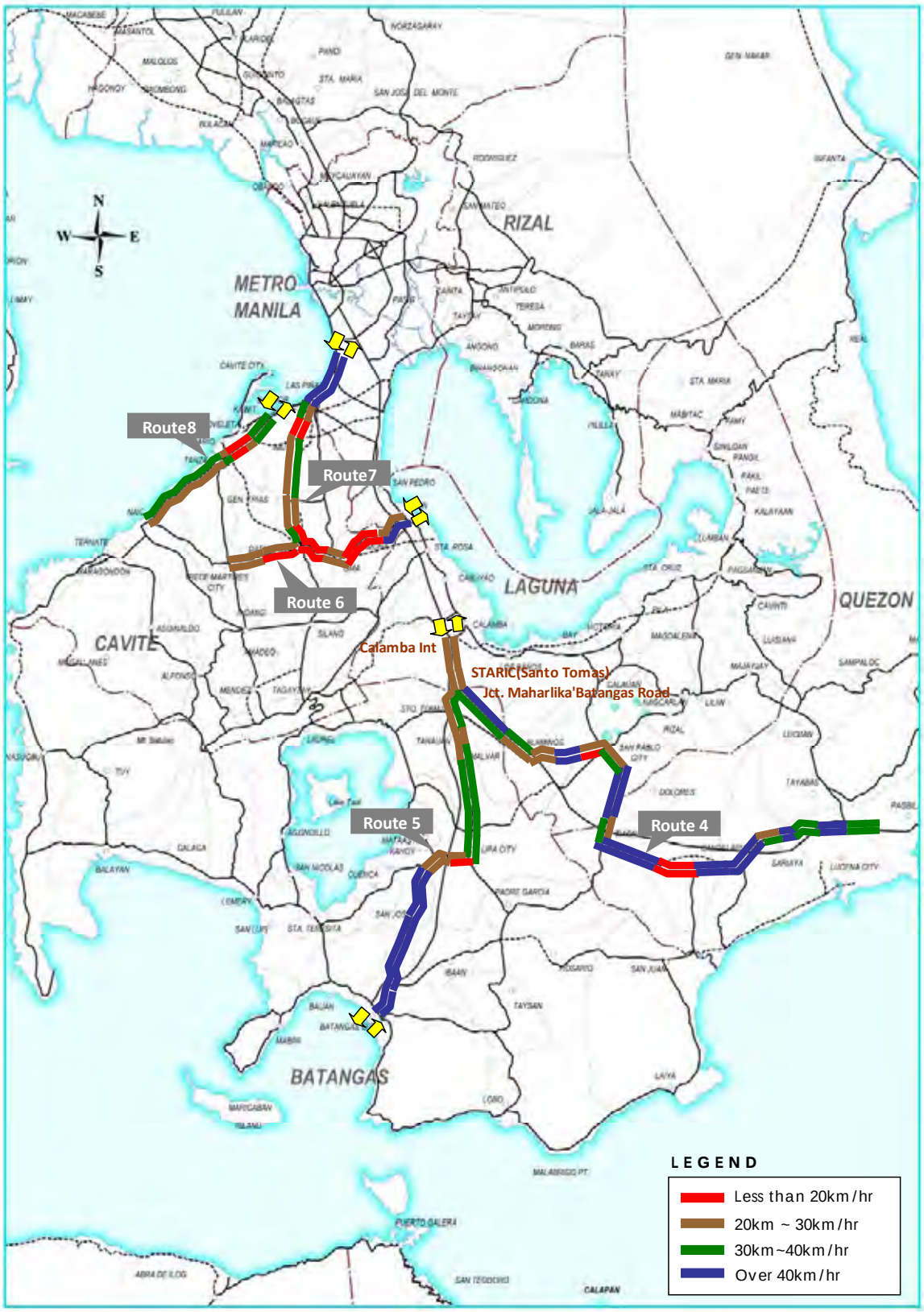


FIGURE 8.2.2-10 TRAVEL SPEED (SOUTH OF MANILA)

Vehicle Composition

The vehicle composition is shown in **Figure 8.2.2-12** and **Figure 8.2.2-13** (see Annex 8.4 for vehicle composition of other survey stations). It is observed that the vehicle volume and composition is quite different from those recorded at the "gate" of the urban center and those observed at the center of the city. For instance, the overall share of tricycle traffic is less than 20% at both sides of the city but increased to almost 60% after reaching the city center.

Volume of traffic drastically increases inside the city as local traffic dominates the road network. This creates serious traffic congestions which affect the flow of both local and through traffic. In some cases, a bypass which would separate through traffic from the local traffic is necessary. In the future, the realization of expressway plans which runs parallel to Manila North Road would take out substantial traffic that passes through the urban centers. Cities along the Pan Philippine Highway on the other hand like Cabanatuan City are in the process of constructing bypass road. Cabanatuan City bypass road that would shift some through traffic away from the urban center is currently being constructed.

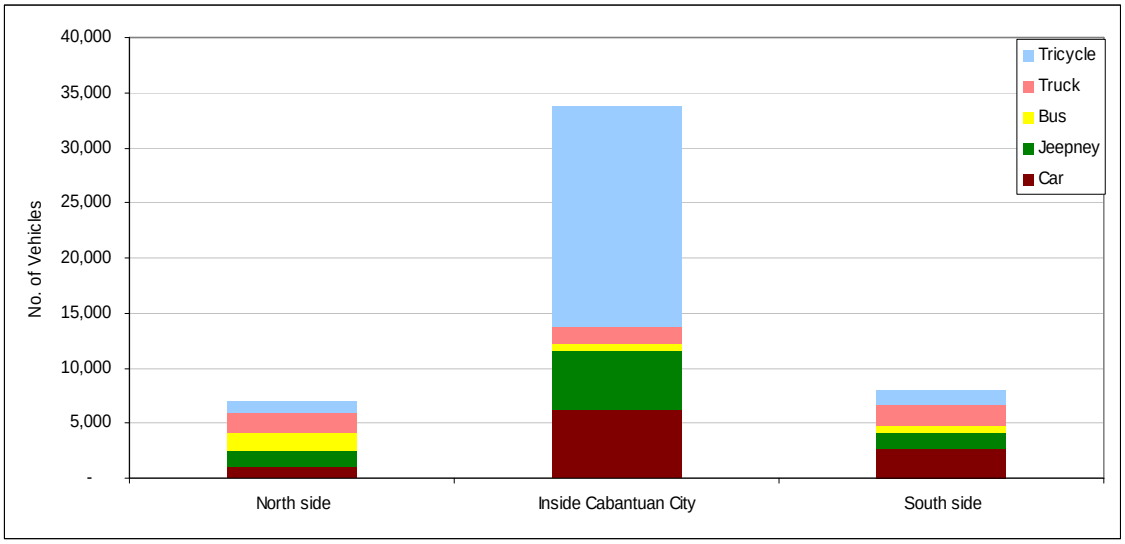


FIGURE 8.2.2-11 TRAFFIC COMPOSITION AT REGIONAL URBAN CENTERS: PAN PHILIPPINE HIGHWAY (CABANATUAN CITY)

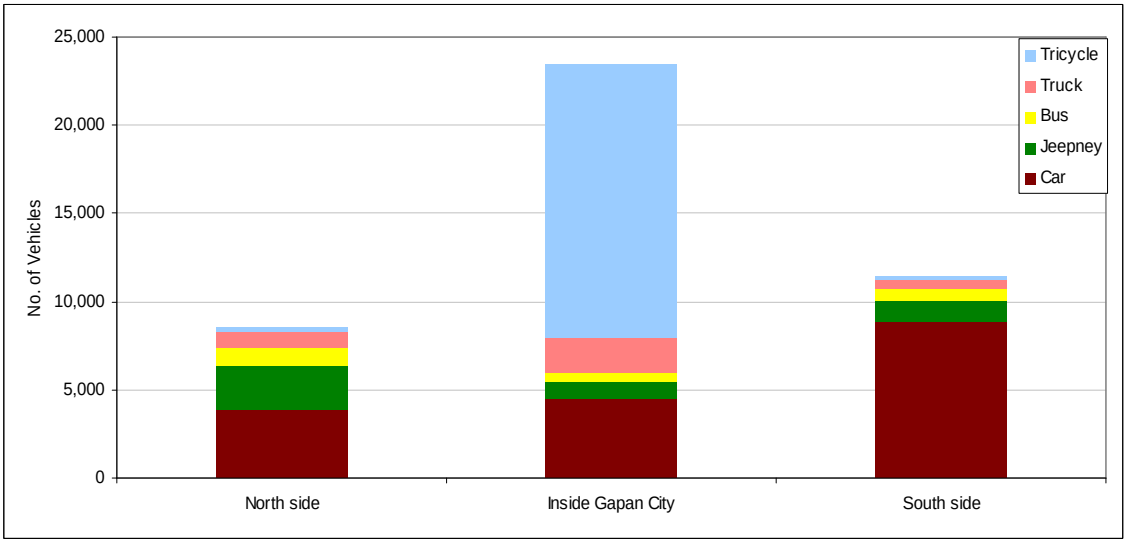


FIGURE 8.2.2-12 TRAFFIC COMPOSITION AT REGIONAL URBAN CENTERS: PAN PHILIPPINE HIGHWAY (GAPAN CITY)

8.2.3 Traffic Demand Management

The following traffic demand management is being implemented according to 2006 ATLAS prepared by the DPWH.

Yellow Box

- A yellow pavement marking which indicates that vehicles should not enter an intersection when the exit is not clear.
- This is intended to prevent the blocking of the intersection and spread of congestion to the crossing streets.

One-Way System

- This system has been adopted at many locations in major cities.

Bus Lane System

- This system was introduced along EDSA in 1990.
- Two outside lanes out of the total of five lanes were designated as bus lane.

Bus Stop Segregation Scheme

- The scheme was introduced in EDSA wherein buses are divided into two groups based on their destination.
- Buses are required to stop and load/unload passengers only at the designated bus stops.

Truck Ban

- This regulation was introduced to decongest the roads and prevent invasion of trucks into small streets.
- In 1994, a revised truck ban was adopted and new rules prohibit trucks along EDSA from 6:00 AM to 9:00 PM between Pasong Tamo and Balintawak and designate new truck ban hours (6:00 AM to 9:00 AM and 5:00 PM to 9:00 PM) for other trucks.(See **Figure 8.2.3-1**)
- This system has been affecting international competitiveness in industry and commercial sectors due to constraints of freight transport in the daytime.

Unified Vehicular Volume Reduction Program or Color Coding

- All motor vehicles, excluding large trucks, emergency vehicles and other exempt vehicles are banned from all Metro Manila roads from 7:00 AM to 7:00 PM one day per week based on the last digit of their license plate number as follows: 1 & 2 are banned on Monday, 3 & 4 on Tuesday, 5 & 6 on Wednesday, 7 & 8 on Thursday, 9 & 0 on Friday.
- No restriction was applied and any vehicles can be used on Saturdays, Sundays and public holidays.

Source: Prepared by the Study Team based on Truck Ban, Ordinance No. 5 Series of 1994, Metro Manila Council

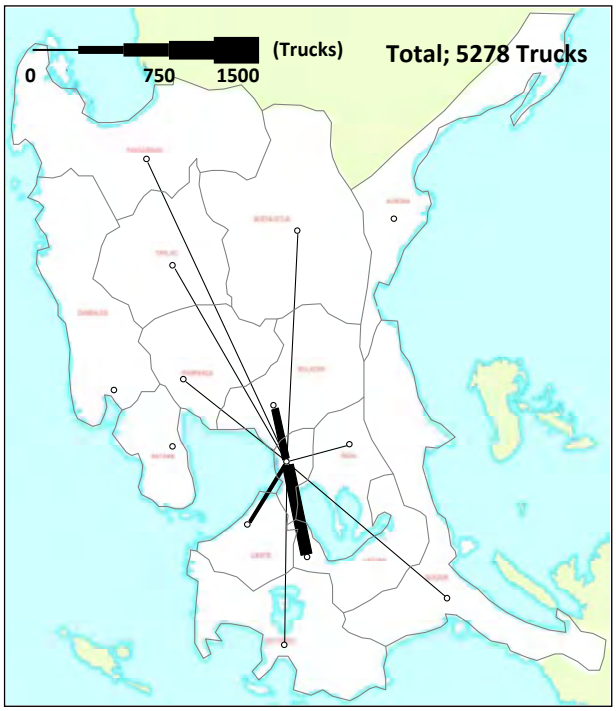
FIGURE 8.2.3-1 TRUCK BAN IN METRO MANILA ROADS

8.3 FREIGHT MOVEMENT AND LOGISTICS CORRIDORS

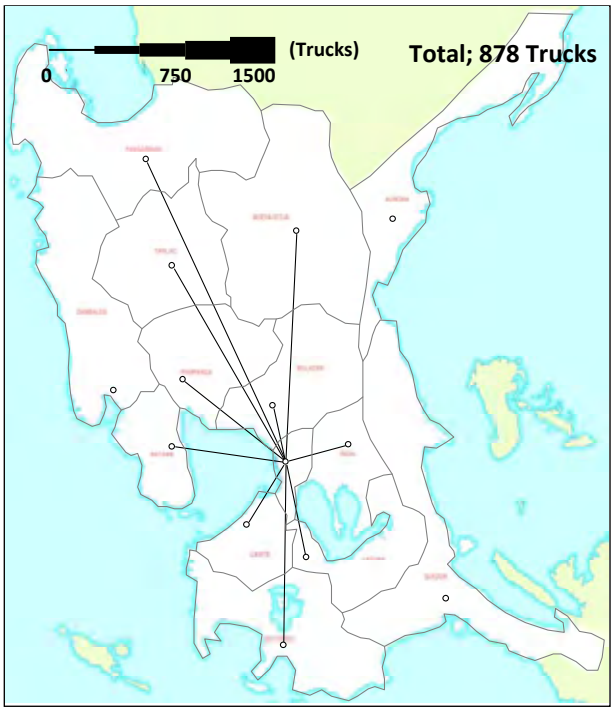
8.3.1 Port/Airport Related Freight Movement

The truck OD survey was undertaken at the international ports and airports. Based on the survey results, desire line maps were prepared as shown from **Figure 8.3.1-1** to **8.3.1-3** (see Annex 8.5 for desire line of ports/airports outside of Metro Manila).

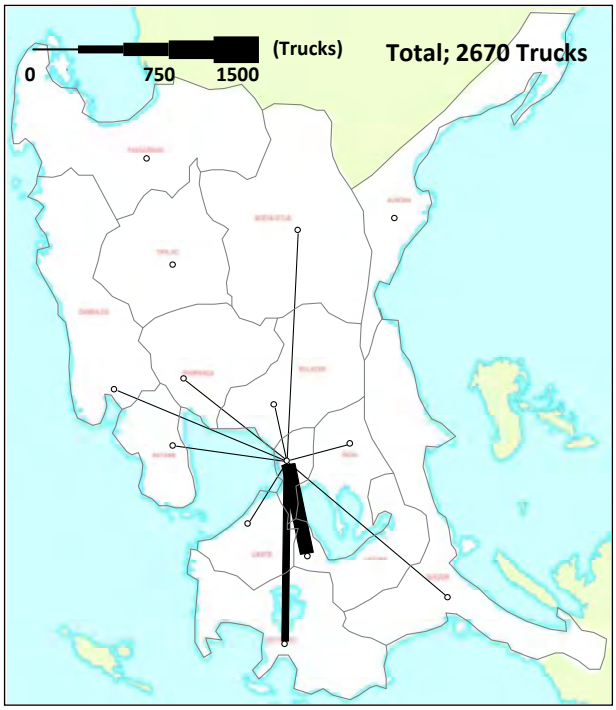
- Trucks to/from Metro Manila ports/airports have their origin/destination at neighboring provinces in the order of Laguna Province, Bulacan Province, Batangas Province and Cavite Province.
- Volume of trucks to/from Batangas Port is still not so significant.
- Subic Bay Free Port has wide service areas, though magnitude of truck volume is not that high yet.
- Diosdado Macapagal International Airport has also wide service areas, and majority of trucks have their OD at Tarlac Province.



Manila North Harbor



Manila South Harbor



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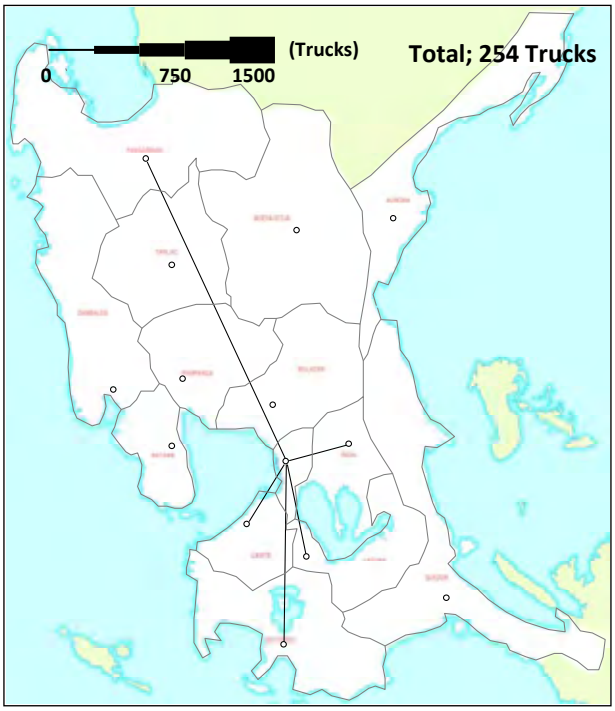

NAIA (PAL Cargo)

FIGURE 8.3.1-1 FREIGHT MOVEMENT RELATED TO METRO MANILA'S PORTS AND AIRPORTS

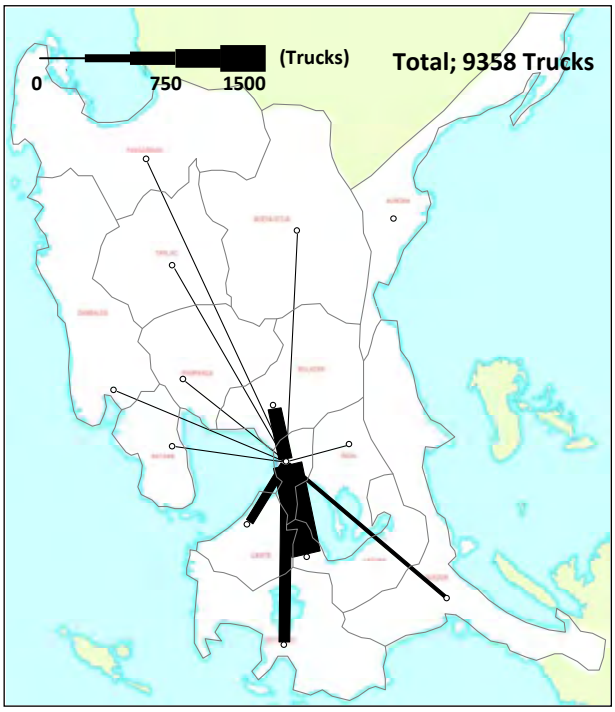

FIGURE 8.3.1-2 FREIGHT MOVEMENT (COMBINED ALL PORTS/AIRPORTS OF METRO MANILA)

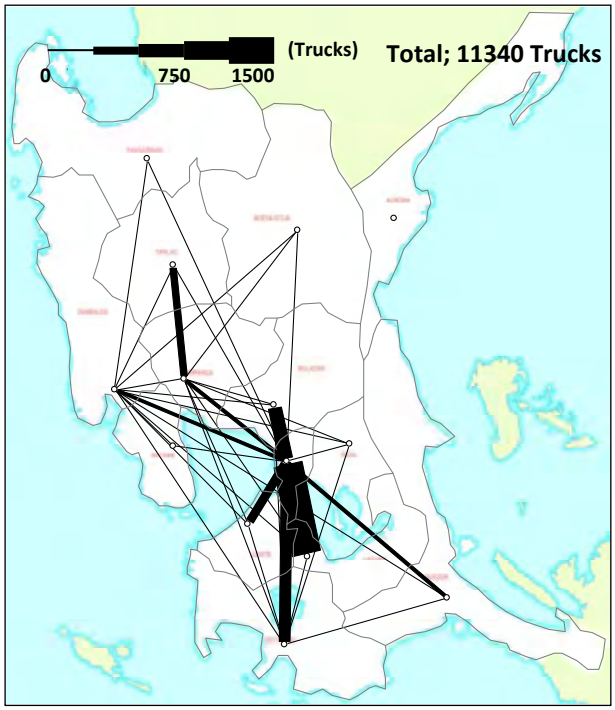

FIGURE 8.3.1-3 FREIGHT MOVEMENT (COMBINED ALL PORTS/AIRPORTS IN THE STUDY AREA)

8.3.2 Logistic Corridors of Economic-zones

An interview survey was carried-out on the 10 major Eco-zones, to identify their logistics routes for their product's inputs and outputs. Logistics routes of Eco-zones located in the south of Metro Manila are shown in **Figure 8.3.2-1**. Major inputs/outputs are from/to Manila Ports and NAIA Airport. The major logistics corridors are;

- South Luzon Expressway
- Manila-Cavite Coastal Expressway
- Southern Tagalog Arterial Road
- Aguinaldo Highway (Cavite)
- Governor's Drive (Cavite)

Logistics corridors beyond Metro Manila are;

- North Luzon Expressway
- Olongapo – San Fernando Road

Logistics routes of Eco-zones located in the north of Metro Manila are shown in **Figure 8.3.2-2**. The major logistics corridors are as follows;

- North Luzon Expressway
- Manila North Road
- Olongapo – San Fernando Road
- South Luzon Expressway
- Southern Tagalog Arterial Road
- Governor's Drive

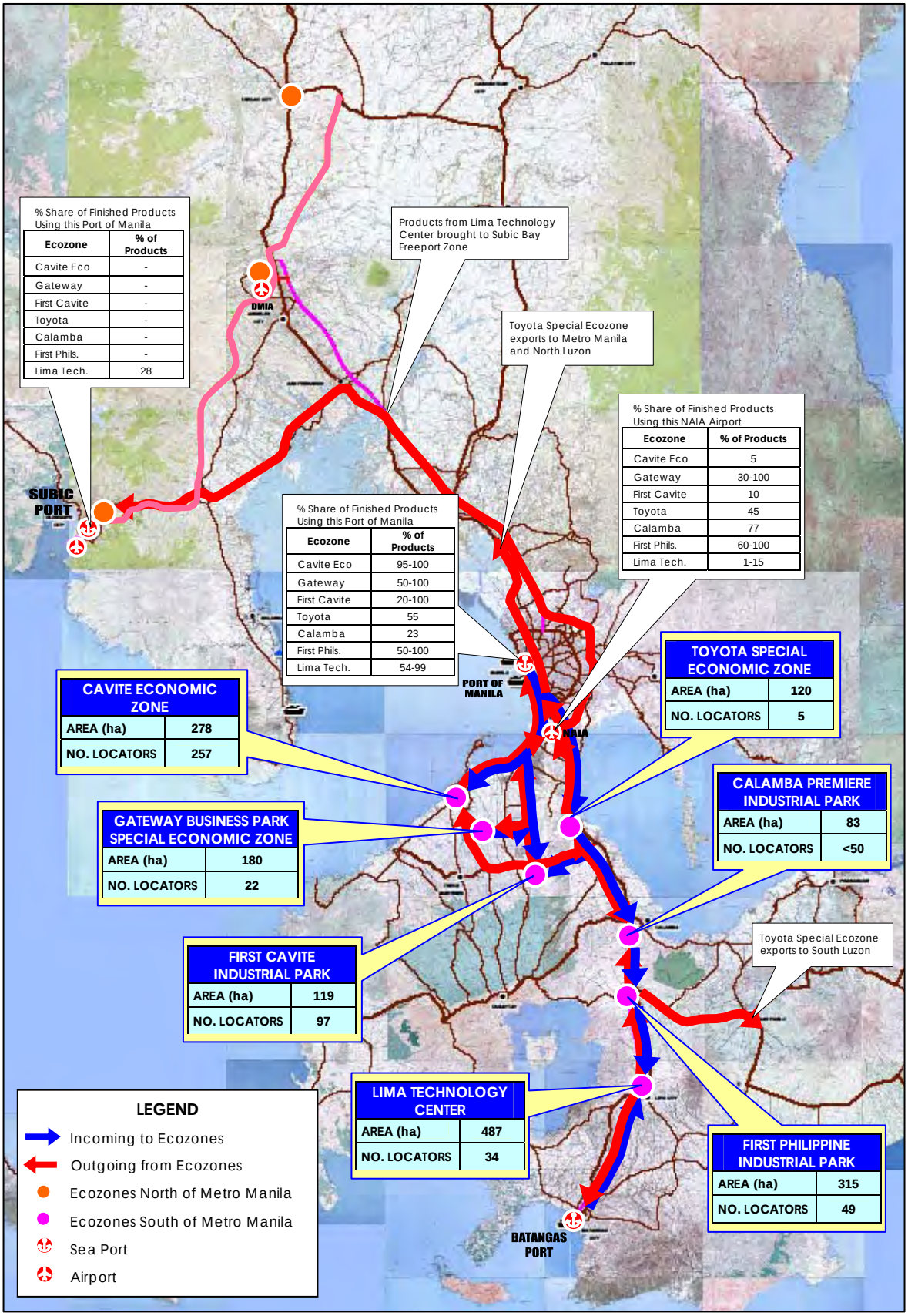

FIGURE 8.3.2-1 LOGISTICS ROUTES OF ECONOMIC ZONES (SOUTH OF METRO MANILA)

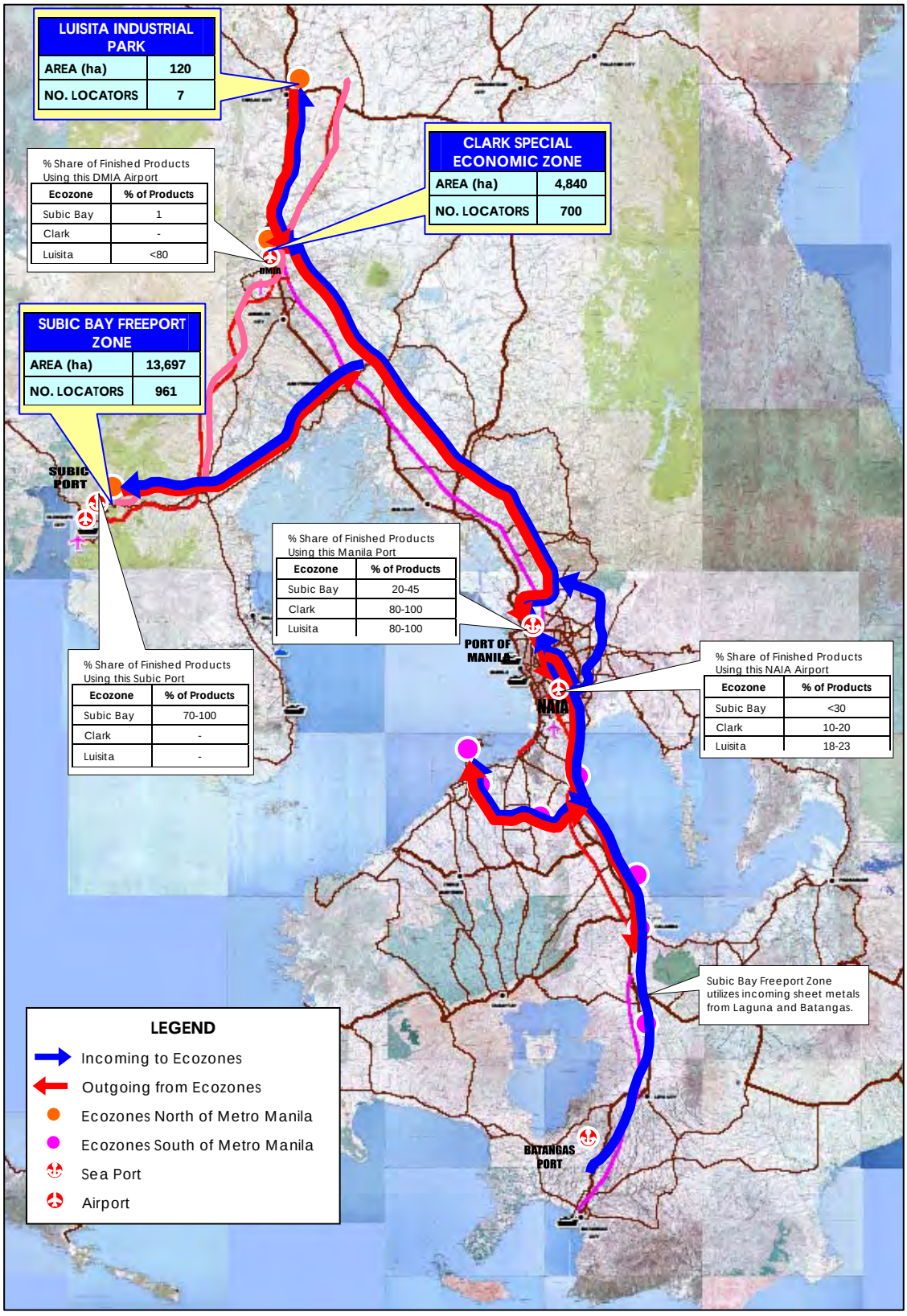

FIGURE 8.3.2-2 LOGISTICS ROUTES OF ECONOMIC ZONES (NORTH OF METRO MANILA)

8.3.3 Comments on Problems Made by Economic-zones Locators

The problems identified by interviewed eco-zones and manufacturing companies related to transportation are summarized below and corresponding solutions are shown in Figure 8.3.3-1.

- Poor Road Infrastructure - this includes insufficient road network and road traffic capacity, low load capacity of bridges, poor road condition/lack of road maintenance, etc.
- Lack of Traffic Management - this includes poor traffic rules/regulation enforcement, poor traffic management of congested areas, lack of facilities for traffic controls, etc.
- Lack of Road Safety Facilities - this includes lack of safety information and road safety signs and facilities, especially for accident-prone areas/safety black box, etc.
- High Transport and Hauling Costs - this includes high costs of fuels and truck maintenance, high toll fees at expressways, high shipping costs, etc.
- Few Options for Other Transport Modes - this includes less frequency of air and sea transport, high cost of shipping, delayed arrivals, etc.

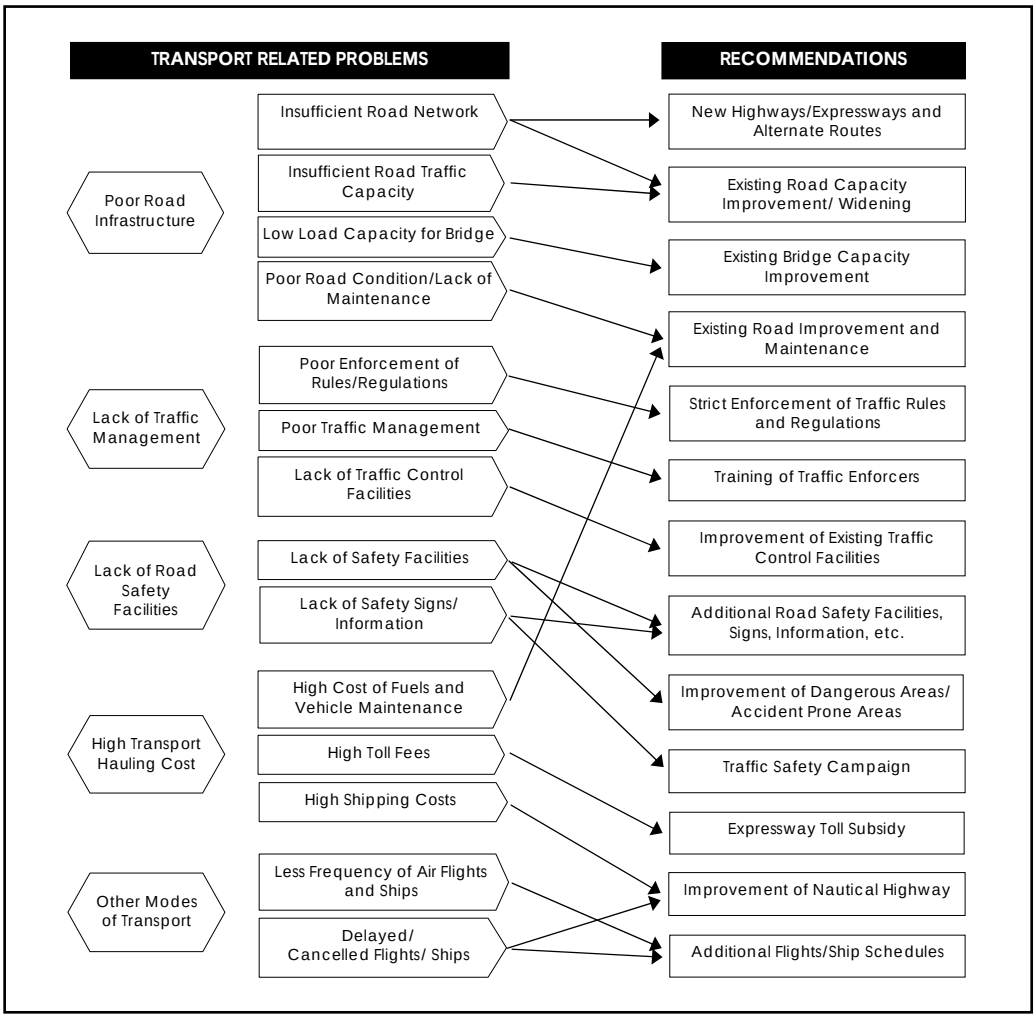

FIGURE 8.3.3-1 TRANSPORT RELATED PROBLEMS AND RECOMMENDATIONS

8.3.4 Japanese Affiliated Companies' Observation on Transportation

The Study Team interviewed some Japanese affiliated manufacturing companies and got their opinions on transportation.

Company-A: Locator at Lima Technology Center, Special Economic Zone, Lipa City, Batangas Province.

- The company uses Manila Port. It wishes to utilize Batangas Port, however, ship calls of container ship are rare, thus it cannot utilize Batangas Port, although it is located much nearer to Batangas Port.
- For transporting products to Manila Port, trucks must pass through heavily congested Metro Manila roads.
- Truck ban forces trucks to wait until 9:00 PM to access to Manila Port.
- When it located about 11 years ago, it was informed that Batangas Port could be utilized soon, however, it cannot still utilize Batangas Port.
- The company together with other manufacturing companies are requesting to make Batangas Port as the main container terminal port, however, there seems to be objections as follows;
  - Different opinions among domestic trucking/logistic companies, Manila Port workers, and other concerned agencies.
  - Manila Ports which have still capacity worry about loss of shipping opportunities.
  - Shipping companies wishes to limit to one port for their ship calls.

Company-B: Locator at Lima Technology Center, Special Economic Zone, Lipa City, Batangas Province.

- The company wishes to utilize Batangas Port, however, it uses Manila Ports. This is because containerized cargo volume is not enough for container ships to visit Batangas Port. One reason for this may be small volume of import at Batangas Port. Container ship will not visit a port with empty for one way.
- The company is located at about 40 minutes drive to Batangas Port. Travel time to Manila Ports takes an average of 4 hours. However, most trucking companies are located in Metro Manila, there is no big difference in transportation cost between Batangas Port and Manila Ports.

Manila Port : Metro Manila → company → Manila Port

Batangas Port : Metro Manila → company → Batangas Port → Metro Manila

- Road development in the Philippines takes too much time from the planning to completion.
- Japan's ODA is recommended to focus on the area along SLEX, since there are many Japanese affiliated companies along the corridor.
- If NLEX and SLEX is connected, the company will benefit in exploring material suppliers.
- If Batangas Port will be much utilized, it will contribute to reduce traffic congestion of Metro Manila to a certain extent.

Company-C: Locator at First Philippine Industrial Park, Sto. Tomas, Batangas Province.

- At the time of deciding where to locate, the company studied eco-zone at Clark International Airport, however, accessibility was not so good at that time.
- The company uses Manila Ports.
- Due to traffic congestion, it is quite difficult to estimate travel time. Truck ban is also affecting transportation schedule.
- To improve accessibility to NAIA is also necessary.
- It is welcomed to connect NLEX and SLEX which will widen the possibility of expanding sub-contractors.
- There is no reliable transporting company in Batangas Province. The company is relying on Manila-based transportation companies.

Company D: Locator at First Philippine Industrial Park, Sto. Tomas, Batangas Province.

- The company utilize NAIA for exporting. Due to heavy traffic congestion, sometimes it fails to deliver goods on time.
- Factory products are transported to a company in Baguio City, Benguet Province. A truck starts at about 4:00 PM and it reaches to Baguio in the next morning.
- The company in Baguio City is planning to move to Clark Economic Zone, therefore, this locator is hoping that NLEX and SLEX will be connected.