REPUBLIC OF THE PHILIPPINES
NATIONAL ECONOMIC DEVELOPMENT AUTHORITY (NEDA)

FOLLOW-UP SURVEY ON ROADMAP FOR TRANSPORT INFRASTRUCTURE DEVELOPMENT FOR GREATER CAPITAL REGION (GCR)

FINAL REPORT SUMMARY

August 2019

JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)

ALMEC Corporation

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ABBREVIATIONS

AC	alternative current
AGR	annual growth rate
AGT	automated guideway transit
ASEAN	Association of Southeast Asian Nations
AUV	Asian utility vehicle
BAU	business as usual
BGC	Bonifacio Global City
BRLC	Bulacan, Rizal, Laguna, and Cavite
BRT	buss rapid transit
CALA-X	Cavite–Laguna Expressway
CAVITEX	Manila–Cavite Expressway
CDP	Comprehensive Development Plan
CGC	Clark Green City
CLLEx	Central Luzon Link Expressway
CLUP	comprehensive land use plan
CO	carbon monoxide
D/D	detailed design
DOTC	Department of Transportation and Communication
DOTr	Department of Transportation
DPWH	Department of Public Works and Highways
EDSA	Epifanio de los Santos Avenue
F/S	feasibility study
GCR	Greater Capital Region
GHG	greenhouse gas
GIS	geographic information system
GMMA	Greater Metro Manila Area
GRDP	gross regional domestic product
GPS	global positioning system
HH	household
HOV	high-occupancy vehicle
HRT	heavy rail transit
HUDCC	Housing and Urban Development Coordinating Council
ICT	information and communication technology
ISF	informal settler family
ITS	intelligent transportation systems
kph	kilometer per hour
LGU	local government unit
LiDAR	light detection and ranging
LRT	light rail transit
LTFRB	Land Transportation Franchising and Regulatory Board
JICA	Japan International Cooperation Agency
MCX	Muntinlupa–Cavite Expressway
MGB	Mines and Geosciences Bureau
MICT	Manila International Container Terminal
MMDA	Metropolitan Manila Development Authority
MMSP	Mega Manila Subway Project
MNTC	Manila North Tollways Corporation
MPIC	Metro Pacific Investments Corporation
MRT	mass rail transit
MRTC	Metro Rail Transit Corporation
MTS	mass transit system
NAIA	Ninoy Aquino International Airport

NAIAX	NAIA Expressway
NEDA	National Economic and Development Authority
NFSCC	National Framework Strategy on Climate Change
NLEE	North Luzon East Expressway
NLEx	North Luzon Expressway
NOx	nitrogen oxide
NO_2	nitrogen dioxide
NSCB	National Statistical Coordinating Board
NSCR	North–South Commuter Railway
NSO	National Statistical Office
NSS	National Spatial Strategy
O3	ozone
O&M	operation and maintenance
Pb	lead
PCU	passenger car unit
PDP	Philippine Development Plan
PAGASA	Philippine Atmospheric Geophysical and Astronomical Services Administration
P2P	point-to-point
PH	Republic of the Philippines
PHP	Philippine peso
PHIVOLCS	Philippine Institute of Volcanology and Seismology
PIC	planned integrated community
PM	particulate matter
PNR	Philippine National Railways
PPP	public-private partnership
PSA	Philippine Statistics Authority
PUJ	public utility jeepney
PUV	public utility vehicle
QUEBEX	Quezon–Bicol Expressway
RFID	radio frequency identifier
ROW	right of way
SCTEX	Subic–Clark–Tarlac Expressway
SJDM	San Jose Del Monte
SLEx	South Luzon Expressway
SMME	Southeast Metro Manila Expressway
SO2	sulphur dioxide
STAR	Southern Tagalog Arterial Road
TEAM	Traffic Engineering and Management Team
TOD	Transit-oriented development
TPLEX	Tarlac–Pangasinan–La Union Expressway
TRIP	Three Year Rolling Investment Plan
UG	underground
USAID	United States Agency for International Development
UVVRP	Unified Vehicular Volume Reduction Program
V/C	volume/capacity
VOC	volatile organic compounds
WHO	World Health Organization
WVFS	West Valley Fault System

1 INTRODUCTION

1. The rapid (and unplanned) growth of the capital city has spawned multiple problems. The government has tried to address these several times – by initiating the preparation of master plans, often with assistance from ODAs.

2. In the 1970s, there was an ambitious plan for 10 radial railway lines under the “Urban Transport Strategy for Metro Manila Area”, followed by a more realistic “Metro Manila Urban Land Use and Transport Plan (METROPLAN)”.

3. In the last two decades, the most significant ones were: “Metro Manila Urban Transportation Integration Studies (MMUTIS)” in 1999, and the “Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas” in 2014. The latter has been dubbed the Dream Plan, because it dared to answer a question previously unasked: what would banish traffic congestion in the region and make it livable, sustainable, and resilient by year 2030?

4. This Study is a sequel and an update of the Dream Plan – albeit, with a longer time horizon to 2035 and the inclusion of adjustments emanating from the priorities and directions launched by a new administration.

5. The efforts took into consideration several pre-existing plans, such as: The Philippine Development Plan 2017-2022, the Central Luzon Regional Development Plan 2017- 2022, the CALABARZON Development Plan 2017-2022, Metro Manila Green Print 2030, the provincial physical framework plan of Bulacan, the MCA Preliminary Master Development Plan, comprehensive land use plans of LGUs in the study area, and many other insights from various stakeholders.

6. Although its official title is “Follow Up Survey on Roadmap for Transport Infrastructure Development for Greater Capital Region”, its scope and contents can best be capsulized as

“A Transportation Roadmap to Year 2035 for Mega Manila.”

2 ASPIRATIONS

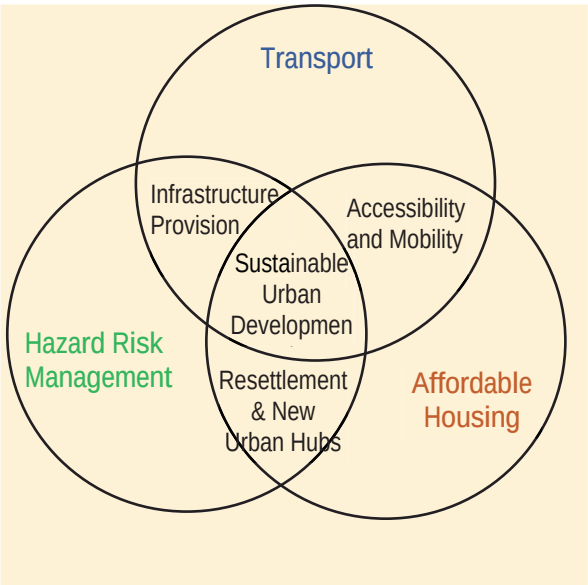
7. The prosaic objectives of the Study is to update the transport development strategies and policies, and the corresponding 20-year package of infrastructure projects. It is an update (and a sequel) to a previous Roadmap conducted by JICA in 2013, that has been dubbed – fondly - as a “Dream Plan.”

8. In many ways, it is a “Dream” that embodied the collective aspirations of the residents of the most urbanized region of the Philippines for a livable city – free from chronic traffic jams, free from the health hazards of air and noise pollution, able to move seamlessly from one place to another undeterred by high costs and travel time, and a community freed from the slums dotting non-habitable places.

9. It is no different from the goals of sustainable mobility and accessibility, that animate cities of the developed World - ehere sustainability is viewed in three dimensions: social, environmental, and economic. Efficient and inclusive urban access and mobility is at the core of sustainable urban development, poverty reduction and growth.

10. For the public sector, the purpose of this Study is to formulate a common game plan (a Unified Agenda) for the many agencies of government involved in urban transportation. A previous version of the Plan was adopted by the NEDA Board in September 2014 to avert heavy congestion in Mega Manila by 2030 and improve mobility, connectivity and quality of life.

11. It is also an articulation of the long term goals of "Ambisyon Natin 2040" in the priority sectors of Connectivity and Urban Development, and is aligned on the medium-term with the Philippine Development Plan 2017-2022.



Source: JICA Study Team

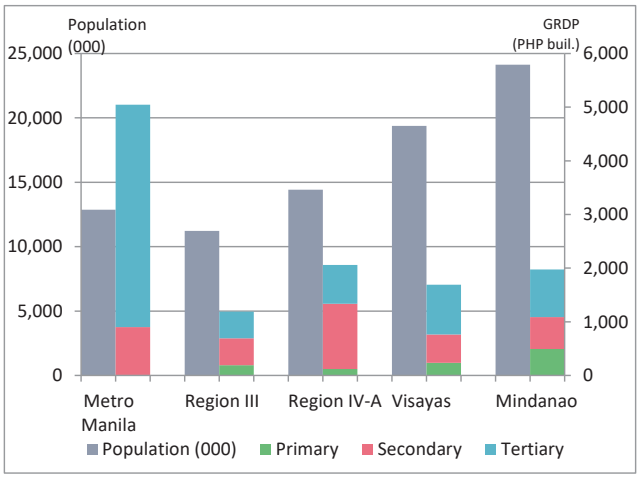
Figure 2.1 Study Approach

3 CURRENT AND FUTURE CONDITIONS

1) Scale of Conurbation

12. By global standards, Metro Manila ranks 7th among the largest cities of the World. This scale comes with complex (often, intractable) problems – especially for a developing country. With a 2015 population of 12.9 billion, on 620 km2 of land, it has density higher than Tokyo and Seoul.

13. As the national capital region, Metro Manila has been the focus of past master planning studies. Non-implementations over the years, however, have led to the severe inadequacies of infrastructure.



Source: JICA Study Team based on NSO 2015 and NSCB 2015.
1/ n.a. = no available data

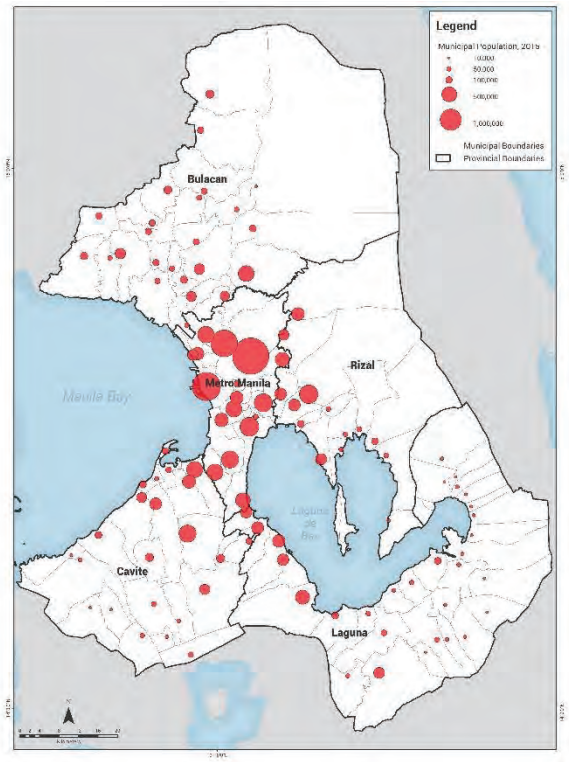
Figure 3.1 Profile of the Study Area

14. Aside from population, its economic size dwarfs that of other regions. Its continuing vitality is therefore of national significance.

15. For more than 3 decades, the efforts to dial down the growth of the capital via a growth pole strategy (higher and rapid growths in other regions of the Philippines) combined with decentralization policy have not reversed the trend. From 31% share of GDP in 1990, Metro Manila's share of the economic pie rose to 41% in 2015. Thus, earning for the region the moniker "imperial Manila".

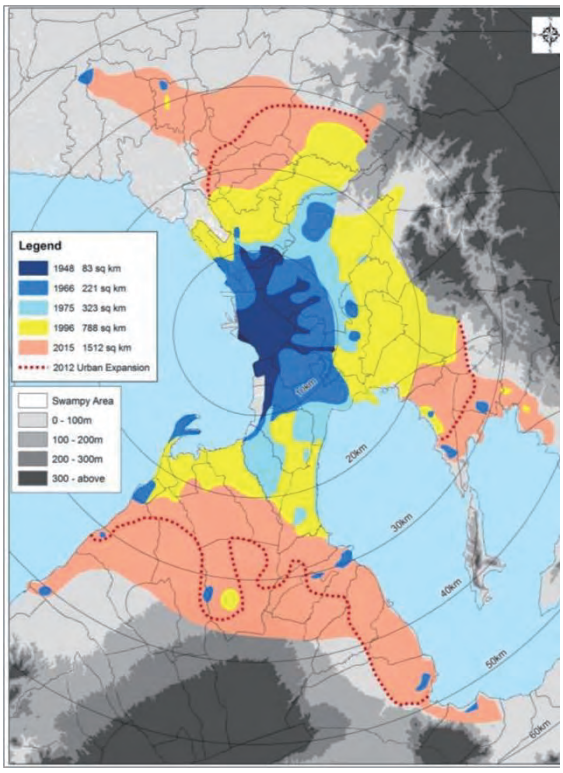
16. As a consequence, urbanization has spilled over – in an uncontrolled fashion - to the neighboring provinces of Bulacan, Rizal, Laguna, and Cavite – embracing an area of 20,289 km2 and a population of 25.8 million.

17. Unavoidably, the locus of planning has gone beyond Metro Manila, to Mega Manila, and to a larger area that includes Central Luzon and Calabarzon. This expanded Tri-Region planning space is 39,508 km2 (nearly 64 times the area of NCR); with a population of 38.5 million (38% of the Philippines).



Source: JICA Study Team

Figure 3.2 Population Distribution in 2015

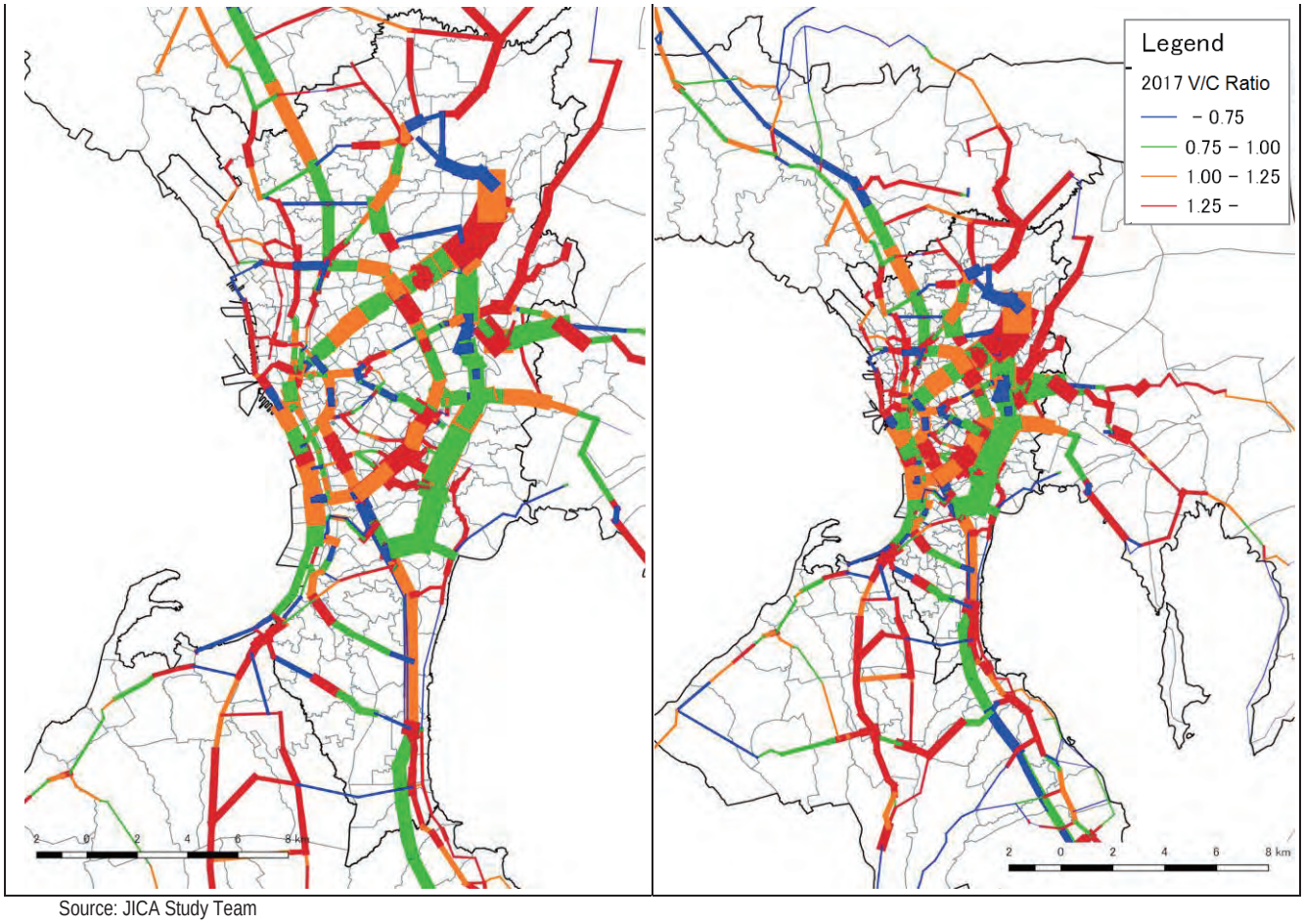


Source: JICA Study Team

Figure 3.3 Urban Expansion

2) Current Challenges

18. Failure to implement plans over three decades have spawned severe traffic congestion, heavy air and water pollution, lack of affordable housing and swaths of blighted zones. These problems are compounded by the region's vulnerability to natural hazards (flooding, landslides, and earthquakes).



Source: JICA Study Team

Figure 3.4 Traffic Volume on the Existing Road Network—Based on Traffic Model

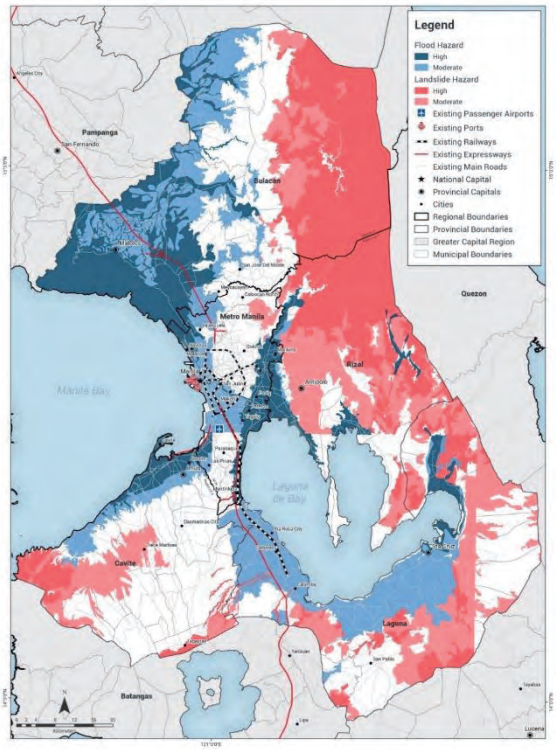
19. **Traffic congestion** is severe. The estimated transport cost in 2017 is PHP3.5 billion a day in Metro Manila and PHP2.4 billion a day in the adjacent areas of BRLC. Nearly all roads have reached saturation point – leaving little wiggle room for traffic management to ease the situation.

20. **Air pollution** has been at unhealthy levels for more than two decades. The PM levels exceeded WHO guidelines more than three-fold, more than two-fold in the case of NO_2. Latest studies on ultrafine soot particles (black carbon) showed concentration 10 times higher than in cities of developed countries. The December 2017 statement of the President that Manila will be a dead city in 25 years may not be far off the mark. Transport is the main culprit; and the jeepney the worst among vehicular classes.

21. The water pollution situation is exemplified by the sad state of Manila Bay, a hazard to swimming.

22. The vulnerability of the region to disasters can be seen from available geo-hazard maps.

Flood and Landslide Hazards



Fault Line and Trenches

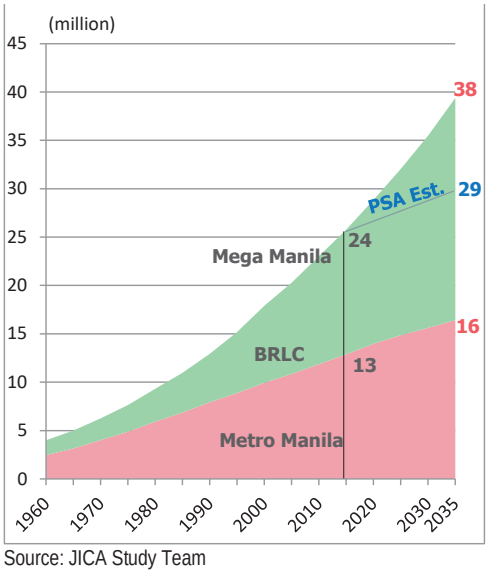
Source: MGB, GMMA-READY Project

Figure 3.5 Three Geospatial Risks for Greater Capital Region

3) Outlook on the Road to 2035

23. The current problems of the Greater Capital Region are already daunting. Their severities will be more acute and pronounced 20 years from now, unless some remedial and corrective actions are done.

24. Population is projected to grow from 12.9 million in 2015 to 16.4 million in 2035 for Metro Manila. Over the same span of 20 years, the neighboring areas in BRLC would balloon from 10.7 million to 21.9 million. Instead of dealing with a conurbation of 16 million, the government will be faced with the problems of 38 million, in an expanded urban area more than 6 times. This is based on historical trend. Official estimates placed the 2035 population at 29 million (instead of 38 million).



Source: JICA Study Team

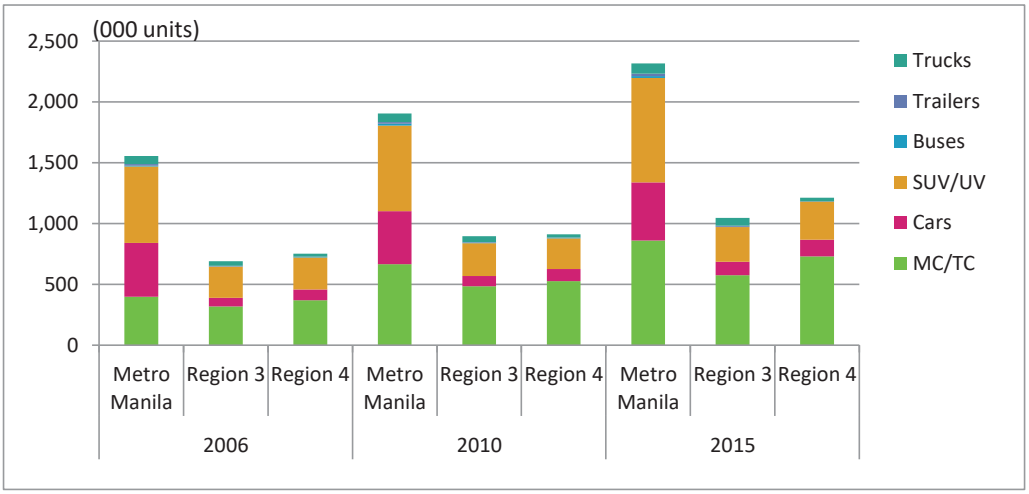
Figure 3.6 Growing Urban Areas

25. The number of motor vehicles has been cited, unwittingly as the cause, of traffic congestion. From 2006 to 2015, the vehicle population in the three regions expanded by 1.5 times. At that rate, it would be 2.25 times by 2035. At 5% growth per year, it would be nearly 3 times the current number. Traffic gridlocks – which are happening now in some sections of NCR – would spread to many parts of Mega Manila. It is not farfetched to say that socio-economic growths will choke to death.

26. Estimated demand will increase by 125% – from 18.4 million trips/day to 22.9 million trips/day by 2035.

27. In 2017, transport cost is esimated PHP3.5 billion/day in Metro Manila (PHP2.4 billion in the adjoining areas of BRLC), these would increase to PHP5.4 billion/day and PHP5.9 billion, respectively, by 2035 – if nothing is done.

28. Business-as-usual is no longer an option.



Source: PSA

Figure 3.7 No. of Registred Vehicles in Metro Manila, Region 3 and Region 4

4 DEVELOPMENT DIRECTIONS

29. How to address the current challenges and move forward to a better (and sustainable) future? There is no silver bullet, no easy nor instant solution.

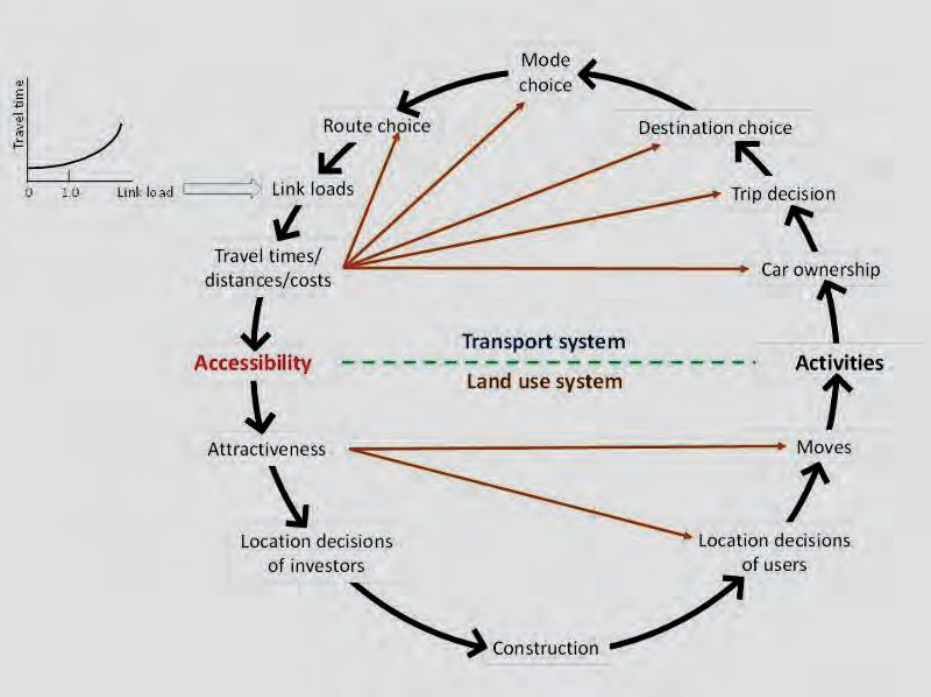
30. It used to be that “predict-and-provide” in transport infrastructure was good enough. Those were the features of yesterday’s master plans: anticipate demand and build the infrastructure supply predicated on motorized mobility. It was not sustainable.

31. Accessibility to various services can be realized without reliance on motorized transport; and conversely, services can be moved to where the demand is. In transport, that means managing and re-shaping the demand for and supply of, mobility that ultimately results in an inclusive transport.

32. Converting the “Dream” of a sustainable Mega Manila into reality by 2035 entails five building blocks. The first one is on the arrangement of land uses in physical space.

1) Spatial Reconfiguration

33. The most basic block is a comprehensive (and coordinated) approach that integrates transportation and land use. Demand for transport is a function of land use, and vice versa. This is illustrated in Figure 4.1



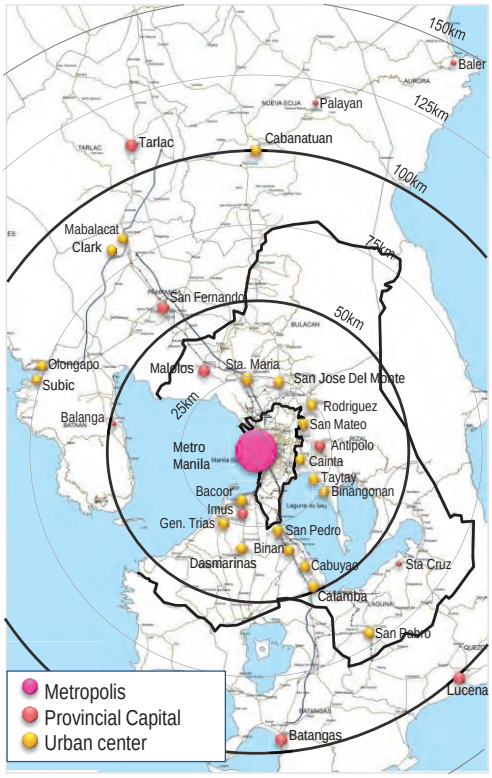
Source: JICA Study Team

Figure 4.1 Land Use and Transport Integration

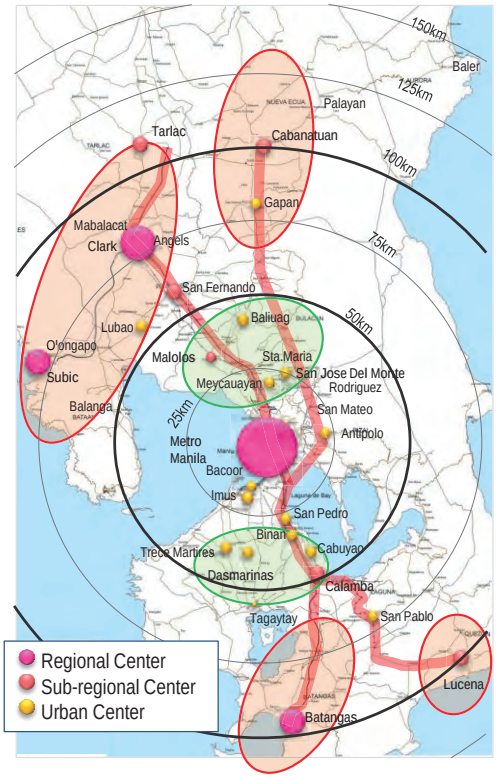
34. Re-shaping the metropolitan land scape (where people live and work) and investing in the right kind of infrastructure to re-enforce that spatial development is the key. When cities were small villages, the travel time from home to work is short, because home was also the place to work. As cities grew and expanded, moving from one place to another took longer, farther, and complicated. The central idea is to recapture that old feature – through compact development (and conversely less sprawl), new townships that has as many amenities and necessities needed for urban living within walking distance, transit-oriented development.

35. The urban land developments must also avoid the hazardous areas, aside from relocating households currently at risk to flooding, landslides, and earthquakes. The competition for land should also minimize adverse impacts on productive agricultural areas via sound land use policies that do not depend on strong institutions to enforce or achieve.

Current Spatial Structure (Monocentric)



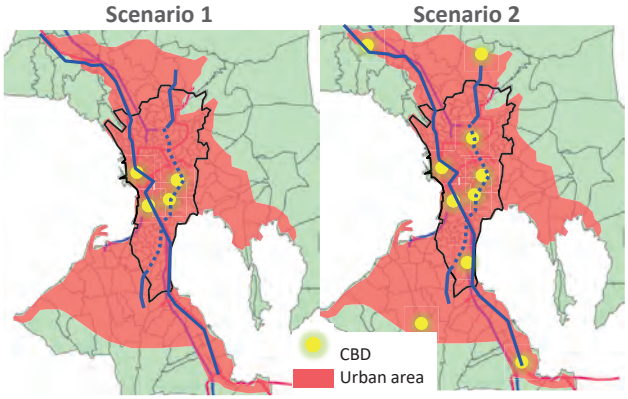
Proposed Future Spatial Structure (Polycentric)

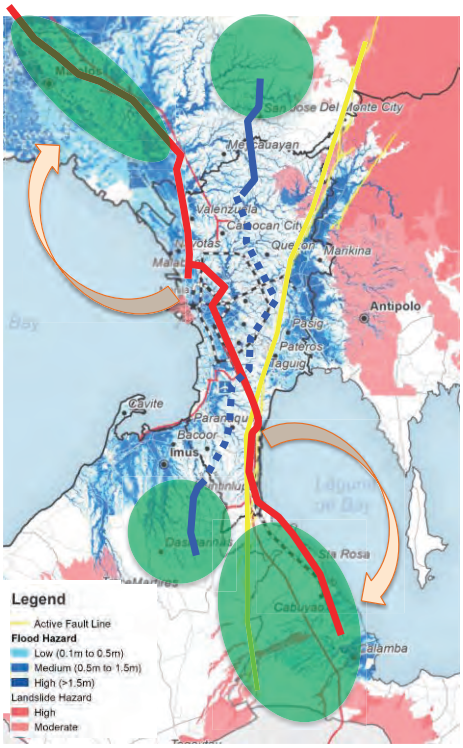


Source: JICA Study Team

Figure 4.2 Proposed Spatial Structure

- **Scenario 1:** relocate people in high hazard areas to areas outside Metro Manila along NSCR and Mega Manila Subway. (approximately 1.4 mil. people)
- **Scenario 2:** Scenario 1 + develop the job opportunities outside Metro Manila along NSCR and Mega Manila Subway.





Source: JICA Study Team

Figure 4.3 Land Use Reform of Metro Manila

2) Investment in Infrastructure

36. The most important lever of governments in re-shaping the built-up areas is transportation infrastructure - the provision of mass transit systems, expressways, urban road networks, and the ancillary facilities and services.

37. For Mega Manila, a strong north-south transport backbone will nudge the old urban form; from a radial-and-ring road pattern centered on Manila to a ladder form with multiple centers from Central Luzon to Calabarzon.

38. The strategic transport infrastructure for this desirable spatial configuration are:

- Expressways: NLEX and SLEX, Laguna Lake Expressway, C-5 Expressway
- Mass Transit: PNR North and South Commuter, and the Mega Manila Subway

39. Another determinant is the gateway airports and seaports. Mega Manila has outgrown the existing MNL International Airport and the Port of Manila. They are vital to the continued economic development of the region, but their capacities are now constraining growth. The strategy is to shift more of the expanding traffic to other locations - to Clark in the case of air traffic, to Ports of Batangas and Subic in the case of sea traffic. The locations, capacities, and efficiencies of these facilities will influence the investment decisions of future industries, and the corresponding load on the surface transport system.

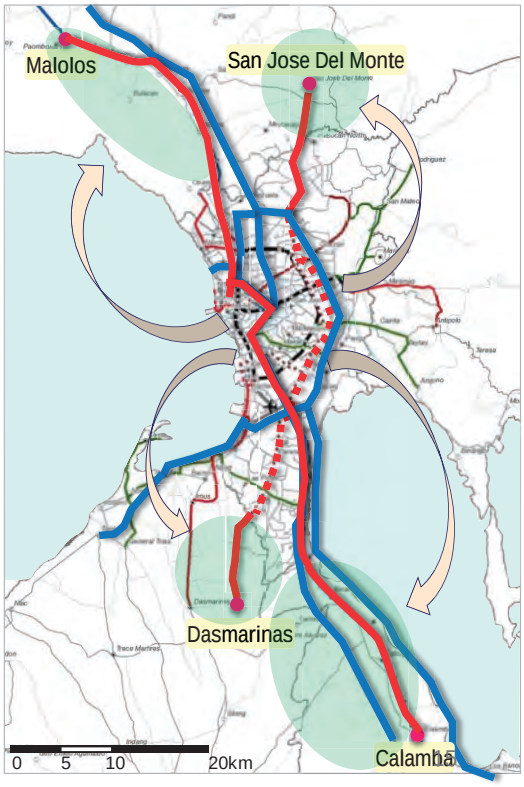
40. To catch up for lost time, due to low investments in the past two decades, the government has to accelerate the implementation of key transport infrastructure projects already on the drawing board.

3) New Townships and TOD

41. From 2015 to 2035, Mega Manila has to provide for an additional 15 million people. It is akin to building 15 Makati cities in 20 years! And in terms of land, that would be equivalent to 35 Makati-sized cities (i.e., if all were on the old-style single dwelling).

42. While a large part of that growths will be in the form of in-filling and accretion to existing build-up areas, the better course is the creation of new townships, compact development units, and transit-oriented developments (TOD). In this way, the average trip lengths of commuting will be shorter, a stable volume of demand for mass transit is established, and less land area is used.

43. An integrated approach to re-settlement from hazardous areas, railway development, and TOD (Scenario 2 in Box 1) reduces daily person trips per day by 600 thousand.



Source: JICA Study Team

Figure 4.4 Transform Urban Structure by NSCR and MMSP

44. The regional connectivity implicit in the strategic infrastructure will be incomplete without the “last-mile”, which is accessibility of the existing CBDs and new townships. They

need finer-grained planning - by LGUs (like in Japan) and private sector developers (more prevalent in the Philippines).

45. Because LGUs are reluctant (or rarely have the competence and incentive), the emergence of planned townships and TOD have to rely on the private sector. To a limited extent, this is already occurring. With the collaboration of the LGUs, more and better results can be realized.

46. Thus, a strategy that leverages private and public resources rest on fertile ground – especially in the development of TOD.

4) Infrastructure of Another Kind

47. Undoubtedly, Mega Manila needs more transport infrastructure – like roads and mass transit system. They are the conventional connectivity solution. A new form of connectivity, virtual in nature, is changing the nature of transport and work.

48. Thus, another pillar of the development framework is a transportation technology strategy. The rapid developments in digital innovations has opened a new frontier in unlocking urban mobility - promising relief sooner rather than later. Smart solutions in the form of embedded intelligence on roads and on vehicles, smart traffic signals, and technology-mediated public transport systems have started to emerge in many leading cities of the World. The coming of the 4th Industrial Revolution is changing the nature of work; whilst its sibling in the transport sector (Intelligent Transportation System) promises higher throughput from existing hard assets.

49. Moreover, building the physical connectivity assets – from a low base like Mega Manila has - will take time. This is compounded by public institutions with poor capacity to implement. Resort to digital technologies offers a faster pathway.

5) Re-thinking Institutional Arrangements

50. The existing arrangement will be ineffectual in addressing the challenges of the largest urban clusters in the country, which also ranks one of the largest mega cities of the world.

51. MMDA is limited to the geographic area of the 17 LGUs, aside from falling short of expectations. Enlarging MMDA’s scope and functions is also not advisable, as it would run against political orthodoxies.

52. A new regional authority, limited to transportation, has the best chance if designed and created with the following considerations:

- Able to coordinate (and exact cooperation from) national (DPWH and DOTr) agencies, several LGUs, and private sector entities;
- Able to recruit, nurture, train, and retain human capital in a manner relatively free from the vagaries of political winds;
- Capture the competitive strengths and resources of the private sector, particularly in operations and maintenance of infrastructure as a service;
- Able to go beyond passive regulation and be pro-active in creating an efficient (and Smart) public transportation system that is multi-modal and largely private sector-owned and managed
- Promote a digital ecosystem for an intelligent transport system
- Track progress in terms of network performance measures

- Accelerate execution of infrastructure projects, by anticipating and resolving bottlenecks.

5 ROADS

1) Traffic Management

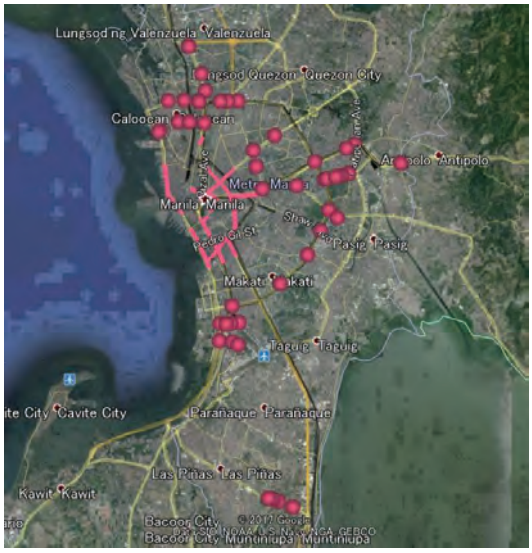
53. Because of their low cost and high benefits, traffic management is often recommended as the first line of attack against congestion. An exercise made in the Study showed that if the capacities of existing road increased by 10% (no physical expansion, only traffic management), this can generate as much as PHP1.0 billion a day in reduction of congestion cost.

54. Traffic management measures include: (i) intersection and signal improvements, (ii) removal of bottlenecks on arterials, and (iii) traffic signal and intersection improvements (e.g., signal timing optimization, controller/cabinet and signal head upgrades, vehicle detectors repair/replacement, communication with a central system, turning lanes, pavement striping, lane assignment changes, signage and lighting).

55. The conventional objective function of traffic management is to narrow the gap between the design capacity of the road and the volume of vehicles through traditional tools of coordinated traffic signals, geometric improvements, and traffic enforcement. In Metro Manila, the MMDA has pursued traffic management with particular emphasis on traffic enforcement, and very little else on other aspects of a comprehensive traffic management solution. That the government is still enthralled by the old objective can be gleaned from its attempts to widen the 16-year old UVVRP.

56. What is called for is a shift to the 'new' objective function of mobility: maximizing people throughput, i.e., more persons moved per lane of road. This implies a focus on getting a higher number of commuters per vehicle on the road, which is not synonymous with vehicle reduction.

57. Enforcement is the first tool of choice when it comes to correcting widespread mis-use of valuable road space, such as Illegal parking on busy streets, on-street car repairs, vending on streets and sidewalks.



Source: JICA Study Team prepared based on the information from MMDA

Figure 5.1 Bottlenecks in Metro Manila

58. Easing bottlenecks or chokepoints on the network should be the next target. Despite signalization, 70 intersections and seven road sections in Metro Manila are classified as bottlenecks (Figure 5.1). Of the 70 intersections, 60 are signalized, indicating the need for grade separation to boost road capacities.

59. **Proposed Roadmap:** A conceptual roadmap for traffic management development in the GCR is illustrated in Table 5.1. Actual sequencing of specific technologies will require a detailed feasibility study and the formulation of a long-term master plan for an intelligent transport system.

60. An immediate and short-term project is to expand the existing traffic signaling system (>400 intersections to be synchronized) and upgrade it to adaptive control which allows local and global optimization. This can be considered as TEAM V project, where TEAM 1 was the initial project implemented in the mid-1970s. The promotion of ride-sharing and car-pooling schemes offers the quickest way to achieving higher people throughput per vehicle.

61. The direction is to graduate to an Intelligent Transport System. The vision is a smart metropolis where vehicles, roads, traffic lights, message signs, etc. become intelligent. Phasing is not intended to be discrete, but continuous; early measures serve as foundation or building blocks to the next with the appreciation that the roll-out of technology packages would have dynamic timelines, since some may easily get off the ground, while others may get stalled.

62. For a short-term action, it is intended by MMDA with a technical assistance of JICA to implement a comprehensive traffic management project for Metro Manila (the project commenced March 2019) with following objectives; (i) to formulate five-year plan which will be updated on yearly, (ii) to promote coordination with transport departments, especially DPWH and DOTr, and (iii) to enhance traffic management capacities of MMDA and Metro Manila LGUs. The project is carried out over three years involving the wider range of stakeholders.

Table 5.1 Roadmap to Intelligent Transport System

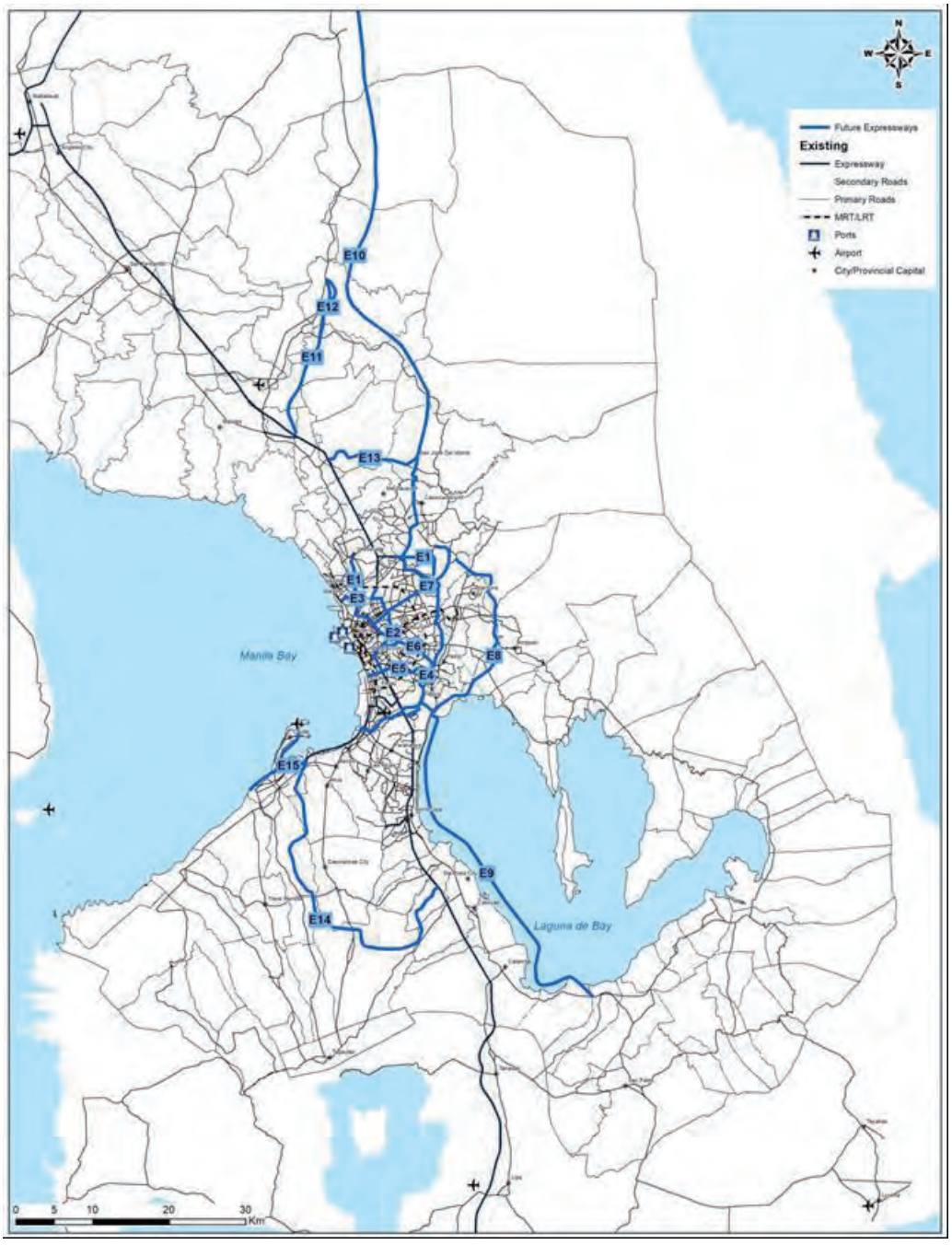
	Phase 1	Phase 2	
	2018-2022	2023-2029	2030 upward
Objective of traffic management	• More Vehicle/lane/hour & priority to HOVs, particularly buses	• People Throughput (more persons moved per hour per lane of road) in major roads	• Urban mobility (short travel time from origins to destinations) in entire network
Digital Technology	• Smart Traffic Control System	• Intelligent Traffic Control	• Intelligent Transport System
Traffic management Scope	• Management of traffic flow, using historical data & pre-set response; • Manual traffic enforcement; • Fleet management system for bus and jeepney operators	• Management of traffic flow using current data & dynamic response; • Automatic traffic enforcement; • Automatic signal priority to bus transit & HOVs	• Management of traffic flow using real-time data & dynamic response with prediction; • Public transport dispatching guided by real-time passenger demand;
On road sensors	• Inductive loop detection that counts number of vehicles during a unit time	• Multiple detection devices including Bluetooth, audio and video, RFIDs for vehicles	• Data fusion from multiple sensors; LiDAR technology detects moving & static objects, as well as discriminate
Motorists	• Passive recipient of traffic status; no interaction with traffic control system	• Navigation through the road network is recommended; • Interaction between in-vehicle and roadside devices	• Motorists become active participant in optimizing mobility; dynamic traffic light sequence; active priority to emergency and special vehicles; collision avoidance system

Source: JICA Study Team

2) Expressways

63. Urban expressway separates long-haul trips from local trips, thus decongesting at-grade road traffic. With expressways, longer distances is no longer synonymous with longer travelling hours.

64. There are those who feel that roads should not be built, to avoid more cars – ignoring the fact that very little has been built in the last two decades in Mega Manila, and the network is far from complete (still at a low degree of connectivity) compounded by ambiguous road hierarchy.



Source: JICA Study Team

Figure 5.2 Expressway Network in Mega Manila

65. The proposed expressway network shown in Figure 5.2. It consists of 78-km of urban expressways and 426-km of intercity expressways. When fully built, the flow of goods and people is expected to be more resilient, its vulnerability to disruption lessened. Unlike railways, expressways tend to recover its full cost as to attract private investments.

66. The expansion of the urban expressway network has been sluggish in the last two decades. If the same pace transpires in 15 years, only about 20% of the GCR expressway will get built by 2035. Clearly, there is a need to accelerate execution.

67. Setting up a practical set of priorities is the starting point. Shovel-ready projects, i.e., those with highest degree of project preparation, should be accorded highest priority. Opportunistic, in the sense of getting things done. The priority projects (which are already under implementation) are:

- Skyway 3 and NLEX-SLEX Connector Road – its greatest impact is on the decongestion on R-1 and EDSA
- Lakeshore Dike Expressway and C-5 – impact is greatest on BRLC (37% improvement in the V-C ratio), as well as on EDSA (10% improvement)

Table 5.2 Impact on EDSA of Two Expressway Projects

	Indicators	Skyway3+Connector	Dike + C5 Expressway
Without Project	Traffic Volume (000 pcu)	292	276
	V/C Ratio	0.98	0.88
With Project	Traffic Volume (000 pcu)	279	109
	V/C Ratio	0.89	0.60

Source: JICA Study Team

68. It should be noted that under the recently-released Luzon Spine Expressway Network of DPWH, three expressways (Dike Expressway ~43-km, C-5 Expressway~46-km, and Calamba-Los Banos ~14.7km) were inexplicably omitted from the priority list.

69. Secondly, the absorptive capacities in the public sectors is very limited. Hence, the government must lean on the private sector. Attractiveness to the private sector can be enhanced through a creative blending of government (and ODA) funds with private funds, rather than a policy of sequential approach – government first, followed by privatization of operations and maintenance.

70. To minimize inter-operability issues, bundling of contiguous segments should be explored, i.e., concession granted to the same party, in addition to inter-operability of toll ticketing system. Lastly, whether the project is ready for tender or not, forward acquisition of Rights-of-Way should be undertaken.

71. The phased development of the Expressways is illustrated in Table 5.3 below

Table 5.3 Roadmap for Expressway

Phase 1	Phase 2	
2018-2022	2023-2029	2030 upward
• Complete Skyway 3 and Link Expressway	• Build the Lakeshore Road on PPP (after completion of dike component via GAA) • Build C-5 Expressway • Los Baños-Calamba-Expressway	• North Luzon East Expressway Stages 1 and 2 • Extension of Expressway from Calamba to Tagaytay

Source: JICA Study Team

3) Urban Roads

72. The capacities of the 10 radial and 5 circumferential roads can be increased if all the interchanges (as proposed in the past) are implemented. Many have been stalled by ROW issues, and objections from residents in the vicinity.

73. A complementary program with similar effect is the construction of flyovers or bridges across selected secondary arterials. Many of these roads have reached saturation levels for which signalization will not suffice. These land bridges should be simple in design (straight flyover), easy to build and not requiring additional ROW acquisition.

Source: JICA Study Team complied from the several sources

Figure 5.3 Examples of (instant) Modular Flyovers-Bridges

74. The traffic-impact objective is the same for major and minor interchanges: increase the capacities of existing urban roads by eliminating at-grade conflicts.

75. Recommended criteria for intersection selections are as follows:

- Currently congested, with long delays exceeding 2 minutes;
- Traffic signalization is no longer a viable option;
- The primary road is at least 3 lanes, preferably 4 lanes or more, to permit space for the flyover on the median;
- Required flyover should be simple, straight in configuration, to be suitable for modular, relocatable, and standard structure

Table 5.4 Roadmap for Urban Road

Phase 1	Phase 2	
2018-2022	2023-2029	2030 upward
• Build C4/Taft Interchange • Build C2/Lacson Interchange • Complete the Sta.Monica Bridge + 2 other bridges across Pasig River	• Build C4/North Avenue Interchange • Revive the C5/Kalayaan Interchange project • Other interchanges on C5 in conjunction with C5 Expressway	• Other missing interchanges on intersections of Circumferential (C1 to C5) & Radial Roads (R1 to R10) • Transform major roads into intelligent highways vis-a-vis intelligent transport system

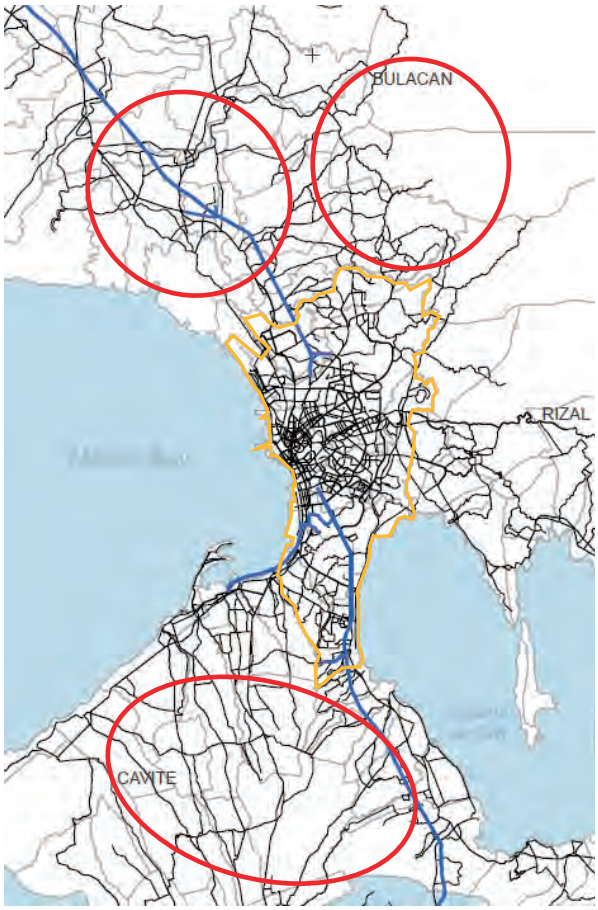
Source: JICA Study Team

4) Secondary Roads

76. One of the reason that the main roads are congested is the inadequacy of secondary roads – mostly on the outer fringes of NCR and in newly-urbanized towns.

77. Provision of secondary roads is a function often neglected by LGUs – replaced by private subdivisions building their own road network that are often closed to other traffic.

78. The challenge (and the opportunity) for creating these roads confront the adjoining areas of Bulacan, Rizal, Laguna and Cavite where more than 10 million are expected to be added by 2035. Their respective Comprehensive Land Use Plans and Comprehensive Development Plan (CDP) should start addressing the necessity of having secondary road network.



Source: JICA Study Team

Figure 5.4 Areas Lacking in Secondary Roads

6 PUBLIC TRANSPORTATION

1) Railways

(1) Rationale

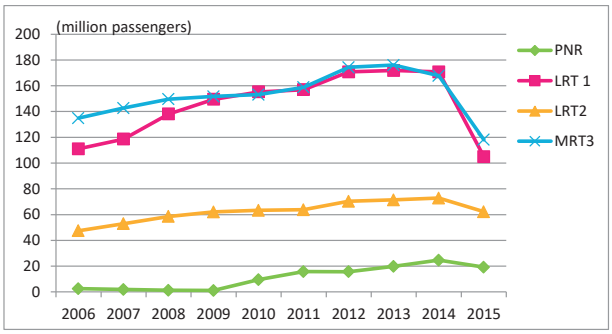
79. The evidence are incontrovertible: mobility in large cities the size of Mega Manila is impossible without a network of mass rail transit system. There is a limit to road expansion; whilst motor vehicles continue to grow unabated.

80. Development of railway as network is critical to increase ridership across all lines by providing public transport users seamless services.

(2) Current Situation in Rail

81. In 2015, total volume of passengers on urban rail stood at 850 thousand/day, down by 23% from the 2011 ridership, due to deterioration in service levels.

82. The aggregate number of railway passengers in 2015 was more than 304 million passengers, 39% of which was accounted for by LRT 3, followed by LRT 1 (34%). Passenger volumes in the four lines showed increasing growth from 2006 to 2014. The precipitous decline after 2014 was primarily caused by a 45% reduction in train availability on MRT 3 and about 20% on LRT 1. The market share of railways stood at less than 5% in 2015.



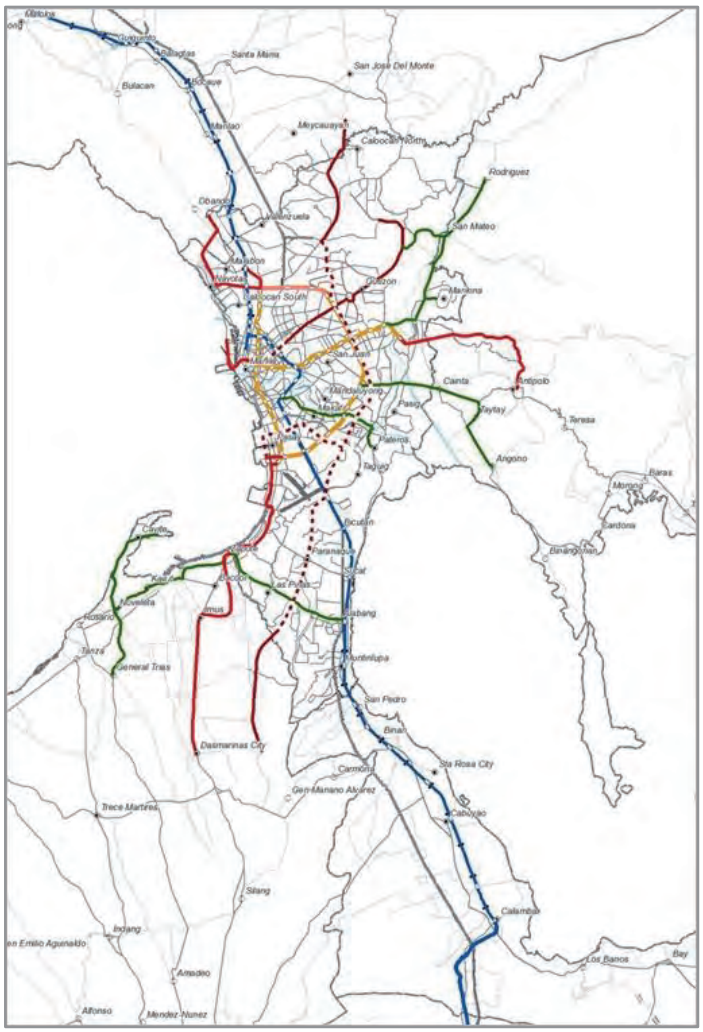
Source: DOTr

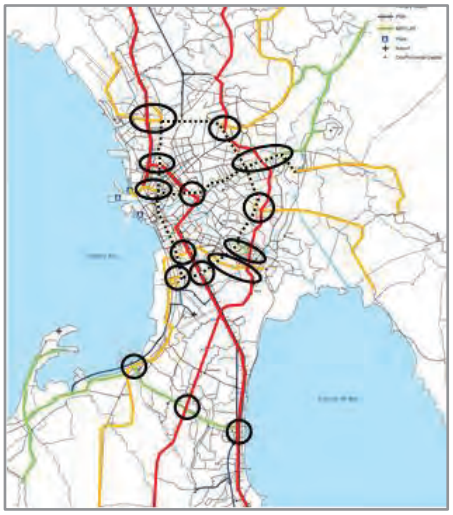
Figure 6.1 Ridership on the 4 Railway Lines

(3) Future MTS Network

83. The rail network by 2035 is envisaged to consist of six (6) main lines spanning 246 km, complemented by five (5) secondary lines with a total length of 72 km. This is shown on Figure 6.2. Rail ridership would rise to 5 million trips (approximately, 28% modal share in the daily commuting market) if all the proposed railway projects are completed.

84. It is recognized that implementation maybe sporadic and disjointed; but their connectivity (Figure 6.2) must be ensured through common transfer stations.





Inter-railway Connectivity

Source: DOTr

Figure 6.2 Proposed Railway Network for Mega Manila

85. The most important lines are the North-South Commuter Railway and the Mega Manila Subway. These are not stand-alone, they must be complimented by a number of secondary services (from buses and jeepneys) and medium-capacity mass transit rail lines.

86. A form of integration that has already been instituted, albeit belated, is a common ticketing system. Its full impact is unrealized, as the fare policy is still predicated on independent lines and without regard to the value-proposition that rail services offer.

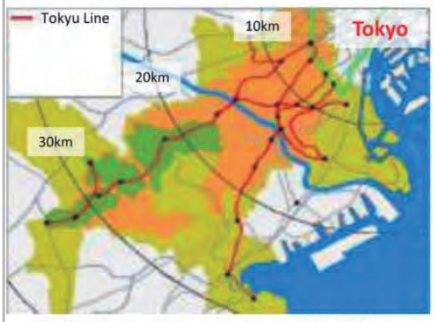
87. A conceptual road map for railways is shown in Table 6.1.

Table 6.1 Roadmap for Railways

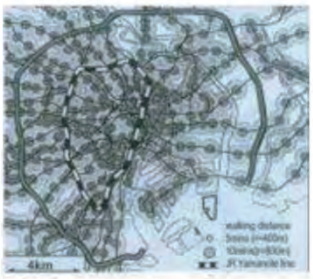
	Phase 1	Phase 2	
	2018-2022	2023-2029	2030 upward
Strategic Thrust	• Fast track construction of shovel-ready rail projects	• New railway lines to expand urban rail network	• Inter-urban railways within GCR but outside NCR
Railway lines	• Complete construction of LRT-1 south extension, LRT-2 east & west extension, MRT-7	• Complete construction of Phase 1 of Mega Manila Subway • Complete the North Commuter (Tutuban to Clark) • Build the South Commuter Service to Calamba • East rail monorail to Taytay	• Build Phases 2 and 3 of the Mega Manila Subway • Manila-Clark Airport Express to in-City Terminal • Monorail Line from Sucat to Alabang • Extension of East monorail, from Taytay to Angono
The MRT-3 Case	• Major rehabilitation and upgrade of MRT-3 via a new PPP concession	• Revert North Loop to MRT-3 and build Depot & spur line to Malabon-Navotas	• MRT-3 extension to Bay Area

Box 6.1 Experiences of Rail Development in Tokyo Metropolitan Area

As the Mega Manila becomes similar size of Tokyo which has an extensive urban rail network and most of the lines are financing independent, it is good to learn from the experience of urban rail development in Tokyo. In CBD, most of the areas are covered by rail within walking distance and lines in Marunouchi area is connected with underground walkway. Tokyu (private railway company) bought large-scale lands at cheaper price, then constructed railway together with housing to sell them in the market at much higher price.



Tokyu Tama Denentoshi along Tokyu Denentoshi Line



Coverage of Urban Railway = 2.5 km

Urbanground Network (Marunouchi)

Source: JICA Study Team

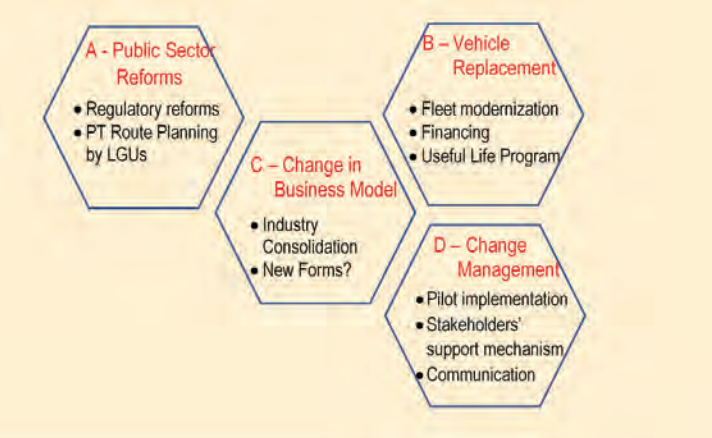
2) Road-based Public Transport

88. At present, about 50% of the daily trips in NCR are carried by jeepneys and buses. The share of jeepneys are larger in BRLC. By 2035, the share would go down to less than 30%, if all the railway lines get built. These mode of transport can hold their ground against private car usage, if their services are improved through a combination of bus-priority policy, modern vehicles suited to urban commuting, change in their operating model (from atomized to organized).

89. The government has to intervene and take a more active role if the desired change in the road-based public transport system, including taxis and vans for hire, will happen.

90. The administration has launched an ambitious Public Utility Vehicle Modernization (PUVM) program to make buses and jeepneys more service-oriented (and less profit-driven),

aside from mitigating their negative road behavior. The components of the PUVM is capsulized in Figure 6.3. A total replacement of the antiquated jeepney fleet is envisaged. It is a program that requires adjustment and sustained efforts over a decade – in the face of organized resistance from jeepney operators centered on the consolidation method and the high cost of new vehicles. Virtual consolidation and higher subsidy are alternative pathways.



Source: JICA Study Team

Figure 6.3 Components of the PUVM

91. The service orientation for privately-owned buses and jeepneys can only be realized if the practice of 'boundary fee' for drivers is jettisoned.

92. To a lesser extent, the bus system also needs a similar modernization program. The number of operators is not as numerous, and the vehicles have undergone renewals in the last two decades. However, the current focus on BRT as the solution maybe misplaced.

93. Two BRT projects were listed in the Build-Build-Build Program: BRT 1 on Quezon Avenue and BRT 2 on EDSA. BRT 2 is not advisable due to the physical configuration of the corridor, presence of MRT-3. The introduction of the MM Subway will make it superfluous. The physical context for BRT 1 is brighter, as Quezon Avenue has 6-8 lanes, except for some sections near central Manila. However, it is redundant if the LRT rail project on the same route is also built.

94. A roadmap for bus/jeepney development is shown in Table 6.2. It recommends a stronger reliance on ICT technology, and a gradual shift away from petrol-dependent to electric vehicles.

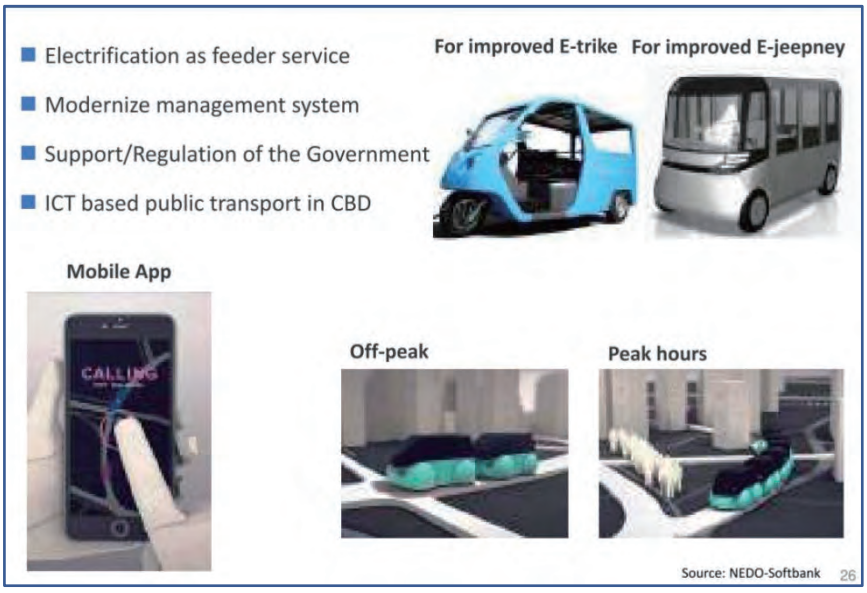
95. The public transport fleet should gradually shift to electric vehicles (EVs). They are currently diesel-fed, a fuel that is being phased out in Europe due to its carcinogenic effects. The constraint to EV adoption is not due to lack of charging infrastructure (MERALCO has announced plans to establish a network of charging stations), but legal. Current laws do not consider EVs as motor vehicles that can be registered and allowed to run on Philippine roads.

Table 6.2 Roadmap for Road-based Public Transport

Phase 1	Phase 2	
2018-2022	2023-2029	2030 upward
• Issue technical standards for new metro buses (Euro 4, 2 side-door, low floor, etc.) • Pilot test a digital fleet management system on EDSA (common ticketing, organized scheduling, GPS tracking, etc.) • Issue new franchising guidelines for urban buses. Pilot-test on EDSA	• Re-deploy non-compliant buses to inter-urban routes (between NCR and other cities in GCR) • Improve the digital management system to include other functionalities (e.g., passenger information & interaction), and expand to other parts of NCR • Restructure bus routes, starting with NCR	• Shift to electric or hybrid buses, with bus-to-bus communication and other advanced features • Expand the ICT-based solution to other buses in GCR (outside of NCR) • Establish a new franchising regime based on ICT platform

Source: JICA Study Team

Box 6.2 Opportunities for EV and ICT



Source: JICA Study Team

3) Other Support Measures

96. Historically, the government has left the provision of public transport services largely in the hands of the private sector. Its primary role has been that of a regulator, or gatekeeper into the market. It is a passive role that it could, and should, not continue. On buses, it has forayed (albeit, gingerly) into BRT that would drastically alter the current fragmented and multi-operator operating model. On buses, it has launched a jeepney modernization program, that would, among others, led to consolidation or merger into less number but bigger-scale operators.

97. Applying operating model (in the form of actual consolidation into single or fewer entities) from developed countries would likely falter, because of the different starting base and factor conditions. Instead, it is recommended that it adopts a virtual consolidation model that relies on technology platforms to coordinate dispatching, pool revenues, and re-allocate revenues according to service rendered. Grab models can easily be adapted to the less stringent demands of fixed route buses and jeepneys, or the point-to-point vans.

98. The goal of industry re-structuring needs also to be supported on the ground with passenger transfer facilities, like urban terminals and loading/unloading shelters. These were naturally provided by monopoly operators and/or city governments in developed countries; they are mostly absent in the Philippines.

7 GATEWAY PORTS and LOGISTICS

1) Global and Local Linkages

99. Manila emerged and grew as a premier city because it serves as the entrepot for international commerce - enabled by the Port of Manila and the Manila international airport.

100. Capacity constraints, however, have become evident – anticipated more than a decade ago, but somehow sidestepped.

2) Gateway Airport: In Search of a Safe Landing

101. Various studies in the past have proposed the development of Clark, initially to replace Manila; and later as a second gateway serving the market north of NCR. Subsequently, a new NAIA was conceptualized to replace the existing Manila airport after a detailed review of nine (9) alternative sites. In 2015, the government opted for Sangley in Cavite, then placed on-hold starting end-2016. The development of Clark, on the other hand, took the slow lane.

102. By end of 2017, four proposals emerged from an impatient business sector. A group identified with Cebu Pacific submitted a PHP838 billion proposal to fast track the development of Clark. This was later rejected, as government opted to do it by its own self, with privatization of operations and maintenance as a future step. Another group came up with a PHP700-billion airport to be located in Bulacan; with an announced area of 2,500-hectare property and six runways, it was clearly aimed as a replacement for NAIA.

103. Not to be outdone, another consortium revived and expanded its proposal for a Philippine Sangley International Airport on 2,500 hectares of reclaimed land. A 4th proposal came from a super consortium with the intent to rehabilitate, expand, operate, and maintain the Ninoy Aquino International Airport (NAIA) for 35 years, at a cost of PHP350 billion. A 5th proposal is akin to, if not a variant of, the 4th.

104. With a surfeit of aggressive proposals, the government decision matrix has been confounded. Unsolicited proposals require a “Swiss Challenge”; such that accepting all (which is also equivalent to not making a choice) eviscerate potential challengers.

105. An efficient international airport with gateway pretensions, however, is an agglomeration facility that is ideal for hub-and-spokes operation; in contrast with a point-to-point route architecture. The challenge of interline transfers (and transhipment for cargo) increases geometrically with more than 2 non-contiguous airports

Source: JICA Study Team

Figure 7.1 Options for International Airports in Mega Manila

106. Despite the size of Mega Manila, the aviation market would have difficulty sustaining more than two gateway airports. It is also doubtful that financing faucet would be open to all proposals – if all are greenlighted. Clark Airport is constant in any scenarios and is the only practical option for traffic that cannot be accommodated in the existing NAIA over the next 10 years. Lastly, the center of gravity of the air transport market recommends a location south of NCR.

3) Gateway Seaports: Clear to Anchor

107. Unlike in the case of airport where the future direction is hazy, the plan for the sea ports is clear and unchanging. Three major seaports for Mega Manila have already been decided. Government has built the Port of Batangas, as well as the Subic Port, to provide relief to the Port of Manila. The latter two facilities are under-utilized despite their natural advantages in navigability, aside from having room to grow.

108. The avowed policy is to nudge international cargo shippers towards Subic and Batangas, and for domestic shipping to shift to Batangas. This has little effect on a market that gravitate to a port with higher frequencies of ship calls.

109. The main beef against the Port of Manila is its adverse impact on urban traffic due to the volume of trucks hauling cargoes in and out of North and South Harbors. Truck bans imposed by various LGUs along the route adds to the logistic cost and pose constant risk of disruption in the supply chain. Several countermeasures have been initiated, and needs to be intensified and sustained, such as:

- Harmonizing the truck bans across several municipal boundaries;
- Wider use of digital technologies (starting with TABS at MICT) to optimize productivity of on-road haulage;

- Completion of elevated expressways linked to the ports that can accommodate truck traffic and separate the short- and long-haul users;
- Widening the options for getting goods in and out of the port, such as the construction of an Inland Container Depot utilizing the railway lines of PNR (which was proposed by a private group), and the Cavite Gateway RoRo Terminal (proposed by ICTSI);

Source: JICA Study Team

Figure 7.2 Gateway Ports in Mega Manila and ICDs

110. A long-term direction is the re-purposing of North Harbor into a mixed use TOD developments (with a terminat station for LRT-2 West Extension), and move domestic shipping to the Port of Batangas. Manila can adopt what other cities in developed countries have doen to their old ports

8 TRANSIT ORIENTED DEVELOPMENTS

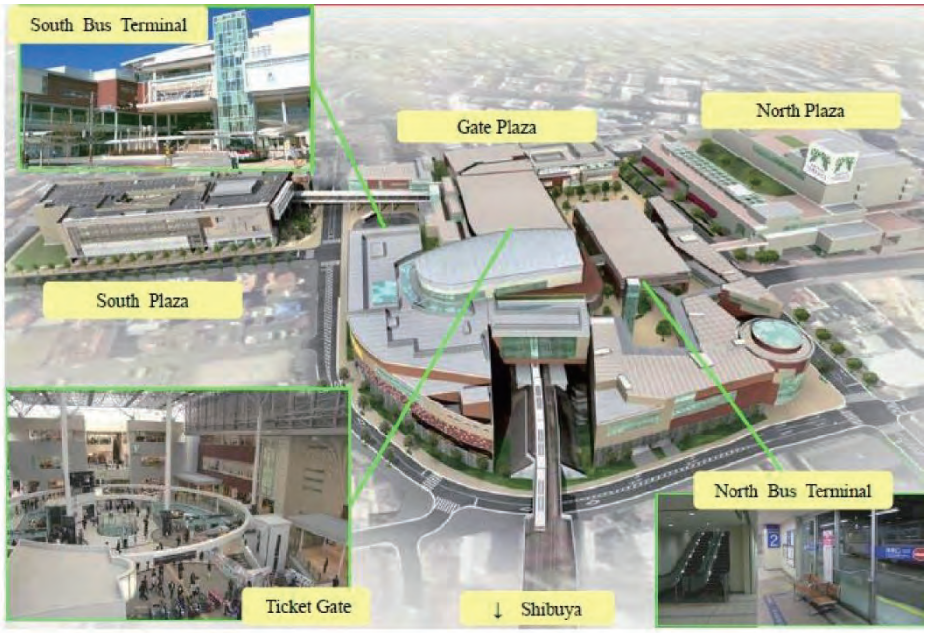
1) Concepts of compact urban node

111. TODs have been implemented in several countries around the world. They cover areas ranging from around 2 hectares immediately surrounding transit stations, to larger areas within short walking distance of the station building, to more than 10 hectares within commuting distance via other modes of public transport. They are normally initiated by government, but their actual construction and management often involves partnerships with private landowners and businesses.

112. TODs usually accommodate a wide range of land uses and building types depending on the economic potentials of the station area and the volume of passengers that the station concerned generates. Where the economic potentials are significant and the volume of passengers is large, the wider the range of land uses, and the bigger the land area of the TOD. For example, it can accommodate the following facilities:

- Hotels and related lodging facilities

- Commercial establishments
- Offices (especially Business Process Outsourcing offices)
- Small and medium manufacturing enterprises/light industries
- Residential communities and condominiums



Source: http://www.japantransport.com/seminar/(2)%20Mr.%20Tomoo%20Kimura%20[Tokyu].pdf

Figure 8.1 TOD around Tama-Plaza Station, Yokohama

113. Within NCR, several high-rise property developments are being billed as TODs due to their proximity to Manila's LRT stations. They are mostly small-scale TODs (within 500 meter radius of a mass transit station), with few facilities for convenient walkabity and integration with the transit system. These deficiencies arose from the difficulty of consolidating small parcels of land with fragmented ownership plus the lack of initiatives from the transit authority and the concerned LGU.

114. A planned unit development within 1-km radius of a railway station can be deemed as intermediate-scale TOD, while a large-scale one encompass an area within 5-km radius of the transit station. From its conception in the 1990s, the Bonifacio Global; City was supposed to have a central railway station. Delays and changes in the construction of such a railway line, as well as other factors, resulted in a new CBD served largely by private cars.

2) TOD Potentials in Mega Manila

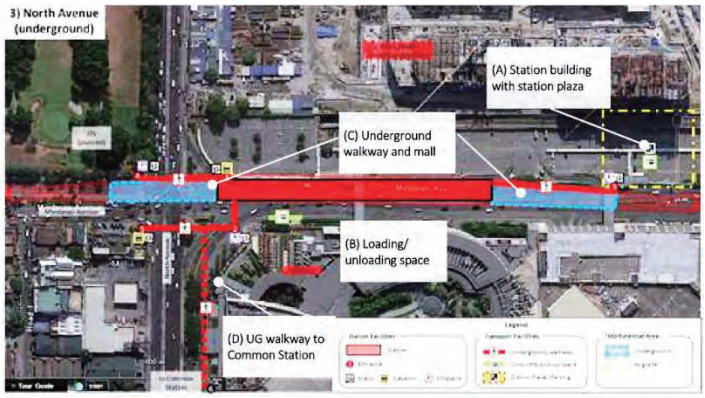
115. The stations of the proposed North South Commuter Railway and the Mega Manila Subway provide opportunities many opportunities for small-scale and intermediate-scale TODs.

116. Figure 8.2 illustrates what could be made to happen around the Bocaue Railway Station.

117. It is recommended that government, particularly railway authorities, take leading roles in the realization of TODs by acquiring additional land as the stations get built and offer their subsequent developments to private property developers.

Source:

Figure 8.2 Bocaue Station North CR



Source:

Figure 8.3 Schematics for TOD around North Avenue Station of MMS

3) Compact Townships

118. A new township farther north is the Clark Green City (9,450 hectares); it is public sector initiated. Smaller-scale townships under development by the private sector are Alviera in Porac (1,125 hectares), Capital Town in San Fernando, and many others in the south. None of these would qualify as TOD, but nonetheless should be encouraged.

Box 8.1 Township Development in Japan

■ **Kohoku New Town:** This was developed as one of six strategic project of Yokohama City in 1960s. It aimed at preventing from indiscriminate development. This new town locates 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 population in Tokyo Metropolitan Area, especially by relocating research and education institutes. This new town locates 50 km away from Tokyo and 40 km away from Narita International Airport. Total area is 28,400 ha with 2,700 ha of centre part. Total population was 216,300 in 2011.

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

9 IMPLEMENTATION

1) Transport Investment Program

119. The Roadmap to 2035 will entail a series of investments – in discrete packages called projects.

120. The total package of proposed Projects is about PHP2.8 trillion, of which 44% (~PHP1.2 trillion) can be picked up by the private sector. That is an average investment of PHP215 billion per year, up to 2035.

121. Those projects that can (and should) be implemented in the current Philippine Development Plan (2017-2022) amounts to PHP799 billion. On the other hand, the transport projects in the Build-Build-Build Program totaled PHP2.4 trillion – which is three times. This implies either of the following: a) new projects not identified in any master plan, b) moving

non-priority projects ahead of the queue; or c) differences in “soft cost” or estimates not based on feasibility studies.

122. The more critical question: can the higher or lower level of investments be afforded?

123. The short answer is yes, assuming the economy’s growth momentum continues and that a higher percentage of the nation’s GDP will be invested in public infrastructure – from 2.9% to 7%. For the short-term period (2018 to 2022), the budget envelope ranged from a low of PHP839 billion to a high of PHP2,499 billion. The budget envelope over the long run is estimated at PHP4.3 trillion (low) to PHP10.1 trillion (medium forecast) from 2018 to 2035. The low forecast exceeds the total investment program of PHP2.8 trillion, of which the private sector could be expected to account for nearly 44%.

124. Breakdown of the Program by type of projects is shown on Table 9.1, as well as their likely timing. For the Build!Build!Build! program, the implementation schedule posted on the government website were used.

Table 9.1 Indicative Transport Investment Program

	ID	Category	Project Title	Cost (PHP bil.)	Cost to Gov't		Schedule			Current Status
					%	PHP bil.	‘18-‘22	’23-‘35	Note	
Railway	R1	NSCR	North Phase 1 (Malolos – Tutuban)	149	60	89.5				Pre-construction
	R2		North Phase 2 (Malolos – Clark)	284	60	170				L/A Signed
	R3		South Commuter (Tutuban - Calamba)	345	50	172				L/A Signed
	R4		Commuter Rail System Operations and Maintenance	0.1	0	0				ICC Evaluation
			Sub-total	778		432				
	R5	PNR	Freight Line	10	0	0.0			TBC	Pre-F/S
	R6	Metro Manila Subway	Phase 1 (Mindanao Ave. – FTI)	356	90	320				L/A Signed
			Phase 2	-		-				
			Sub-total	356		320				
	R7	LRT1	LRT Line 1 Cavite Extension and Operation & Maintenance	64.9	50	32.5				Pre-construction
	R8		LRT 1 North Extension	15.9	60	9.6				-
			Sub-total	80.8		42.0				
	R10	LRT2	Rehabilitation Projects	7.1	60	4.3				Procurement
	R11		East Extension Project (Santolan - Masinag)	9.8	60	5.9				Implementation
	R12		Acquisition of Four (4) New Train sets	2.1	60	1.2				-
	R13		East Extension (Masinag - Antipolo)	80.5	20	16.1				-
	R14		West Extension (Recto - Pier 4)	10.1	60	6.1				Procurement
			Sub-total	99.4		27.4				
	R15	MRT3	Capacity Expansion	8.6	20	1.7				Implementation
	R16		South Extension	68.6	60	41.2				-
	R17		North Extension	68.6	60	41.2				-
			Sub-total	146		84.0				
	R18	Manila Metro Line 4 (Metro Manila - Taytay)		85.0	60	51.0			TBM	F/S
	R19	Manila Metro Line 5 (Makati Transit System Loop)		302	60	181			TBM	F/S
	R20	Manila Metro Line 6 (Niyog – Dasmarinas)		64.7	60	38.8				ICC Evaluation
	R21	Metro Rail Transit Line 7 (North Ave. - San Jose Del Monte)		62.7	50	31.4				Implementation
	R22	Unified Common Station		2.8	10	0.3				Procurement
	R23		Marikina Secondary Line	31.5	60	18.9				-

	ID	Category	Project Title	Cost (PHP bil.)	Cost to Gov't		Schedule			Current Status
					%	PHP bil.	'18-'22	'23-'35	Note	
	R23	Secondary Line	Cavite Secondary Line	25.6	60	15.4				-
	R23		Alabang Secondary Line	13.4	60	8.0				-
	R23		Pasig Secondary Line	-	60	-			TBC	-
			Sub-total	70.5		42.3				
	R24	Comprehensive LRT/MRT Business/Commercial Development Plan/Roadmap		0.004	100	0.004				-
	R25-30	Research Projects		0.57	100	0.57				DED
		Total (Railway)		2,067		1,257				
Road-based Public Transport	PT1	Bus	PUV Route Rationalization Study - Metro Manila	0.07	100	0.07				F/S
	PT2		South Integrated Transport System	4.0	20	0.8				Implementation
	PT3		Southwest Integrated Transport System	3.2	20	0.6				Implementation
	PT4		North Integrated Transport System	4.0	50	2.0				Project Dev't
	PT5		NAIA Intermodal Terminal	2.0	50	1.0				Pre-FS
			Sub-total	13.2		4.5				
	PT6	BRT	Metro Manila BRT - Line 1 (Quezon Avenue)	4.8	20	1.0				DED
	PT7		Metro Manila BRT - Line 2 (EDSA/Central)	37.8	20	7.6			TBC	Loan Negotiation
	PT8		Metro Manila BRT - Line 3 (C5)	31.2	20	6.2				-
	PT9		Metro Manila BRT Line 4 - Roxas Blvd.	19.9	20	4.0			TBC	Project Dev't
	PT10		Metro Manila Bus Rapid Transit System (BGC-NAIA Segment)	21.9	20	4.4				Project Dev't
			Sub-total	116		23.1				
	PT11	Others	BRT Greenways (green walkways to BRT lines)	4.0	100	4.0				-
	PT12		Ortigas Greenways (high quality walkways within Ortigas)	0.6	100	0.6				Pre-F/S
	PT13		Public Transport Information Management Center	0.05	100	0.05				F/S
	PT14		Public Transport Facility Improvement Project	0.02	100	0.02				Pre-F/S
			Sub-total	4.7		4.7				
		Total (Road-based Public Transport)		133		32.3				
Traffic	TM1	Intelligent Transport System (Traffic Signal System Upgrading and Communication and Monitoring System)		10.0	100	10.0				Implementation
	TM2	Comprehensive Traffic and Transport Management Study/Plan for Metro Manila		-	-	-				Implementation
		Total (Traffic Management)		10.0		10.0				
Expressway	E1	Urban Expressway	NLEX Harbor Link, Segment 10	9.0	30	2.7				Implementation
	E2		Skyway Stage 3	37.4	30	11.2				Implementation
	E3		NLEX-SLEX Connector Road Project	23.3	30	7.0				DED Review
	E4		C-5 Expressway	92.7	30	27.8				-
	E5		Manila - Taguig Expressway	66.6		20.0				DPWH Evaluation
	E6		R4 Expressway (Shaw Blvd.)	23.4	30	7.0				-
	E7		R7 Expressway (Manila - San Jose Del Monte)	24.5	30	7.3				-
			Sub-total	277		83.1				
	E8	Others	Southeast Metro Manila Expressway (C-6) Project	45.0	30	13.5			TBC	ROW Acquisition

	ID	Category	Project Title	Cost (PHP bil.)	Cost to Gov't		Schedule			Current Status
					%	PHP bil.	'18-'22	'23-'35	Note	
	E9		Laguna Lakeshore Expressway Dike (LLED)	76.0	60	45.6				Evaluation of Bid Doc.
	E10		North Luzon Expressway East, Phase I and II	44.6	30	13.4				-
	E11		Arterial (Plaridel) Road Bypass Project Phase II (ODA)	3.7	30	1.1				ROW Acquisition
	E12		Plaridel Bypass Phase III	5.3	30	1.5				-
	E13		C6 North Section	4.3	30	1.3				-
	E14		Cavite-Laguna Expressway	35.7	50	17.8				Construction
	E15		CAVITEX Extension	12.7	30	3.8				-
			Sub-total	227		98.1				
		Total (Expressway)		504		181				
Urban Roads	B1	Interchange /Flyover/Underpass	Metro Manila Interchange Construction Project Phase VI (MMICAP IV)	4.0	100	4.0				D/D
	B2		C-2(Gov.Forbes St.)/R-7(España St.) Interchange Project	2.6	100	2.6				Implementation
	B3		Ortigas Avenue - Santolan Road Interchange Project	0.6	100	0.6				F/S
	B4		EDSA-Taft Flyover Project	0.7	100	0.7				ECC
	B5		Senator Gil Puyat Avenue-Paseo de Roxas/Makati Avenue Vehicle Underpass Project	1.1	100	1.1				Work Suspension
			Sub-total	9.0		9.0				
	B6	Bridges	Metro Manila Priority Bridges Seismic Improvement Project	4.3	100	4.3				ROW Acquisition
	B7		Pasig River-Marikina River-Manggahan Floodway Bridges Construction Project (2 bridges)	6.0	100	6.0				NEDA Board Approval
			Pasig River-Marikina River-Manggahan Floodway Bridges Construction Project (10 bridegs)	27.4	100	27.4				NEDA Board Approval
	B8		Bonifacio Global City to Ortigas Center Road Link Project , Phase I, IIA & IIB	5.7	100	5.7				Procurement
			Sub-total	43.4		43.4				
	UR1	Primary Roads	C-3 Missing Link (N. Domingo St. (San Juan) - Buendia Ave. (Makati))	10.5	100	10.5				Pre-F/S
	UR2		C-5 Kalayaan- Bagong Ilog Improvement Project	8.5	100	8.5				NEDA Approval
	UR3		C-5 (SLEX to Coastal Road, Zapote Bound Coastal Service Road)	0.1	100	0.1				DED
	UR5		Widening of C-6	0.3	100	0.3				DED
	UR6		C-6, Napindan-ML Quezon Ave	0.6	100	0.6				DED
	UR7		C-6, Taguig Pateros	0.03	100	0.03				DED
	UR8		By-Pass Road (Marcos Highway to JP Rizal St.)	0.1	100	0.1				DED
	UR9		Taguig Diversion Road to Elizco By-Pass Road(Via Visitacion Street) incl. ROW	0.1	100	0.1				DED
			Sub-total	20.2		20.2				
	UR10	Secondary Road (Metro Manila)	Road packages (Navotas/Malabon/Valenzule)	23.9	100	23.9				
	UR11		Road packages (Marikina)	8.7	100	8.7				
	UR12		Road packages (Ortigas)	8.9	100	8.9				
	UR13		Road packages (A. Rodriguez Ave. and Pres. M. Quezon)	9.9	100	9.9				
	UR14		Road packages (Alabang – Zapote)	0.3	100	0.3				
	UR15		Marcos-Alvares Road	0.2	100	0.2				F/S

	ID	Category	Project Title	Cost (PHP bil.)	Cost to Gov't		Schedule			Current Status
					%	PHP bil.	'18-'22	'23-'35	Note	
	UR16		Widening/improvement of General Luis St.-Kaybiga-Polo-Novaliches Road	2.9	100	2.9				DED
			Sub-total	54.9		54.9				
	UR17	Secondary Road (BRLC)	Pulilan-Baliuag Diversion Road, incl. Bridge	0.7	100	0.7				F/S
	UR18		Candaba - San Miguel Bypass Road	0.4	100	0.4				DED
	UR19		Western Bulacan Connector	0.4	100	0.4				DED
	UR20		Road packages (Marcos Hwy)	4.0	100	4.0				
	UR21		Jct. Batasan-San Mateo-Rodriguez By-Pass Link Road, Phase III & IV, incl. ROW	1.5	100	1/5				F/S
	UR22		Road packages (Calamba)	0.4	100	0.4				
	UR23		Bucal By-Pass Road incl. Bridge Widening	0.2	100	0.2				DED
	UR24		Alaminos-San Pablo City By-Pass incl. ROW and Bridge	1.0	100	1.0				F/S
	UR25		Road packages (Rosario)	4.0	100	4.0				
	UR26		General Aguinaldo-Magallanes-Nasugbu Road (East-West Road) Section III, Magallanes-General Aguinaldo-Maragondon Section	1.5	100	1.5				DED
	UR27		Malagasang-Bucandala-Alapan Road, incl. ROW	0.4	100	0.4				DED
	UR28		General Aguinaldo-Magallanes-Nasugbu Road (East-West Road), Amadeo Section	0.2	100	0.2				DED
	UR29		General Aguinaldo-Magallanes-Nasugbu Road (East-West Road) Section II, Indang-Silang Section	0.8	100	0.8				F/S
	UR30		Kaykulot Road connecting Tagaytay-Calamba Road to Sta. Rosa Ulat Tagaytay Road	0.4	100	0.4				F/S
			Sub-total	16.0		16.0				
		Total (Urban Road)		91.0		91.0				
Air	A1	Sanglay Airport Development Project		0.7	100	0.7				ICC Review
		Total (Airport)		0.7	100	0.7				
Maritime	M1	Pasig River Ferry System		5.6	100	5.6				ICC Review
	M2	Design and Development of an Inter-Island Maine Vessel		0.02	100	0.02				R&D
	M3	Brgy Lumbac		0.01	100	0.01				For ocular inspection
	M4	Construction of Maragondon Port		0.01	100	0.01				
		Total (Maritime)		0.04		0.04				
Grand Total				2,865		1,630				

Source: JICA Study Team

2) Impact of the Build!Build!Build! Program

125. Not surprisingly, the impact of the Build!Build!Build! Program on transport network performance is positive. The volume-to-capacity ratio (a measure of congestion on the road network) of Metro Manila would plunge from 0.98 in 2017 to 0.77 in 2022, and 0.90 to 0.66 in BRLC. Likewise, the transport cost will go down from PHP3.5 billion/day to PHP2.1 billion/day for Metro Manila, and from PHP2.4 billion/day to PHP2.3 billion/day in BRLC in the period of 2017 – 2022.

126. But the Build!Build!Build! Program is not enough. Additional projects have to be implemented beyond 2022, to fill up the gap between the Roadmap to 2035 Plan and the

Build!Build!Build! Program (which is only up to 2022). These are listed in Table 9.1, with an estimated price tag of PHP409 billion.

3) Implementation Schedule

127. The criteria for classifying which of the projects in the list should go first, the projects were evaluated on the following criteria:

- Consistency with policies, strategies (and implicitly, with the Roadmap2)
- Doability, i.e., the readiness of the projects for actual construction
- Effectiveness, i.e., the ability of the project in resolving present and future capacity constraints.

128. The above is similar to NEDA's Three-Year Rolling Infrastructure Program (TRIP), which puts a premium on ready-to-implement (aka shovel-ready) projects.

129. A cursory review of the Build!Build!Build! Program, however, revealed that more than 50% are still on development stage, not yet on shovel-ready, with several projects on very tight schedules.

4) Role of PPP

130. The participation of the private sector has often been construed as augmentation to a small budget envelope. In the case of Mega Manila, it is less about money than the efficiency in project execution, operations, and management. Infrastructure as a service requires more PPP.

131. The Philippines has a long history on PPP, and a bigger harvest than most of its ASEAN neighbors in many respects. But it also had the most controversies – exemplified by the abrogation of the contract for the NAIA Terminal 3 in 2002.

132. The PPP program experienced highs and lows over 3 decades – depending on the thrusts and priorities of the incumbent administrations. By 2017, the PPP was relegated to a second choice (in the public sector) but took the front burner in the private sector. Unsolicited proposals have proliferated, such as: proposals for gateway airports (of which there are 3), expressways (3), LRT (1), and several others being cooked up but not yet served.

133. For Mega Manila to get where it should be by 2035, it has to lean on the private sector, much more than required in the current hybrid policy - where construction is done and funded by government, then privatized after completion. On the other hand, the government should be wary of red flags from unsolicited proposals, such as:

- Projects that upends the integrity and coherence of the Roadmap 2035;
- Requires market exclusivity
- Entails "take-or-pay"
- Periodic payments untied to performance

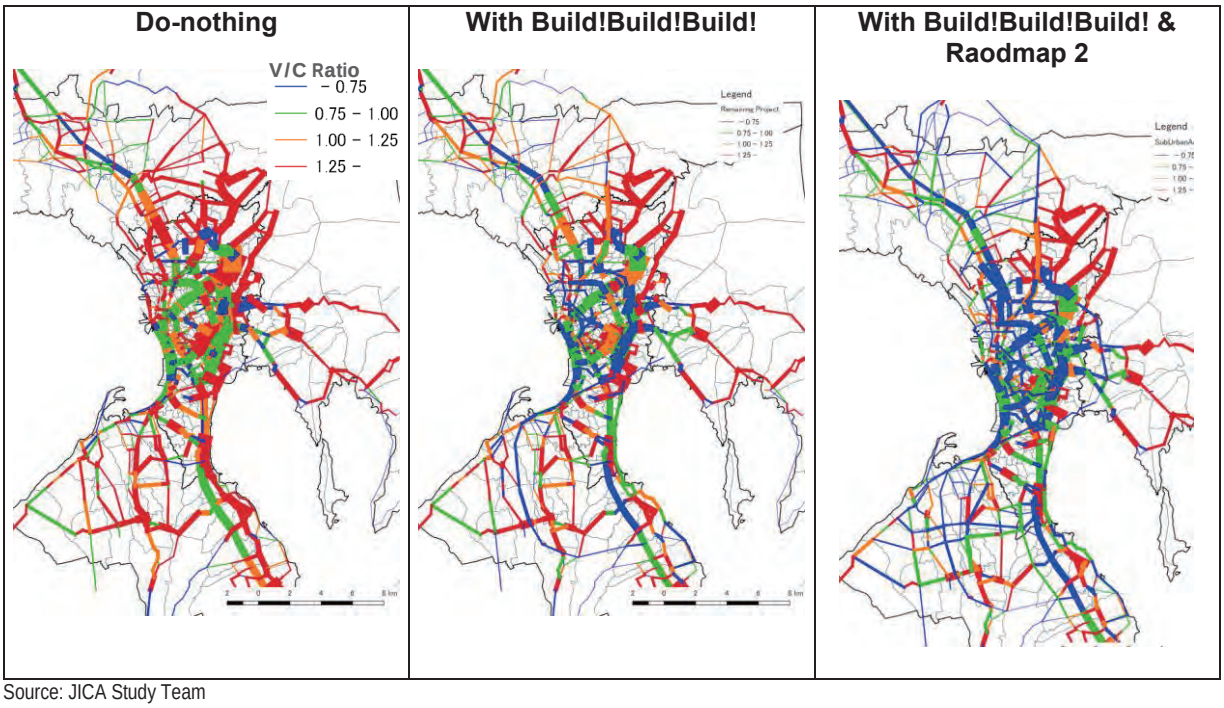
5) Progress Measurement

134. The Program must be monitored with simple, and measurable, key performance indicators, as shown in Table 9.2.

Table 9.2 Key Performance Indicators

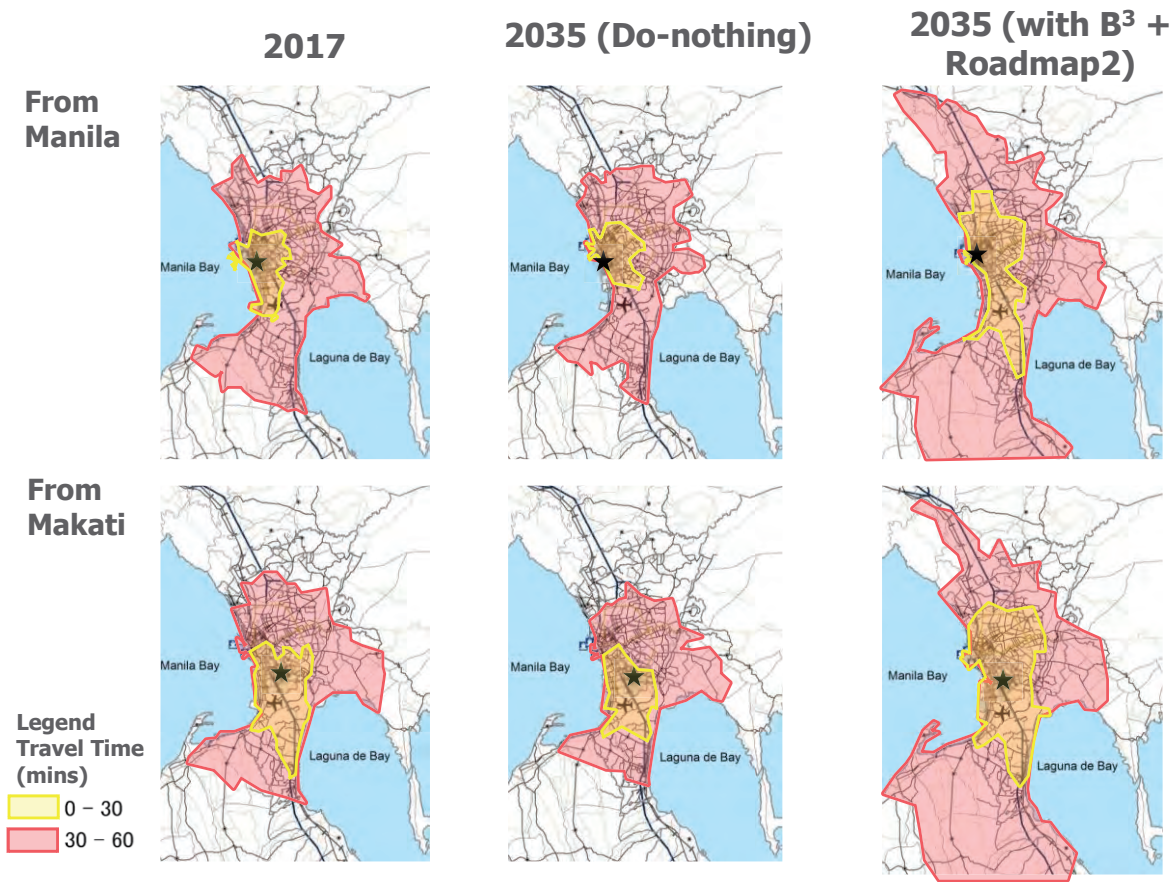
Scope	Key Performance Indicators
Traffic Performance	• Average travel speed (in kph)
	• Average Volume to Capacity Ratio
	• On-board congestion on MRT/LRT
Economic	• Congestion Cost per day
Social	• Average commuting time: home to work
	• Average public transport cost per user
	• Number of households without housing
Financial	• Cost recovery ratio for tollways
	• Farebox ratio for mass transit systems
Environment	• Emission volumes
	• Number of households in hazardous areas

Source: JICA Study Team



Source: JICA Study Team

Figure 9.1 Illustrative Chart of Network Performance in 2035



Source: JICA Study Team

Figure 9.2 Illustrative: Areas w/in One Hour Commute Time

10 EPILOGUE

135. Before World War II, Manila prided itself as the Pearl of the Orient. In the last four decades, it has become a Mega Manila without the Pearl. Properly and consistently prosecuted, the proposed Roadmap aims to bring back that glory by 1935.

136. That future, however, will be vastly different – because of technology. The cities that were shaped by the 1st Industrial Revolution will not be the same as those in the wake of the 4th Industrial Revolution. Connectivity will be the hallmark of the cities of tomorrows.

137. Underpinning that connectivity are the traditional infrastructure of roads, mass transit, public transit and the new kid on the block: digital infrastructure.

138. A connected Mega Manila equals mobile, accessible, inclusive, resilient, vibrant and sustainable.

139. To get there, it needs to roll out the following:

- Inter-connected urban expressways (80-km) and intercity expressways (~400km);
- A railway network of six (6) main lines (~ 369 km), complemented by five (5) secondary lines (75 km);
- Re-shape a megapolitan footprint in the north-south direction, and away from disaster-prone areas;

- Modernize its road-based public transport system into a virtually-integrated fleet of LEVs and EVs serving diverse trips;
- Create new townships and TODs and re-develop old zones of existing urban hubs that will be homes to an additional 10 to 15 million people in 20 years;
- Update several archaic laws on transit and traffic, create new entities, and re-model its infrastructure-coordinating institutions into a Mega Manila Transport Authority;
- Conduct researches and in-depth feasibility studies in support of the above measures, as well as achieve efficient program implementation.

140. The establishment of a Greater Capital Regional Transport Authority should be seriously considered. If the old pace of expressway development (in the last 15 years) is doubled, less than 50% of the target expressway network will get built by 2035. In railways, a pace twice faster would only build 1/5 of the desired network.