CHAPTER 5

PROJECT IMPLEMENTATION PLAN

CHAPTER 5 PROJECT IMPLEMENTATION PLANNING

5.1 Examination of Preliminary Construction Plan

The construction of NSCR will require careful planning and organization, given the magnitude of the works, time constraints and the location of the works on busy national and arterial roads within Metropolitan Manila and Bulacan Province.

5.1.1 Temporary Works

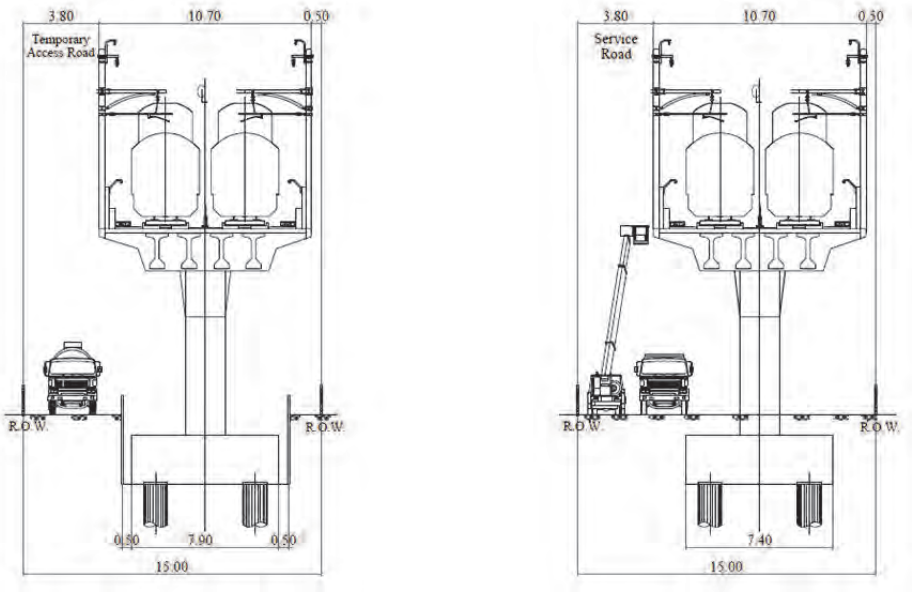
1) Temporary Access to Site

It is necessary to apply countermeasures flooding during heavy rain season because of the low ground level between Malolos and Caloocan. There is no problem with an access road to the site along the main road in this area. However, it is necessary to consider to construct temporary access to site far from main roads.

In swampy areas between Malolos and San Fernando along the PNR Route, it is necessary to construct a temporary steel stage for machinery or materials transportation during construction. It is necessary to install sheet piles to avoid an intrusion of ground water during construction of the substructure.

2) Sufficient Space for the Works

There are some narrow ROW sections between Malolos and Caloocan along the PNR Route. During construction of elevated structures, it is necessary to have more than 15m width for access road to secure access of many trucks, truck mixers and other construction equipment transportation to the site. After construction, the temporary access shall be maintained more than 15m width as a service road for maintenance or emergency evacuation.



Source: JICA Study Team

Figure 5.1.1 Necessary ROW for Elevated Structures

5.1.2 Viaduct

5.1.2.1 Foundations

Viaduct foundations comprise of conventional bored piles and pile caps. Bored piles will be constructed using high torque powered rotary drilling rigs mounted on crawler cranes with telescopic kelly bars and using a set of various buckets, augers and chisels. Excavation typically will be carried out under a bentonite slurry without the use of temporary casings. Following the completion of the boring and the placement of the steel rebar cage in the pile excavation, concrete is placed using a tremie pipe while the bentonite slurry is pumped away.

Critical issues during construction will be:

- proper mixing and recycling of the bentonite slurry to ensure the formation of a waterproof lining on the face of the excavation and allow clean placement of concrete
- ensuring that the end of the tremie pipe is always sufficiently embedded in the wet concrete as the bored pile concreting progresses
- avoidance of cold joints due to breakdown in supply of concrete
- overcasting of the pile and chipping back, or baling of the contaminated concrete while wet, to ensure good quality concrete at the pile head.

Notwithstanding delays caused by utility relocations, the construction period for a typical bored pile pier foundation will depend on the number and size of piles per foundation, required depth of pile, soils encountered, etc. The piling work is on the critical path for the pier construction, since once the piles are constructed, multiple teams can be mobilized to complete the remaining reinforced concrete works for the piers.

5.1.2.2 Substructure

The viaduct substructures comprise of conventional reinforced concrete pier columns and pre-stressed concrete pier heads. The columns should be constructed using standardized steel forms to promote a good quality of finish and reduce construction cycle times. The pier head formwork will supported on falsework anchored to the pier columns to minimize required construction area and allow operation within the provided construction work space.

Table 5.1.1 Example of Duration for 1 Pile Construction – LRT Line 2

<table>
<tr><td colspan="6">Foundation/Footing</td><td colspan="2">Column</td><td>Pier Head</td></tr>
<tr><td rowspan="3">Survey etc.</td><td colspan="2">Footing(Foundation)</td><td rowspan="3">Leveling Concrete</td><td rowspan="3">Reinforcement Placing/Form Placing</td><td rowspan="3">Concrete Placing / Curin</td><td rowspan="3">Reinforcement Placing/Form Placing</td><td rowspan="3">Concrete Placing / Curing</td><td rowspan="3">Instllation</td></tr>
<tr><td>Piling Work</td><td>Excavation Work</td></tr>
<tr><td>Pile Driving 6days (a pile/day) Preliminary Works 1day Pile Head Treating 3days</td><td>Sheathing</td></tr>
<tr><td>1day</td><td>10days</td><td>3days</td><td>1day</td><td>6days</td><td>3days</td><td>3days</td><td>3days</td><td>3days</td></tr>
</table>

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Critical issues during construction will be:

- accurate surveying of column location and vertical checking of steel forms
- proper quality control of column formed surfaces and joint areas
- proper handling methods for the steel forms to prevent damage and deformation

Typical progress photographs of the existing LRT Line 2 pier column construction are shown below.

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Figure 5.1.2 Pier Column Construction – LRT Line 2

5.1.2.3 Superstructure

The viaduct will comprise precast post-tensioned concrete elements, pre-fabricated at the casting yard and erected at site. Precast concrete units will be delivered with low-bed trailers of 50 to 100 tons capacity.

Advantages of precast concrete over concrete cast in-situ are:

- Rapid construction on site with minimal impact on traffic, units can be delivered during night time work shifts
- Quality can be controlled and monitored much more easily in the pre-cast yard making it easier to control the mix, placement, steam curing and formed finish
- Weather is eliminated as a factor in the pre-casting process with covered and protected casting beds in the casting yard
- Less labor is required
- On site, precast elements can be installed immediately, there is no waiting for elements to gain strength
- Repeatability—multiple units of the same precast element can be made; and by maximizing repetition, the contractor can maximize the value from a mold and a pre-casting set-up

Depending on the final form of structure adopted, the precast elements will either be PC Box segments, weighing 30 to 40 tons each, or AASHTO girders, weighing up to 50 tons each. The segments or girders units will be provided with lifting points for ease of erection.

1) PC Box Segment Erection

The PC Box segments will be erected using a double steel truss, or a single steel box girder, self propelling overhead erection gantry, depending on the type of PC Box girder segment erected. The erection gantry will typically be designed for the project by a specialist sub-contractor hired by the main contractor for the segment erection. The gantry will be long enough to be self propelled across two viaduct spans, with a total length of at least 60m long and have a lifting capacity of at least 150 tons.

A typical erection sequence of a PC Box segment is as follows:

i. Erect and install the erection gantry support legs on the pier heads by crawler cranes or truck mounted cranes.

ii. Assemble the erection gantry on the constructed support legs by crawler cranes or truck mounted cranes.

iii. PC Box segment is delivered by trailer to the erection gantry, the segment is lifted by winch from a rail mounted movable gantry crane supported above the gantry.

iv. The PC Box segment is rotated if necessary and launched forward by the gantry crane to its required location and then supported from the gantry by four (4) hydraulic jacks, one side of which (2 jacks) is hydraulically linked to provide a determinate 3 point lift.

v. Successive segments are similarly placed, adjusted and leveled. Segments are placed working backward so that the furthest segment is the first positioned.

vi. When all of the segments for a span are positioned, the segment joints are epoxied and joined, the pre-stressing tendons are installed and stressed, and the complete span is lowered onto the bearings and prepared anchor rods before final grouting of the tendon ducts.

vii. The erection gantry is then launched to the next span, and the procedure is repeated.

The position of the gantry legs can be adjusted laterally on beams attached to the pier heads such that the erection gantry can negotiate curved viaduct sections.

During the construction of the existing LRT Line 2, a total of three (3) erection gantries were used with both smaller steel plate box girder and larger steel truss girder designs for the main longitudinal gantry girders, to enable lifting of both single box segments and multiple cell box segments respectively. A typical erection cycle for one viaduct span, twin single box type, is given below:

Table 5.1.2 Example of Duration for 1 Span Erection – LRT Line 2

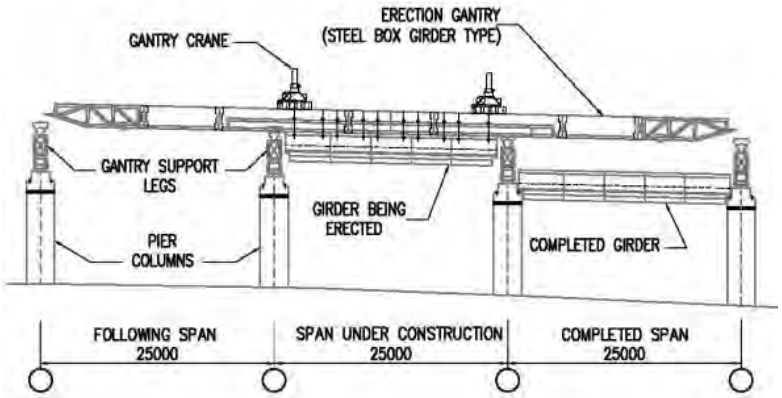
Span Girders (Twin Single Box Type)	Segments transported and erected	Epoxy & Joining of Segments	Stressing of Tendons	Anchor Rod Grouting and Final Lowering	Grouting of Tendon Ducts
Box Girder 1	Day 1	Day 2	Day 2	Day 3	Day 4
Box Girder 2	Day 3	Day 4	Day 4	Day 5	Day 6
Launching of erection girder to next span					2 – 3 Days
Total Cycle Time for One (1) Span					8 – 9 Days

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

A typical progress photograph of the existing LRT Line 2 PC box girder construction is presented in the photograph below showing a truss type erection gantry used to erect multiple cell box segments. An illustration of a typical steel box girder type erection gantry, used to erect the twin box segments, is given in the figure below.

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Figure 5.1.3 PC Box Girder Erection (Truss Type Erection Gantry) – LRT Line 2



Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Figure 5.1.4 Typical Erection Gantry (Steel Box Girder Type)

2) AASHTO Girder Erection

The AASHTO girders will be erected using crawler cranes or truck mounted cranes. A single girder will typically require two crawler cranes supporting and lifting the girder from each end, or a single large capacity truck crane.

The main advantage of crawler cranes is that multiple sets can be mobilized to erect girders at several locations along the viaduct and they can perform each lift with little set-up, since the crane is stable on its tracks with no outriggers. In addition, a crawler crane is capable of traveling with a load.

Truck mounted cranes are able to travel on highways, eliminating the need for special equipment to transport the crane. Outriggers are extended horizontally from the chassis then vertically to level and stabilize the crane while stationary and hoisting. The outriggers allow large lifting capacities with a single crane able to lift the girders.

The Line 1 North Extension Project (NEP) features AASHTO Type 5 girders with typical span of 28m and a concrete deck slab formed in situ. The 5.4km of viaduct was constructed in 18 months using truck mounted cranes to erect the girders.

Construction progress photographs showing the Line 1 NEP AASHTO girder erection are shown in the photographs below.

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Figure 5.1.5 Girder Erection by Single Truck Mounted Crane – LRT Line 1 NEP

3) Construction at Overlapping Section with Highway

The section where the alignment overlapped with the Connector Road Project, to be completed prior to NSCR, it is expected space constraints of work space under the highway structure. The fixed supporting erection method shall be adopted due to difficulty of election using gantry crane or large truck crane. This method is assembling fixed supporting system at election site, then constructing the structure body on that support. Fix support system is combined with the small size of the temporary member, there is no need to use large truck crane, furthermore it is not only applicable to narrow construction space but also to variety of terrain.

Source: Japan Prestressed Concrete Contractors Association

Figure 5.1.6 Example of Fixed Supporting Method

5.1.3 Elevated Stations

Elevated station structure is supported entirely from centrally located piers with cantilever pier heads. The critical phase in terms of impact on traffic is during the construction of the cantilever pier heads. At this stage the central construction area will occupy a width of approximately 20m of ROW to allow falsework support to the cantilever ends of the pier head. However, once the pier heads are constructed and the concourse level supporting beams and floor is in place, the traffic lanes can be re-opened and construction can proceed with minimal impact on traffic flow, at least during daylight hours. For the Line 1 NEP project, traffic lanes were occupied at each station for approximately 6 months before station construction progressed sufficiently to allow full road access to the traffic.

Typical progress photographs of the LRT Line 1 NEP station construction are shown below.

Cantilever Pier

Concourse and Platform

Source: Preparatory Study for LRT Line2 Extension Project, October 2011, JICA

Figure 5.1.7 Station Construction – LRT Line 1 NEP

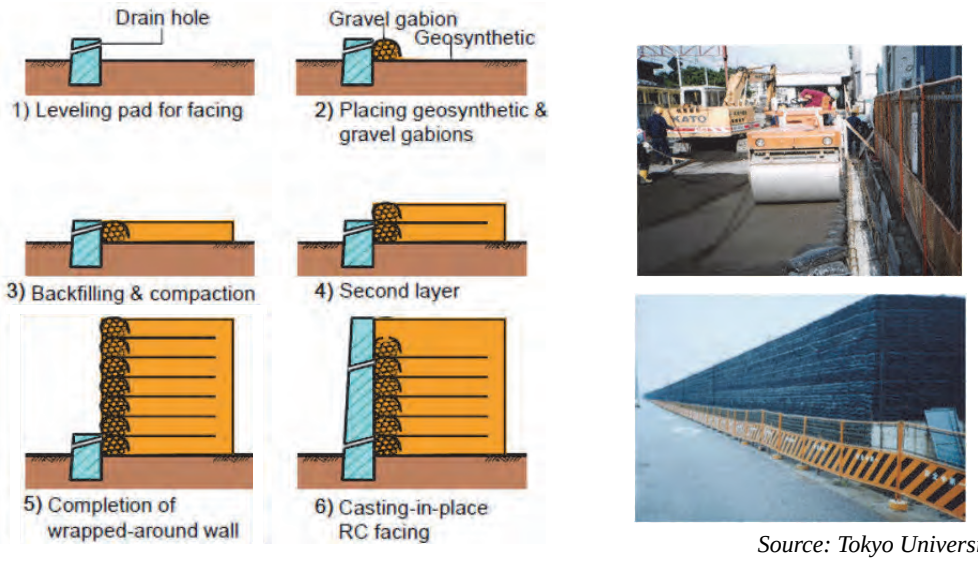
5.1.4 Embankment

Construction of GRS retaining wall is as follows.

Step 1- 2: After grubbing and levelling the ground, place gabions at the shoulder of each soil layer.

Step 3- 4: Compaction of the backfilling with approximately 0.3m of each layer, without rigid facing during backfill compaction

Step 5- 6: After sufficient compression of backfill and supporting ground has taken place, a full-height rigid facing is constructed by casting-in-place concrete directly on the wrapped-around wall



Source: Tokyo University of Science

Figure 5.1.8 Construction Method of GRS Retaining Wall

5.1.5 Depot

Consideration of depot construction method shall be carefully examined in consideration with both topographic and geotechnical conditions of the site. The earth filling method is a simple method by filling the depot area with well-graded soil and using rollers for compaction. This construction method is in good cost efficiency and easiness of construction. On the other hand, it may require more construction time for ground settlement by the weight of the filling material. It is necessary to consider soil improvement or preloading if there are soft cohesive soil layers beneath the depot area.

It is recommended to commence preloading earth filling for one or two years prior to the track works to promote compaction and drainage of the ground. It is also considerable to apply vertical drain or paper /plastic drain for reducing the construction time if necessary.

Furthermore it is necessary to conduct more detailed geotechnical and hydrological surveys, including soil laboratory tests and a hydrologic study for flooding at the depot area during design stage.

5.2 Traffic Management and Safety Planning During the Construction Period

The Construction of NSCR will have an impact on traffic and will reduce the traffic-capacity, particularly on the major national roads linking Bulacan province to Metro Manila and Laguna province. In order to mitigate the congestion on the traffic flow, a comprehensive traffic and safety management plan will be required by the developed by the Contractor for approval prior to commencing of construction work.

The Contractor will be required to coordinate closely with the government traffic authorities, cities, municipalities, barangays and other relevant agencies to ascertain the requirements in relation to the management of traffic flows during construction and based on these establish a traffic and safety plan for approval.

Table 5.2.1 List of Agencies Relevant to Traffic/Safety Management during Construction

Name of Government Organization	Functions
Metropolitan Manila Development Authority (MMDA)	Primary role is to coordinate and integrate the efforts of local governments and the central government in drawing up policies and plans and implementing transport projects within Metro Manila.
Department of Public Works and Highways (DPWH)	Responsible for road construction and maintenance of National Roads.
Local Government Unit (LGUs)	Enforces traffic regulations and physically directs traffic on the street. Responsible for road construction and maintenance for local roads.
Department of Transportation and Communication (DOTC)	Authority and responsibility for national transportation policy and its implementation strategy.
Traffic Engineering Center (TCT)	Responsible for road planning that requires traffic engineering.
Utility Authorities/ Companies	Responsible for the installation and maintenance of the various utilities.

Source: JICA Study Team

The traffic and safety management plan shall include the following features,

i. Traffic Detour: Designation of traffic detours or rerouting plans in the event that the minimum number of lanes cannot be open for certain construction activities requiring either that all lanes are closed or that an insufficient number of lanes are open to prevent serious congestion. In formulating a traffic detouring plan, the Contractor will be required to undertake a road inventory survey, including travel time and delay surveys along affected roads and on identified alternative routes

ii. Public Relations: Advertisements, billboards, road advisories, public and stakeholder consultations, other meetings, etc.

iii. Night shift work

iv. Project coordination: Reduction of material transportation frequency by harmonizing and interfacing work schedules with neighboring sections and/or other project work packages.

v. Monitoring of Traffic and Safety Management

5.3 Procurement Plan

5.3.1 Civil

The Procurement Plan for Material and Equipment of Civil Work shall be assumed for Elevated Structures of NSCR as shown in the following table. It is shown for each main material and equipment at the construction site with an Elevated Structure. Each material and piece of equipment involves both Foreign and Local Currency.

Table 5.3.1 Main Materials and Equipment

Items		Currency		Construction Site	
				Elevated	
		Foreign	Local	Structure	Station
Materials	Cement	△	◎	○	○
	Fine Aggregate	△	◎	○	○
	Coarse Aggregate	△	◎	○	○
	Rebar	△	◎	○	○
	Metal Materials	◎	△	○	○
	Shoe	◎	△	○	×
	Pre stressing Tendons	◎	△	○	×
	Water Proofing	◎	△	○	○
	Paint	◎	△	○	○
	Formwork	◎	◎	○	○
Equipment	Escalator	◎	△	×	○
	Elevator	◎	△	×	○
	Ventilation	◎	△	×	×
	Air Conditioner	◎	△	×	○
	Lighting	◎	◎	○	○

Legend ◎ - applicable △- not applicable ○ - be used × - not to be used

Source: JICA Study Team

The main materials such as cement with different brands, fine and coarse aggregates and re-bars are usually available in the Philippines. Other metal materials, shoe and pre-stressing tendons will be available from foreign sources.

Regarding temporary equipment, it is shown for each main piece of temporary equipment at the construction sites with elevated structures as shown below.

The most of temporary equipment such as a crawler crane is currently only available from foreign countries while other different types of earth augers used for soil drilling are currently available nationwide. Other equipment such as scaffolding, concrete pumps, generators, backhoes, dump trucks and rammers are all available from foreign countries. But, in some construction businesses here in the Philippines, most of the major project contractors bought and imported that equipment from foreign countries and made it available in the Philippines for rental purposes.

Table 5.3.2 Main Temporary Equipment

Items	Currency		Construction Site	
			Elevated	
	Foreign	Local	Structure	Station
Crawler Crane	◎	△	○	○
Earth Auger	◎	◎	○	○
Scaffolding	◎	△	×	○
Concrete Pump	◎	△	○	○
Generator	◎	△	○	○
Backhoe	◎	△	○	○
Dump truck	◎	△	○	○
Ramer	◎	△	○	○
Vibrator Roller	◎	△	○	○
Mobile Lift	◎	△	○	○
Erection Gantry	◎	△	○	×
Sheet pile	◎	△	○	×
Trench Timbering	◎	△	×	×
Covering plate	◎	△	○	×
Temporary Elevator	◎	△	×	○
Temporary Lift	◎	△	×	○

Legend ◎ - applicable △- not applicable ○ - be used × - not to be used

Source: JICA Study Team

5.3.2 Rolling Stock

There is no supplier of rolling stock or rolling stock parts in the Philippines and all rolling stock used in existing railways have been imported. Rolling stock used in this project also must be imported.

5.3.3 Electrical and Mechanical Systems

The procurement plan for materials and equipment regarding the electrical and mechanical systems for the NSCR is shown in Table 5.3.3.

Table 5.3.3 Procurement Plan for Materials and Equipment - E&M System

System		Foreign currency	Local currency	Procurement Plan
1.	Power Supply and Catenary	85%	15%	The feeding system of a Japanese standard is adopted. A Japanese supplier implements the installation work. Products of transformer and distribution facilities would be imported from Japan and the third country. Catenary of a Japanese standard is introduced. Parts of the catenary would be imported from Japan and the third country.
2.	Signaling	85%	15%	The CBTC system developed in Japan is adopted. Signal equipment would be imported by a Japanese signaling supplier and the installation work would be implemented by them.
3.	Telecommunications	85%	15%	The communications function used in Japan is introduced into the digital train radio of NSCR. Products of Telecommunications facilities would be imported from Japan and the third country.
4.	Track Works	75%	25%	Solid bed tracks with removable sleepers of Japanese specification are adopted. End head hardened rails which have resistance to wear would be imported from Japan.
5.	Depot Facilities	80%	20%	Depot equipment would be imported from Japan and the third country. The installation work would be implemented by a Japanese supplier.
6.	Automatic Fare Collection (AFC)	90%	10%	Specification of common ticketing system for integration of AFC of LRT 1, LRT 2, and MRT 3 is adopted.

Source: JICA Study Team

5.4 Study on Applicability of STEP

The NSCR is designated as a new commuter railway in Metro Manila. Therefore, NSCR shall, different from the specification of LRT or MRT, be designated to as the highly important railway line in Metro Manila.

Due to ensuring the requirements for NSCR mentioned above, it is enumerated the superiority of Japan's railway technologies such as the following items.

i. High quality material
ii. Special material and equipment
iii. Electrical and electronic related products
iv. Precision equipment
v. Environmentally (Ecologically)-friendly railway system
vi. Station facilities considering the passenger's convenience, safety and ecologically-friendly

Items shown in the Table below are items that it is most likely to be purchased the product of Japanese companies in consideration with requirement to the NSCR operation.

Table 5.4.1 STEP Potential Items

Category	Item	Sub Item	Recommendation
a) Civil Works	Bridge	Steel Bridge (Weather-proof Steel)	This project is planned to construct near the coast, and is subject to impact from the sea owing to the frequent typhoon. Therefore, selection of steel bridge type which has forceful corrosion measure strong against salt damage is required. Japan's experience of weather- proof steel material will be a strong advantage due to maintenance- free structure. Rust does not proceed even without painting this material. It's color due to artificial rust can be paint any color. This item will be an applicable subject of STEP. Additionally, know-how utilization of Japanese companies will be an applicable subject of STEP.
		Steel Bearing Shoe	Bearing shoe is the parts for bearing the weight of long span superstructure. Steel bearing shoe applied for long span bridges is the steel products which is a deep experienced Japanese products. This item will be an applicable subject of STEP.

Category	Item	Sub Item	Recommendation
a) Civil Works	Viaduct	PC Concrete Bridge	Box type structure is superior than I type or T type from the viewpoint of less exposed surface. Additionally, construction experiences in Japan are superior than other country's considering the introduction of pre-stress. - As the advantages, there are use of grout filling material and polyethylene sheath which is strong against deformation, adoption of pregrouted steel, construction management by grout sensor with IC tag, intrusion prevention of chloride ion owing to electrode surface and preventing neutralization of concrete, etc. - For quality improvement, by describing above mentioned items in particular specification for contractor, the advantages can be secures. - LCC (Life Cycle Cost) can be reduce by construction techniques and technical advices of Japan. Meanwhile, multi-column concrete bridge which is general type in Japan is a complicated structure type and has not advantage as an applicable subject of STEP, and also from the viewpoint of landscape.
		PC Tendon	PC tendon, the products of steel material that the Japan has good experience, and embedding in the pre-stressed concrete to resist the tensile strength.
		Rubber Bearing Shoe	Rubber bearing shoe is a products using special rubber material, which is a subject to be applied Japanese good experience. Same as the steel bearing shoe, rubber bearing shoe is used to the support part receiving girder. Additionally, vibration control friction damper bearing with negative stiffness is the advantage of Japan.
	Temporary Facilities	Low- height Pile Driving Machine	Construction in a narrow site is one of the superiority of Japan's technology. In this project narrow construction site is expected crossing under Segment 10 structure. Due to limitation of height under such structure, low- height pile driving machine will have the superiority of Japanese construction technology. Therefore this item will be an applicable subject of STEP.

Category	Item	Sub Item	Recommendation
a) Civil Works	Building Material	Roof Material for Stations	It is a roofing material using a special cloth that the Japanese companies have much superiority. It is much strength and stain- resistance material and to reduce maintenance costs.
	Utilization of Superior Techniques of Japanese Companies	Bridge and Construction Technique	Provided services, providing equipment and materials from Japan and technical advices are considered to contribute to the orders of Japanese companies.
b) Track Works	Rail	Heat- treated Rail (60Kg)	It is one of the steel products appearing superiority of Japanese technology. Heat-treated rail is performed a special heat treatment to the rail to increase durability and longevity. The cost will be increase to 20-30% as compared to general rail, but heat-treated rail provides excellent durability (resistance for wear and crack). The exchange cycle of the heat-treated rail develops at about 4 times compared with a general rail.
c) Power Supply System	Substation Facilities	Transformer, Power distribution	It is one of the electrical equipment appearing a superiority of Japanese products. Consideration with necessity of stable power supply of railway it is required the quality and durability to the electrical facilities. Therefore this item will be an applicable subject of STEP. As for the distribution facilities, regenerative power storage equipment and adoption of combined feeding system which is for reduction of voltage drop loss during regeneration are considered.
d) Operation Safety Facilities	Signal Safety System	Interlocking Devices ATP System CTC/PRC System	It is one of the electrical/ electronic equipment appearing a superiority of Japanese products. Consideration with importance of signal system to liability and safety of railway operation, it is required the quality and durability to the signal system. Therefore this item will be an applicable subject of STEP.
e) Station Facilities	Station Facilities	AFC Facilities	It is one of the electrical/ electronic equipment appearing a superiority of Japanese products. Consideration with efficiency of automatic fair collection, it is required the quality and durability to the AFC facilities. Therefore this item will be an applicable subject of STEP.

Category	Item	Sub Item	Recommendation
e) Station Facilities	Station Facilities	Environmental Measure Facilities	As for the ecologically-friendly measures at the stations, following items are considered. - Reducing CO2 emission in entire station building by changing to LED lighting and introducing lighting control system - Reducing power usage of the stations by introducing the solar power system at platform and concourse.
f) Workshop Facirities	Facilities of Rolling Stock Inspection and Maintenance	Important, Critical Parts Inspection Facilities Routine Inspection Facilities	Precise equipment applying to depot and workshop is having a superiority of Japanese products. Precision and quality is one of the basic requirements for inspection and maintenance facilities. Therefore this item will be an applicable subject of STEP. - Reducing the power usage by introducing the same ecologically-friendly measures at the stations.
g) Rolling Stock	Passenger Car	EMU	- Narrow gage (1067mm) train was developed in Japan, and there are a lot of introduced experiences. ・EMU is an assembly of Japan's superior technologies such as high quality material, electrical/ electronic equipment. There is also a Japanese companies are currently promoting the Japan's railway system in the home territory of the "Big-3" (Siemens, Bombardier, Alstom) in Europe. Therefore this item will be an applicable subject of STEP. - As for the ecologically-friendly measure (climate change), the costs of operation and maintenance management can be reduced by using the stainless or aluminum car body and lightweight car bogie and equipment. - utilization of advanced technologies such as using regeneration brake, adopting energy efficiency function by VVVF control, noise reduction and barrier-free measures are the advantages. - In Europe, the territory of the "Big-3" (Siemens, Bombardier, Alstom), Japanese companies are actively developing the high speed rolling stock, and rolling stock of narrow gage will be an applicable subject of STEP.

Category	Item	Sub Item	Recommendation
g) Rolling Stock	Passenger Car	EMU	- The background of the advantages of Japanese EMU are as follows; 1) Approximately 20,000 cars of public and private railways are operating in metropolitan area. And based on the proper maintenance, this railway network is formed with high reliability and unlike any other in the world. 2) The design and manufacture of the EMU are conducted considering the feedback of operating issues, and secured high reliability. 3) Owing to the frequent track sharing in metropolitan area, many of cars and car parts are standardized for sharing tracks each other. Therefore many of car parts are on production line constantly, and supplying car parts for maintenance is expected to be smooth by adopting the same specification.

Source: JICA Study Team

5.5 Project Implementation Schedule

As shown table below, the North South Commuter Rail Project will be divided into 7 packages for mainline construction, depot construction, E&M and rolling stock.

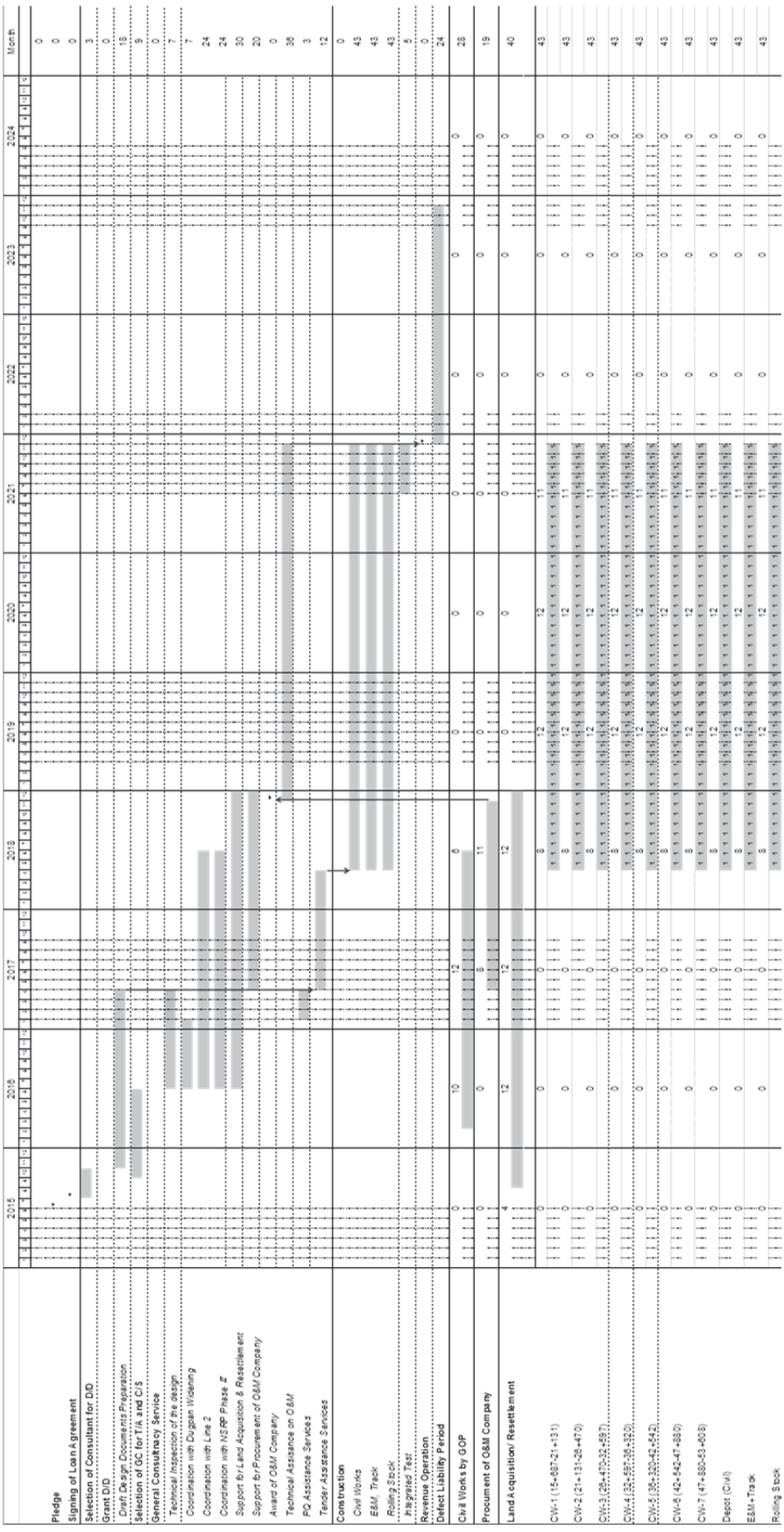
Table 5.5.1 Project Package

	Package (Chainnage)	Section (Station)	L (Km)
Mainline	CW-1 (15+687-21+131)	Tutuban- Caloocan (Tutuban, Solis)	5.4
	CW-2 (21+131-26+470)	Caloocan- Varenzuela (Caloocan)	5.3
	CW-3 (26+470-32+597)	Varenzuela- Malirao (Varenzuela, Maycauyan)	6.1
	CW-4 (32+597-36+320)	Marilao- Bocaue2 (Malirao)	3.7
	CW-5 (36+320-42+542)	Bocaue- Balagtas (Bocaue, Baalagtas)	6.2
	CW-6 (42+542-47+880)	Balagtas- Guiguinto (Guiguinto)	5.3
	CW-7 (47+880-53+608)	Guiguinto- Malolos (Malolos)	5.7
Depot	Depot (Civil Works)	Civil Works+ Building	-
E&M, RS	E&M+ Track	Mainline+ Depot	-
	Rolling Stock		-

Source: JICA Study Team

As the Government of Philippines wishes to start this project as soon as possible to appeal to commence the mass transit project contributing to alleviate the current poor traffic condition of the Greater Metro Manila. The first section commenced in short, by own budget, might be site preparation such as fencing, grabbing and leveling for main line, station area and depot. Such works will be the subject to exclude from the project scope, therefore those costs are not considered in cost estimation of the Project.

The draft implementation plan is as shown Figure below. It is drawn with assumption of timing of L/A is August 2015.



Source: JICA Study Team

Figure 5.5.1 Project Implementation Schedule

5.6 Examination of Consulting Services, TOR and Manning Schedule

Objectives of the Consulting Services, Terms of Reference (TOR) and Manning Schedule are as described below.

5.6.1 Objectives of Consulting Services

The objectives of this Consulting Services for NSCR Project between Malolos and Tutuban are defined as shown below on each subject of the Project. The detailed design will be carried out with grant assistance of the Government of Japan.

- To assist the Client in the Bid Call and Pre-bid conference, Bid Evaluation and Clarification, Awarding Bidder and Contracting for the following works.
  - Construction of elevated guide-way as well as elevated stations including track works
  - Construction of depot and procurement maintenance and inspection equipment including track works
  - Installation of electrical and mechanical system
  - Procurement of rolling stock
- To supervise the Construction Works during the Project Construction Stage followed by the Commissioning, Test and Handover to the Employer.

5.6.2 TOR

The Employer shall be responsible to coordinate with the relevant authorities: DPWH, MMDA, DENR and other concerned agencies. General Consulting (GC) Services will assist the Employer in the coordination as required.

Works of the GC Services include the following scope of works and study requirements:

1) Review of Detailed Design

2) Tender Assistance
- Assistance of Pre-Qualification
- Assistance of Tender Evaluation

3) Construction Supervision Stage
- Construction Site Hand Over
- Review the Contractors submittals and Design Interface
- Supervise the Civil Work Construction and the E&M Installation
- Quality Control and Quality Assurance
- Safety Management Plan
- Material Testing
- Work Acceptance, Disbursement Request, and Payment Certificate
- Amendment, Changes, Variations and Disputes
- Monthly and Ad Hoc Progress Meeting
- Testing and Commissioning
- System Integration of Train Operation

4) Post-Construction Stage

- Defect Liability Period
- Final Taking Over
- Project Completion Report

5) Social and Environmental Consideration and Monitoring

- Promotion of Environmental Management Plan
- Promotion of Environmental Monitoring Plan
- Promotion of Resettlement Action Plan

6) Coordination and Advisory Activities

- Coordination with Relevant Project, design consultant etc.
- Assistance for Public Relations Activity
- Supporting on Establishment of O&M Guidelines, Staff Training
- Monitoring and Advising on Operation & Maintenance

5.6.3 Manning Schedule

Services of GC will be carried by qualified Consultants who have enough experience to complete assigned services. Estimated below, the Consultant's team may consist of the following professionals. Herein, Professional A means International Expatriates who have suitable capabilities to conduct the Project having general work experience 10 years or more after graduating from university/college. Professional B means the Local Experts who have sufficient capabilities to conduct the Engineering Study for the urban type mass transit. The estimated Man-Months are as shown below.

Table 5.6.1 Staffing Requirements

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
	Professional (A) Staff				
A1	Project Director	22	43	6	71
A2	Project Coordinator 1	22	43	0	65
A3	Project Coordinator 2	10	0	0	10
A4	Chief Contract-Financial Manager	22	43	0	65
A5	Contract Manager 1	12	43	12	67
A6	Contract Manager 2	12	0	0	12
A7	Cost Control & Estimation Expert	10	43	0	53
A8	Specification Expert 1	22	23	0	45
A9	Specification Expert 2	12	0	0	12
A10	Manual Expert	0	23	0	23
A11	Construction Schedule Expert 1	10	43	0	53
A12	Chief Quality Assurance & Quality Control Expert	16	43	0	59
A13	System Safety Expert	16	43	0	59
A14	Safety & Health Expert	0	43	0	43
A15	Operation & Maintenance Rule Expert	10	18	6	34
A16	Training Expert	0	18	0	18

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
A17	Quality Expert (Civil)	6	43	0	49
A18	Quality Expert (Elect.)	6	43	0	49
A19	Quality Expert (S&T)	6	43	0	49
A20	Labour Protection Specialist	0	43	0	43
A21	Natural Environment Expert 1	7	21	0	28
A22	Social Environment Expert (Land Acquisition) 1	22	43	0	65
A23	Social Environment Expert (Land Acquisition) 2	22	8	0	30
A24	Social Environment Expert (Resettlement) 1	22	43	0	65
A25	Social Environment Expert (Resettlement) 2	22	8	0	30
A26	Railway Civil Project Manager 1	12	43	4	59
A27	Interface Coordinator	12	43	0	55
A28	Depot Design Expert	12	0	0	12
A29	Railway Alignment Expert 1	12	43	0	55
A30	Chief Structure Planner	12	0	0	12
A31	Sub-structure Expert	12	0	0	12
A32	Super-structure Expert	12	0	0	12
A33	Station Structure Expert	12	0	0	12
A34	Hydrologic Expert	12	0	0	12
A35	Earthwork Expert	12	0	0	12
A36	Architectural Project Manager	12	43	4	59
A37	Architectural Expert	12	43	0	55
A38	Station Layout Planner 1	12	43	0	55
A39	Landscape Expert	12	43	0	55
A40	Depot Building Expert (Civil)	0	43	0	43
A41	Depot Building Expert (Elect)	0	43	0	43
A42	Project Manager (Civil Construction)	12	43	4	59
A43	Director of Super-structure Engineers	0	43	0	43
A44	Director of Sub-structure Engineers	0	43	0	43
A45	Director of Station Structure Engineers	0	43	0	43
A46	Resident Civil Engineer 1	0	32	0	32
A47	Resident Civil Engineer 2	0	32	0	32
A48	Resident Civil Engineer 3	0	32	0	32
A49	Resident Civil Engineer 4	0	32	0	32
A50	Resident Civil Engineer 5	0	32	0	32
A51	Resident Civil Engineer 6	0	32	0	32
A52	Resident Civil Engineer 7	0	32	0	32
A53	GIS Expert	0	38	0	38
A54	Material Expert (Civil)	0	32	0	32
A55	Project Manager (Civil Depot)	12	33	4	49
A56	Depot Yard Layout Expert	0	33	0	33
A57	Depot Civil/Structure Expert	0	28	0	28

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
A58	Project Manager (E&M, Rolling Stocks)	0	43	5	48
A59	Railway System Expert	0	34	5	39
A60	Rolling Stock Expert	0	43	5	48
A61	Railway & Track Expert	0	43	5	48
A62	Interface System Integrator	0	43	5	48
A63	Material Expert (E&M)	0	30	0	30
A64	Material Expert (S&T)	0	30	0	30
A65	Power Supply Expert	0	43	5	48
A66	Substation Expert	0	30	5	35
A67	Overhead Contact Expert	0	30	5	35
A68	Signaling Expert	0	43	5	48
A69	Telecommunication Expert	0	43	5	48
A70	Passenger Information System Expert	0	30	5	35
A71	Automatic Fare Collection Expert	0	30	5	35
A72	Depot Equipment Expert	0	43	5	48
A73	E & M Resident Engineer 1	0	30	0	30
A74	E & M Resident Engineer 2	0	30	0	30
A75	E & M Resident Engineer 3	0	30	0	30
A76	E & M Resident Engineer 4	0	30	0	30
A77	E & M Resident Engineer 5	0	30	0	30
A78	E & M Resident Engineer 6	0	30	0	30
A79	E & M Resident Engineer 7	0	30	0	30
A80	Finance and Business Management Advisor	22	43	24	89
A81	Operation and E&M Advisor	22	43	24	89
A82	Rolling Stock and Depot Advisor	22	43	24	89
A83	Signal and Telecommunication Advisor	22	43	24	89
A84	Civil and Track Advisor	22	43	24	89
	Professional (B) Staff				
B1	Deputy Project Director	12	43	24	79
B2	Contract Administrator	12	43	24	79
B3	Cost Estimator/ Controller 1	12	43	24	79
B4	Cost Estimator/ Controller 2	12	43	24	79
B5	Cost Estimator/ Controller 3	12	43	24	79
B6	Schedule Engineer	0	43	0	43
B7	Assist. Project Coordinator 1	12	15	0	27
B8	Assist. Project Coordinator 2	12	0	0	12
B9	Assist. Project Coordinator 3	12	0	0	12
B10	Assist. Project Coordinator 4	12	0	0	12
B11	Assist. Specification Expert 1	12	5	0	17
B12	Assist. Specification Expert 2	12	0	0	12
B13	Assist. Specification Expert 3	12	0	0	12

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
B14	Assist. Specification Expert 4	12	0	0	12
B15	Chief Quality Assurance & Quality Control Engineer	0	43	0	43
B16	System Safety Engineer	0	38	8	46
B17	Safety & Health Engineer	0	43	0	43
B18	Quality Engineer (Civil)	0	33	0	33
B19	Quality Engineer (Elect.)	0	38	0	38
B20	Quality Engineer (S&T)	0	43	0	43
B21	IT Engineer	0	43	0	43
B22	Training Coordinator	0	18	0	18
B23	Natural Environment Engineer	0	43	0	43
B24	Social Environment Engineer (Resettlement) 1	22	43	0	65
B25	Social Environment Engineer (Resettlement) 2	22	43	0	65
B26	Social Environment Engineer (Resettlement) 3	22	43	0	65
B27	Social Environment Engineer (Resettlement) 4	22	43	0	65
B28	Social Environment Engineer (Resettlement) 5	22	43	0	65
B29	Social Environment Engineer (Resettlement) 6	22	43	0	65
B30	Social Environment Engineer (Resettlement) 7	22	43	0	65
B31	Social Environment Engineer (Resettlement) 8	12	43	0	55
B32	Social Environment Engineer (Resettlement) 9	12	43	0	55
B33	Social Environment Engineer (Resettlement) 10	12	43	0	55
B34	Social Environment Engineer (Resettlement) 11	12	43	0	55
B35	Social Environment Engineer (Resettlement) 12	12	43	0	55
B36	Social Environment Engineer (Resettlement) 13	12	43	0	55
B37	Social Environment Engineer (Resettlement) 14	12	43	0	55
B38	Earthwork Engineer 1	0	43	0	43
B39	Earthwork Engineer 2	0	43	0	43
B40	Drainage Engineer 1	0	43	0	43
B41	Drainage Engineer 2	0	43	0	43
B42	Geotechnical Engineer 1	0	43	0	43
B43	Geotechnical Engineer 2	0	43	0	43
B44	Deputy Architectual Project Manager	0	43	0	43
B45	Architectural Engineer	0	32	0	32
B46	Station Layout Engineer 1	0	32	0	32
B47	Station Layout Engineer 2	0	32	0	32
B48	Landscape Engineer	0	32	0	32
B49	Building Engineer (Civil)	0	32	0	32
B50	Building Engineer (Elect.)	0	38	0	38
B51	Deputy Project Manager (Civil Construction)	0	32	4	36
B52	Super-structure Engineer 1	0	28	0	28
B53	Sub-structure Engineer 1	0	28	0	28
B54	Station Structure Engineer 1	0	32	0	32

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
B55	Material Engineer (Civil) 1	0	32	0	32
B56	Super-structure Engineer 2	0	28	0	28
B57	Sub-structure Engineer 2	0	28	0	28
B58	Station Structure Engineer 2	0	32	0	32
B59	Material Engineer (Civil) 2	0	32	0	32
B60	Super-structure Engineer 3	0	28	0	28
B61	Sub-structure Engineer 3	0	28	0	28
B62	Station Structure Engineer 3	0	32	0	32
B63	Material Engineer (Civil) 3	0	32	0	32
B64	Super-structure Engineer 4	0	28	0	28
B65	Sub-structure Engineer 4	0	28	0	28
B66	Station Structure Engineer 4	0	32	0	32
B67	Material Engineer (Civil) 4	0	32	0	32
B68	Super-structure Engineer 5	0	28	0	28
B69	Sub-structure Engineer 5	0	28	0	28
B70	Station Structure Engineer 5	0	32	0	32
B71	Material Engineer (Civil) 5	0	32	0	32
B72	Super-structure Engineer 6	0	28	0	28
B73	Sub-structure Engineer 6	0	28	0	28
B74	Station Structure Engineer 6	0	32	0	32
B75	Material Engineer (Civil) 6	0	32	0	32
B76	Super-structure Engineer 7	0	28	0	28
B77	Sub-structure Engineer 7	0	28	0	28
B78	Station Structure Engineer 7	0	32	0	32
B79	Material Engineer (Civil) 7	0	32	0	32
B80	GIS Engineer 1	0	32	0	32
B81	GIS Engineer 2	0	32	0	32
B82	Deputy Project Manager (Civil Depot)	0	33	4	37
B83	Depot Yard Layout Engineer	0	28	0	28
B84	Depot Civil/ Structure Engineer	0	28	0	28
B85	Deputy Project Manager (E&M, Rolling Stock)	0	43	8	51
B86	Railway System Engineer	0	34	0	34
B87	Rolling Stock Engineer	0	43	0	43
B88	Railway & Track Engineer	0	43	0	43
B89	Material Engineer (E&M)	0	30	0	30
B90	Material Engineer (S&T)	0	30	0	30
B91	Power Supply Engineer	0	43	0	43
B92	Substation Engineer	0	30	0	30
B93	Overhead Contact Engineer	0	30	0	30
B94	Signaling Engineer	0	43	0	43
B95	Telecommunication Engineer	0	43	0	43

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
B96	Passenger Information System Engineer	0	30	0	30
B97	Automatic Fare Collection Engineer	0	30	0	30
B98	Depot Equipment Engineer	0	43	0	43
B99	Track Engineer 1	0	30	0	30
B100	Track Engineer 2	0	30	0	30
B101	Track Engineer 3	0	30	0	30
B102	Track Engineer 4	0	30	0	30
B103	Track Engineer 5	0	30	0	30
B104	Track Engineer 6	0	30	0	30
B105	Track Engineer 7	0	30	0	30
B106	Advisory Engineer 1	22	43	24	89
B107	Advisory Engineer 2	22	43	24	89
	Supporting Staff				
C1	Office Manager	22	43	24	89
C2	Office Administrator	22	43	24	89
C3	Bilingual Secretary 1	22	43	24	89
C4	Bilingual Secretary 2	12	43	0	55
C5	Bilingual Secretary 3	12	43	0	55
C6	CAD Operator 1	6	43	24	73
C7	CAD Operator 2	6	43	0	49
C8	CAD Operator 3	6	0	0	6
C9	CAD Operator 4	6	0	0	6
C10	CAD Operator 5	6	0	0	6
C11	CAD Operator 6	6	0	0	6
C12	CAD Operator 7	6	0	0	6
C13	Assistant Surveyor 1	0	43	0	43
C14	Assistant Surveyor 2	0	43	0	43
C15	Assistant Geotechnician 1	0	43	0	43
C16	Assistant Geotechnician 2	0	43	0	43
C17	Social Environment Assistant 1	12	43	0	55
C18	Social Environment Assistant 2	12	43	0	55
C19	Social Environment Assistant 3	12	43	0	55
C20	Social Environment Assistant 4	12	43	0	55
C21	Social Environment Assistant 5	12	43	0	55
C22	Social Environment Assistant 6	12	43	0	55
C23	Social Environment Assistant 7	12	43	0	55
C24	Structure Inspector(Civil) 1	0	32	0	32
C25	Structure Inspector(Civil) 2	0	32	0	32
C26	Structure Inspector(Civil) 3	0	32	0	32
C27	Structure Inspector(Civil) 4	0	32	0	32
C28	Structure Inspector(Civil) 5	0	32	0	32

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
C29	Structure Inspector(Civil) 6	0	32	0	32
C30	Structure Inspector(Civil) 7	0	32	0	32
C31	Structure Inspector(Architect) 1	0	32	0	32
C32	Structure Inspector(Architect) 2	0	32	0	32
C33	Structure Inspector(Architect) 3	0	32	0	32
C34	Structure Inspector(Architect) 4	0	32	0	32
C35	Structure Inspector(Architect) 5	0	32	0	32
C36	Structure Inspector(Architect) 6	0	32	0	32
C37	Structure Inspector(Architect) 7	0	32	0	32
C38	Material Inspector(Civil) 1	0	32	0	32
C39	Material Inspector(Civil) 2	0	32	0	32
C40	Material Inspector(Civil) 3	0	32	0	32
C41	Material Inspector(Civil) 4	0	32	0	32
C42	Material Inspector(Civil) 5	0	32	0	32
C43	Material Inspector(Civil) 6	0	32	0	32
C44	Material Inspector(Civil) 7	0	32	0	32
C45	Material Inspector(Electricity) 1	0	25	0	25
C46	Material Inspector(Electricity) 2	0	25	0	25
C47	Material Inspector(Electricity) 3	0	25	0	25
C48	Material Inspector(Electricity) 4	0	25	0	25
C49	Material Inspector(Electricity) 5	0	25	0	25
C50	Material Inspector(Electricity) 6	0	25	0	25
C51	Material Inspector(Electricity) 7	0	25	0	25
C52	Track Inspector 1	0	29	0	29
C53	Track Inspector 2	0	29	0	29
C54	Track Inspector 3	0	29	0	29
C55	Track Inspector 4	0	29	0	29
C56	Track Inspector 5	0	29	0	29
C57	Track Inspector 6	0	29	0	29
C58	Track Inspector 7	0	29	0	29
C59	E&M Inspector 1	0	25	0	25
C60	E&M Inspector 2	0	25	0	25
C61	E&M Inspector 3	0	25	0	25
C62	E&M Inspector 4	0	25	0	25
C63	E&M Inspector 5	0	25	0	25
C64	E&M Inspector 6	0	25	0	25
C65	E&M Inspector 7	0	25	0	25
C66	IT Technician	12	43	24	79
C67	Web Technician	12	43	0	55
C68	Executive Secretary	12	43	0	55
C69	Chief Secretary	12	43	24	79

No.	Designation	Phase wise Input in Months			Total Input in Months
		Pre- const. Stage	Const. Stage	Post- const. Stage	
		Jul. 2016- Apr. 2018	May 2018- Nov. 2021	Dec.2021- Nov. 2023	
C70	Secretary1	12	43	0	55
C71	Secretary2	12	43	0	55
C72	Secretary3	12	43	0	55
C73	Chief Office Accountant	12	43	0	55
C74	Office Accountant 1	22	43	24	89
C75	Office Accountant 2	12	43	0	55
C76	Office Accountant 3	12	43	0	55
C77	Document Control Secretary 1	12	43	0	55
C78	Document Control Secretary 2	12	0	0	12
C79	Document Control Secretary 3	12	0	0	12
C80	Filing Secretary 1	12	43	24	79
C81	Filing Secretary 2	12	43	0	55
C82	Filing Secretary 3	12	43	0	55
C83	Office Guardsman 1	22	43	24	89
C84	Office Guardsman 2	12	43	0	55
C85	Office Guardsman 3	12	43	0	55
C86	Office Guardsman 4	12	43	0	55
C87	Office Guardsman 5	12	43	0	55
C88	Typist 1	22	43	24	89
C89	Typist 2	12	43	0	55
C90	Typist 3	12	43	0	55
C91	Office Boy 1	22	43	24	89
C92	Office Boy 2	12	43	0	55
C93	Office Boy 3	12	43	0	55
C94	Messenger 1	22	43	24	89
C95	Messenger 2	12	43	0	55
C96	Messenger 3	12	43	0	55
C97	Satellite Office (1) Manager	0	43	0	43
C98	Satellite Office (1) Secretary	0	43	0	43
C99	Satellite Office (1) Office Guardsman	0	43	0	43
C100	Satellite Office (1) Office Boy	0	43	0	43
C101	Satellite Office (2) Manager	0	43	0	43
C102	Satellite Office (2) Secretary	0	43	0	43
C103	Satellite Office (2) Office Guardsman	0	43	0	43
C104	Satellite Office (2) Office Boy	0	43	0	43

Source: JICA Study Team

5.7 Cost Estimation

5.7.1 Cost Breakdown

1) Cost Items

Unit cost and quantity for the cost estimation is calculated for the following items. It was basically made in previous F/S, reviewed and revised in this Study.

- Civil Works
  - Viaduct
  - Station building
  - Depot (civil works, including building)
  - Pavement, drainage etc.
- E&M Systems
  - Depot facilities (inspection and repair facilities)
  - Signal and telecommunications facilities
  - Power supply and distribution system
- Station Facilities
  - Escalator, Elevator
  - AFC
- Track Works
- Rolling Stock

2) Civil Works

For civil works, various structure types in the cost estimation were made based on the examination in the pre F/S and previous F/S for Malolos- Caloocan section. It was based on a unit price analysis made by NLRC in the Northrail Project, based on the Bill of Quantities (BOQ) prepared by SINOMACH. For some structure type not specified in the Northrail Project, LRT Line-2 (East and West Extension Project) and other similar railway project cost were also referred.

The cost of viaducts and bridges was calculated for the following sub-categories set out below.

- Standard PC girder (pier height less than 15m)
- Standard PC girder (pier height more than 15m)
- Wide PC girder for the transition section (pier height less than 15m)
- Wide PC girder for the transition section (pier height less than 15m)
- Standard PC girder crossing under Segment10 structure
- Viaduct of the service line to the depot (pier height less than 15m)
- PC bridge with a span-length between 25m and 60m
- PC bridge with a span-length between 25m and 60m (high pier)
- PC bridge-crossing under Segment10 structure
- PC bridge with a span-length of more than 60m
- Long-span steel truss-bridge

Embankment structures with GRS retaining wall are applied in the section where the hydrologic impact to be minimized, totally about 7.1km in length.

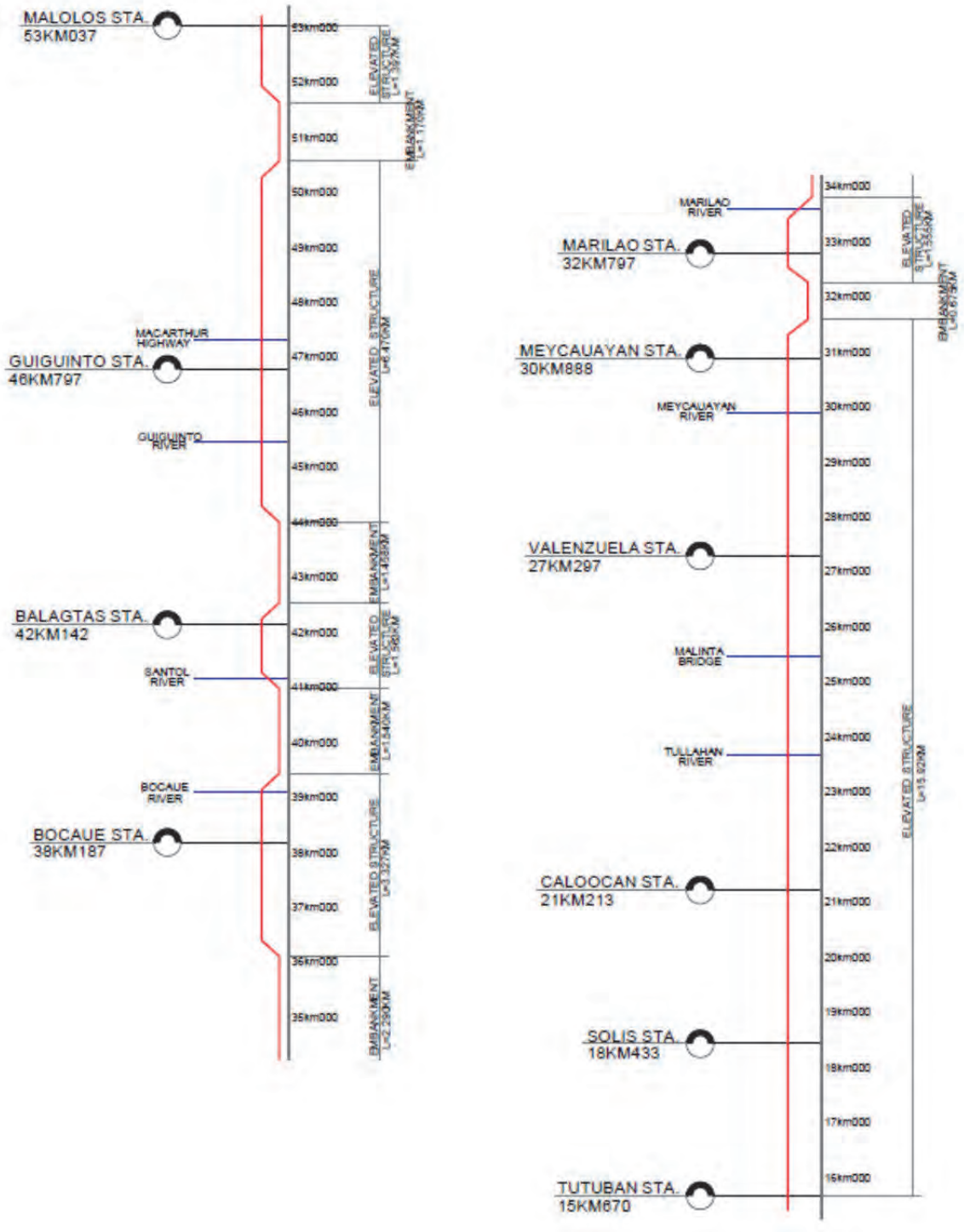
Quantity for each structure is referred to the result in the previous F/S and revised in this Study. The following table and figure is the summary of quantity for mainline civil works.

Table 5.7.1 Viaduct and Bridge: Length by Type

Unit: m

Structure Type	CW-1	CW-2	CW-3	CW-4	CW-5	CW-6	CW-7
	15+687-21+131	21+131-26+470	26+470-32+597	32+597-36+320	36+320-42+542	42+542-47+880	47+880-53+608
Standard PC Girder <15m	1,126		4,607	953	3,887	2,224	3,955
Standard PC Girder >15m	580	1,980				1,265	
Wide PC Girder <15m			400	220	220		343
Wide PC Girder >15m							
Standard PC Girder Under Segment10	3,258	2,999					
25m<Span<60m Bridge (PC)							80
25m<Span<60m Bridge (PC) (High Pier)		40					
25m<Span<60m Bridge (PC) Under Segment10		50					
Long Span Bridge (Steel Truss)		90	85	80	215	106	
Embankment with GRS Retaining Wall			675	2,290	1,540	1,458	1,170
Number of Station (Elevated)	2	1	2	1	2	1	1

Source: JICA Study Team



Source: JICA Study Team

Figure 5.7.1 NSCR Alignment (Elevated and Embankment Section)

3) Depot Works

Embankment for depot is consisting of the following items. Height or thickness of embankment and preloading soil etc. is assumed in previous F/S.

- Embankment, 3.5m height
- Pre-Load Soil, 1.5m height
- Removal Pre-Load soil, 1.5m height
- Sand Mat, 0.5m thickness
- Reinforced Retaining Wall

Civil works of depot is including a standard PC girder (pier height is assumed less than 15m), assumed as an access track structure to depot from mainline track.

4) Station Building

Unit cost for station building assumed in previous F/S is assumed as per-square meter cost with reference to the station cost of LRT Line 2project cost, which the station structure is similar to the NSCR project.

Station layout and dimension of each station is revised in this Study in accordance with the latest operation plan and summarized as shown table below.

Table 5.7.2 Layout of Station Building

Station	Length	Width	Area (sq.m)	Layout	Floor
Tutuban	300	20.5	6,150	1P+2T	3
Solis	180	22.0	3,960	1P+2T	2
Caloocan	180	23.0	4,140	2P+2T	2
Valenzuela	180	35.0	6,300	2P+4T	2
Meycauyan	180	25.0	4,500	2P+2T	2
Marilao	180	35.0	6,300	2P+4T	3
Bocaue	180	25.0	4,500	2P+2T	2
Balagtas	180	35.0	6,300	2P+4T	2
Guiguinto	180	25.0	4,500	2P+2T	3
Malolos	180	29.0	5,220	2P+4T	2

Source: JICA Study Team

5) Depot Facilities

In the previous F/S, depot facility plan was made complying with the maintenance plan based on the assumed operation plan. In this Study, depot facility plan is reviewed based on the revised operation plan and resulted that the cost for depot facility is following to the previous F/S except track and buildings. Track length and building area is revised based on the new operation plan.

6) E&M, Signal and Telecommunications for Mainline

In the previous F/S, cost for E&M, Signal and Telecommunications systems and track works were estimated for a full length of the project section from Malolos to Calamba. The per meter unit cost was made inclusively for all equipment and facilities such as overhead contact lines, distribution lines and substations for E&M, wayside signal and telecommunication facilities, train protection systems including

OCC. The project cost of this Study is calculated applying this unit cost with revised route length from Malolos to Tutuban.

7) Station Facilities

Station facilities, elevator, escalator and AFC are separately estimated from E&M for stations.

Table 5.7.3 Station Facilities

Station	Layaout	Floor	Elevator	Escalator	AFC
Tutuban	1P+2T	2	1	2	1
Solis	1P+2T	2	1	2	1
Caloocan	2P+2T	2	2	4	1
Valenzuela	2P+4T	2	2	4	1
Meycauyan	2P+2T	2	2	4	1
Marilao	2P+4T	3	4	8	1
Bocaue	2P+2T	2	2	4	1
Balagtas	2P+4T	2	2	4	1
Guiguinto	2P+2T	3	4	8	1
Malolos	2P+4T	2	2	4	1

Source: JICA Study Team

8) Track Works

Type of track structure is basically frame shaped slab track. It is adopted for elevated section. Unit price of slab track was examined in the previous F/S with reference to the unit prices in neighboring countries. Ballast track cost applied to the at-grade section is estimated at 0.83 times of the slab-tracks.

9) Rolling Stock

Rolling stock cost estimated in previous F/S is based on the assumption of 10 train cars per train set, light-weight stainless body, 6M4T formation and including door switches to cabs. Cost for on-board train protection systems is estimated for 180 cars and converted to a unit price per car.

In this Study, these assumptions are followed and procured number of car is revised in accordance with the latest operation plan, 102 cars for the year of revenue operation.

5.7.2 Foreign/ Local Procurement Rate for Breakdown Cost Items

Based on the examination of superiority of Japan's technology and applicability of STEP mentioned above, foreign and local procurement rate for breakdown cost items are summarized as follows.

Table 5.7.4 Foreign/ Local Procurement Rate

Category	Item	FC/LC Rate		
		Local	Other	Japan
Viaduct (short span PC)	PC steel material may be subject to consider procurement from Japan.	70%	30%	
Bridge (long span PC)	Steel parts such as steel bearing shoe for long span bridge, PC steel, etc. are the subject to consider the durability and quality due to difficulty of replace or repair.	70%	25%	5%
Long Span Bridge (Steel Truss)	Basically same as long span PC bridge, furthermore weather- proof steel material for structural member will be considerable due to reduction of life cycle cost because of maintenance- free steel structure.	70%	25%	5%
Embankment with GRS Retaining Wall (RRR method)	This method contributes reduction of life cycle cost due to high stability and durability against earthquakes, heavy/prolonged rainfalls, flood and scouring. Furthermore ROW cost is cheaper due to embankment width.	25%		75%
Station Building Material	Building materials such as roof materials (membrane structures), indoor facilities such a toilet facilities, etc., are considerable to import from Japan.	70%	25%	5%
Depot Facilities	Inspection and repair facilities, especially precision equipment such as measurement instrument, etc., road-rail vehicle, etc. are considerable to import from Japan.	20%	20%	60%
Signal and Train Protection System	Operation control device, electronic interlocking device, CBTC device, axle detection device, electric switch machine are considerable to import from Japan due to accuracy, reliability and contributing punctually and safety.	15%		85%
Telecommunication Facilities	Electrical/ electronic equipment such as transmission system, train radio system, platform monitoring system, CCTV, passenger information display system, public address/clock system, telephone system are appearing a superiority of Japanese products and considerable to import from Japan.	15%	30%	55%
Power Supply & Distribution System	Electrical equipment such as transformer, power monitoring control system, catenary system is considerable to import from Japan due to accuracy, durability and contributing punctually and safety.	15%	40%	45%

Category	Item	FC/LC Rate		
		Local	**Other**	**Japan**
AFC	Excellent management method of IC data and high ability for the security is superiority of Japanese products. It is contributing high processing performance of passenger with high speed IC data reader/writer and horizontal swing flap barriers. Furthermore it may contribute reducing installing space and increasing possible number of AFC installation, it is easy for future expansion.	10%		90%
Track Works	Heat treated rail (equivalent to 60kg/m) and nose movable turnout are considerable to import from Japan.	25%	25%	50%
Rolling Stock (EMU)	Japan's superior technologies such as high quality material, electrical/ electronic equipment.			100%

Source: JICA Study Team

5.7.3 Preconditions for Project Cost Estimation

Preconditions of cost estimation provided by JICA are as follows:

- The date of cost estimation: June 2015
- The ratio of the fund allocation: JICA 100% and Philippine 0%
- Exchange rate of currencies: US$ 1= Yen 120.7, PhP 1= Yen 2.72 and US$ 1= PhP44.4
- Price escalation: FC = 1.3% and LC = 1.3%
- Physical contingencies: 5 % for construction and 5 % for consulting services.
- Billing Rates of Consulting experts
  Professionals (A): 3,049 thousand Yen
  Professionals (B): 616.6 thousand Yen
  Supporting Staff: 308.4 thousand Yen
- Tax rate: Value added tax (VAT) at 12%, import tax at 3%
- Rate of administration cost: 3 %
- Rate of interest during construction: 0.1% for construction and 0.01% for consulting services
- Front-end fee: 0.2% (to be added to the first year of the ODA loan)

5.7.4 Overall Project Cost

The estimated overall project cost is summarized in the table below.

Table 5.7.5 Project Cost

Breakdown of Cost	Foreign Currency Portion (million JPY)			Local Currency Portion (million JPY)			Total (million JPY)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Civil Works	31,230	31,230	0	83,368	83,368	0	114,598	114,598	0
Depot (Civil)	343	343	0	3,735	3,735	0	4,078	4,078	0
E&M+Track	45,201	45,201	0	13,156	13,156	0	58,356	58,356	0
Rolling Stock	26,208	26,208	0	0	0	0	26,208	26,208	0
Civil Works by GOP	0	0	0	256	0	256	256	0	256
Price Escalation	6,293	6,293	0	6,133	6,127	6	12,427	12,420	6
Physical Contingency	5,464	5,464	0	5,332	5,319	13	10,796	10,783	13
Consulting Services	13,367	13,367	0	5,457	5,457	0	18,824	18,824	0
Land Acquisition	0	0	0	3,892	0	3,892	3,892	0	3,892
Administration Cost	0	0	0	7,483	0	7,483	7,483	0	7,483
VAT	0	0	0	29,932	0	29,932	29,932	0	29,932
Import Tax	0	0	0	3,442	0	3,442	3,442	0	3,442
Interest during construction	1,006	0	1,006	0	0	0	1,006	0	1,006
Front End Fee	491	0	491	0	0	0	491	0	491
Total	129,603	128,106	1,496	162,187	117,162	45,025	291,789	245,268	46,521

Breakdown of Cost	Foreign Currency Portion (million US$)			Local Currency Portion (million US$)			Total (million US$)		
	Total	JICA Portion	Others	Total	JICA Portion	Others	Total	JICA Portion	Others
Civil Works	258.6	258.6	0.0	690.3	690.3	0.0	948.9	948.9	0.0
Depot (Civil)	2.8	2.8	0.0	30.9	30.9	0.0	33.8	33.8	0.0
E&M+Track	374.3	374.3	0.0	108.9	108.9	0.0	483.2	483.2	0.0
Rolling Stock	217.0	217.0	0.0	0.0	0.0	0.0	217.0	217.0	0.0
Civil Works by GOP	0.0	0.0	0.0	34.6	0.0	34.6	34.6	0.0	34.6
Price Escalation	52.1	52.1	0.0	51.6	50.7	0.8	103.7	102.8	0.8
Physical Contingency	45.2	45.2	0.0	45.8	44.0	1.8	91.1	89.3	1.8
Consulting Services	110.7	110.7	0.0	45.2	45.2	0.0	155.9	155.9	0.0
Land Acquisition	0.0	0.0	0.0	526.0	0.0	526.0	526.0	0.0	526.0
Administration Cost	0.0	0.0	0.0	1,011.4	0.0	1,011.4	1,011.4	0.0	1,011.4
VAT	0.0	0.0	0.0	4,045.8	0.0	4,045.8	4,045.8	0.0	4,045.8
Import Tax	0.0	0.0	0.0	465.3	0.0	465.3	465.3	0.0	465.3
Interest during construction	8.3	0.0	8.3	0.0	0.0	0.0	8.3	0.0	8.3
Front End Fee	4.1	0.0	4.1	0.0	0.0	0.0	4.1	0.0	4.1
Total	96,369	95,257	1,113	126,311	87,119	39,192	222,680	182,375	40,305

Source: JICA Study Team

5.7.5 O&M Cost for NSCR

Project implementation will be over a period of seven years including preparation of feasibility study, preliminary design and tender documents, land acquisition and resettlement, environmental impact assessment, and utility relocation. A 35-year operating period is used in the financial analysis of the project. However, the physical life of the railway system can stretch up to 60 years when the project proponent implements the necessary regular and periodic repairs and maintenance.

The project's O&M costs are comprised of: (1) manpower, (2) spare parts, (3) power, and (4) station services. Annual O&M costs will include preventive maintenance works, and regular and period repairs of the rolling stock, track works, E&M system, and other equipment and structures. Depending on the scheme that will be adopted by the government, the responsibility for the project's O&M can either be carried out by an in-house workforce or outsourced to a third-party contractor.

The summary of annual O&M costs is shown in Table below. O&M cost is estimated based on the operation plan shown in Chapter 4 determines parameters of track length, number of stations, number of trains, train-kilometer per year etc. Except for electrical power rates, the unit prices for each items were referred the current unit prices of LRTA.

Table 5.7.6 O&M Cost

(In million US dollars, constant 2014 prices)

Item / Year	2020	2025	2030	2040
Manpower	10	10	13	13
Spare Parts	28	36	36	36
Power	10	14	17	17
Total	48	60	66	66

Source: JICA Study Team

CHAPTER 6

REVIEW OF PROJECT IMPLEMENTATION STRUCTURE

CHAPTER 6 REVIEW OF PROJECT IMPLEMENTATION STRUCTURE

6.1 Review of Existing Related Agencies and Organizations

6.1.1 Department of Transportation and Communications (DOTC)

6.1.1.1 General

Mandate

The Department of Transportation and Communications (DOTC) is the primary policy, planning, programming, coordinating, implementing and administrative entity of the executive branch of the government on the promotion, development and regulation of a dependable and coordinated network of transportation and communications systems, as well as in the fast, safe, efficient and reliable transportation and communications services.

As one of the first government agencies established under the Malolos Constitution on January 21, 1899, the DOTC plays a crucial role in accelerating the country's economic development. It provides the backbone for growth and enhances the country's competitive edge by providing effective and efficient transportation and communications infrastructure systems that narrow the geographical and physical divide, connecting the country, its islands, and its people to the rest of the world.

Vision

The DOTC is a world class organization, providing integrated transport, connecting people, islands, families, communities and the nation with the rest of the world, and constantly responding for environmentally sustainable and globally competitive transport and communications system.

Mission

To provide the country with efficient, effective and secure transportation systems that are globally competitive, compliant with international standards and responsive to the changing times.

6.1.1.2 Sectorial and Attached Agencies

The DOTC has three (3) Sectorial Offices and fifteen Attached Agencies. The Office for Transportation Security (OTS) is in charge of transportation security for all sectorial offices and attached agencies. The Metro Rail Transit (MRT) Line 3 remains a Project Management Office (PMO) of the Department.

1) Sectorial Offices

a) Maritime Transport

The Philippine Coastal Guard (PCG)

The PCG is an armed and uniformed service primarily tasked with enforcing all applicable laws within the Philippine waters, conducting maritime security operations, safeguarding of life and property at sea and protecting the marine environment and resources.

b) Road Transport

The Land Transportation Office (LTO)

The LTO promotes the safety and comfort of the traveling public with respect to motor vehicles. The LTO

is also tasked with collecting various fees from the registration of motor vehicles, the issuance of licenses to qualified motor vehicle drivers, the collection of fines and penalties for motor vehicle related infractions, and the sale of motor vehicle license plates.

The Land Transportation Franchising and Regulatory Board (LTFRB)

The LTFRB was created by virtue of an Executive order issued on June 19, 1987, with the goal of simplifying the land transportation industry franchising system. Since the creation of the LTFRB, the issuance of franchises for land transport operators has become more stringent, resulting in higher safety standards for land travel. Technical evaluation staff ensure that operating and safety standards of commercial and private vehicles are observed, prior to the issuance of operating franchises.

c) Rail Transport

Metro Rail Transit (MRT)

MRT3, designated as the Blue Line, is also called the EDSA MRT, or Metrostar Express. It was implemented by the DOTC through a Build-Lease-Transfer contract with the privately owned Metro Rail Transit Corporation (MRTC). It has 13 stations on a 16.9 km rail system along Edsa from North Ave., Quezon City to Taft Ave., Pasay City. It became fully operational in 2000.

2) Attached Agencies

Office for Transportation Security (OTS)

The Office for Transportation Security (OTS) is the single authority responsible for the security of the transportation systems of the country, including, but not limited to, the following: Civil Aviation, Sea Transport and Maritime Infrastructure, Land Transportation, Rail Systems and Infrastructure. It was created by virtue of Executive Order No.277. In response to the international mandate (i.e. ICAO and IMO guidelines) calling for a single authority for all modes of transportation security in the Philippines, E.O. 311 was issued on April 26, 2004.

a) Civil Aviation

Civil Aviation Authority of the Philippines (CAAP)

The CAAP is responsible for implementing policies on civil aviation in order to ensure safe, economical, and efficient air travel. As an independent regulatory body with quasi-judicial and quasi-legislative powers, the CAAP is mandated to set comprehensive, clear and impartial rules and regulations for the Philippine aviation industry.

Manila International Airport Authority (MIAA)

Created by Executive Order 778, the MIAA provides safe, efficient, and reliable airport facilities for international and domestic travel at the Ninoy Aquino International Airport (NAIA). It is also tasked with promoting NAIA as a center for international trade and tourism.

Clark International Airport Corporation (CIAC)

The CIAC is in charge of operating and maintaining the Clark International Airport.

Executive Office Building, Civil Aviation Complex Clark Freeport Zone 2023, Pampanga

Head: President Victor Jose I. Luciano

Civil Aeronautics Board (CAB)

The CAB is tasked with regulating, promoting, and developing the economic aspects of civil aviation in the Philippines. The CAB regulates the lease, purchase, and sales of aircraft, along with overseeing consolidations and mergers of domestic air carriers.

Mactan-Cebu International Airport Authority (MCIAA)

The MCIAA is in charge of operating and maintaining the Mactan International Airport, which is currently the premier gateway to the Central Visayas. The MCIAA provides airport safety and security, and also implements airport rules and regulations.

Philippine Aerospace Development Corporation (PADC)

The PADC undertakes business and development activities for the establishment of a reliable aviation and aerospace industry within the Philippines. It engages in the design, manufacture, and sale of all forms of aircraft, and also develops local capabilities in the maintenance, repair, and modification of aviation equipment.

b) Road Transport

Toll Regulatory Board (TRB)

The Toll Regulatory Board supervises and regulates the construction, operation, and maintenance of toll facilities, and is also responsible for the collection of toll fees. It was created by virtue of Presidential Decree (P.D.) No. 1112 (a.k.a. the Toll Operation Decree).

Office of Transport Cooperatives (OTC)

The OTC was created in 1963 by virtue of Executive Order 898, and was originally known as the Committee on Transport Cooperatives. The current objective of the OTC is to integrate the transport cooperatives program into the public transport and transit system, in order to achieve economies of scale with respect to fuel consumption.

c) Railways

Philippines National Railways (PNR)

The PNR was created via legislation in June 1964, in order to provide a nationwide railway transportation system. There are currently plans to create new lines connecting the rapidly developing areas in Central Luzon and the South Tagalog region with Metro-Manila.

Light Rail Transit Authority (LRTA)

The LRTA was created via Executive Order 603 on July 12, 1980, in order to oversee the construction and operation of the Light Rail Transit project extending from Baclaran in Pasay City, to Monumento in Caloocan. Since then, the LRTA's mandate has expanded to encompass other light rail projects in Metro-Manila.

North Luzon Railways Corporation (NLRC)

The North Luzon Railways Corporation (NLRC) was created to implement the Northrail Project, a major undertaking of the Philippine government which aims to build a fast, reliable, and efficient railway system in Central and Northern Luzon. The railway system is expected to further enhance the development and growth potential of the aforementioned areas.

d) Maritime Transport

Philippines Ports Authority (PPA)

The PPA is the primary government agency concerned with the planning and development of the country's seaports. Established in 1974, the PPA charter was amended by Executive Order 857, which expanded its functions to include the integration and coordination of ports nationwide.

Maritime Industry Authority (MARINA)

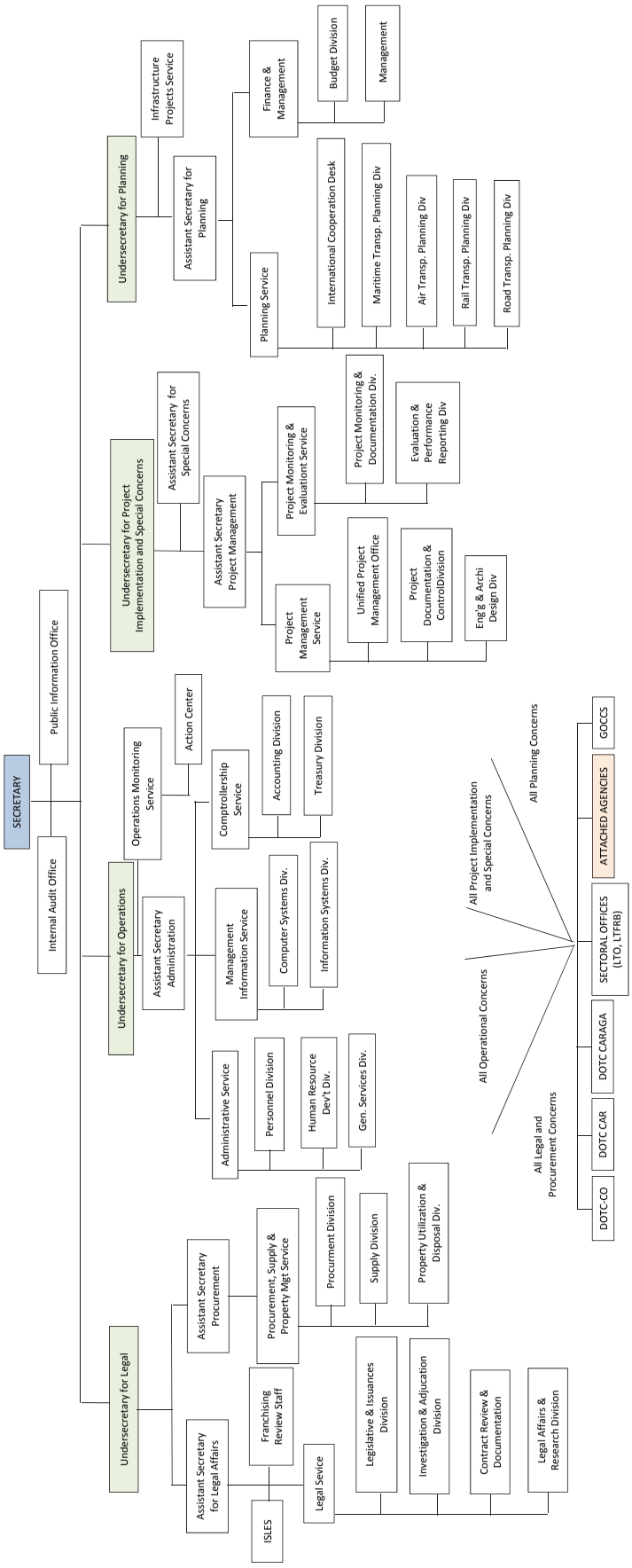
The MARINA oversees the promotion and development of the maritime industry, and also provides effective regulation of shipping enterprises. Since its establishment in June 1994, MARINA was granted the authority to issue Certificates of Public Convenience (CPC), permitting the operation of domestic and overseas water carriers. Other functions of the agency include the registration of vessels, the issuance of licenses, the addressing of safety concerns pertaining to vessel construction, and the enforcement of maritime law.

Cebu Ports Authority (CPA)

The Cebu Ports Authority (CPA) was created through the enactment of Republic Act No. 7621, signed on June 26, 1992. The CPA's mandate is to administer all ports located in Cebu Province, thus effectively separating these ports from the Philippine Ports Authority (PPA) system. The CPA began operations and officially took over all Cebu ports on January 1, 1996.

Philippines Merchant Marine Academy (PMMA)

The PMMA, formerly known as the Philippine Nautical School, was created in January 1963 via Republic Act 3680. The PMMA produces efficient and well-trained merchant marine officers of an international caliber. PMMA graduates spearhead Philippine efforts in international trade, and are also capable of serving as auxiliary naval officers during times of conflict.



Source: JICA Study Team

Figure 6.1.1 Organizational Structure of DOTC

6.1.1.3 Budget and Financial Situation

To be completed as of 2012, the DOTC Operating Budget for Major Final Outputs (MFO) was PhP34,574.48 million, of which 73.88% correspond to Infrastructure Development Services, 13.03% to Regulatory and Enforcement Services, 12.15% Operation and Management Services, and 0.94% Policy Plan Formulation Services.

6.1.2 Bases Conversion Development Authority (BCDA)

6.1.2.1 Historical Background

On 14 March 1947, the Military Bases Agreement (MBA) was signed by President Manuel A. Roxas and Paul V. McNutt, the United States high commissioner in the Philippines allowing the Americans to continue maintaining the military bases and stations established in the Philippines during the American and Japanese occupations[1]. The agreement had a 99-year duration. On September 16, 1991, the MBA was reduced from 99 to 25 years. The new treaty for the extension was rejected by the Philippine Senate, compelling the pull-out of US military presence on Philippine soil.

Before the bases pullout, the Legislative-Executive Bases Council (LEBC) was created by Joint Resolution No. 1 in 1989 and mandated to make recommendations on the following (1) the conversion of the U.S. Bases into the alternative social, economic, and security programs and projects; (2) the maximization of development of the Baselands reverted in 1979; (3) the formulation of alternative uses for the military camps in Metro Manila as well as the facilitation of the transfer of some units of the Philippine Armed Forces to the Clark facilities and other locations; and (4) the reduction of the social and economic dislocation which could result from the withdrawal of the U.S. facilities from the Bases.

The US bases withdrawal had immediate impact on the area in terms of job losses and cut economic and military support. This was aggravated by the 1990 earthquake and 1991 eruption of Mt. Pinatubo that laid to waste much of the area. It was during this time when the Bases Conversion and Development Act of 1992 was passed by Congress to address the impact of the pull-out.

6.1.2.2 Corporate Profile

The BCDA was created by virtue of RA 7227, a law signed by President Corazon Aquino on 13 March 1992. It has a three -tiered mandate: (1) Accelerate the conversion of the Clark and Subic military bases and their extensions into alternative productive uses; (2) Raise funds from the sale of Metro Manila camps and use such funds for its conversion activities; and (3) Promote the economic and social development of Central Luzon in particular and the country in general.

In the pursuit of its mandate, BCDA was given powers such as it can (a) own, hold and/or administer the military reservations transferred to it by the President; (b) adopt, prepare and implement a comprehensive and detailed development plan for the sound and balanced conversion of the Clark and Subic military reservations; (c) encourage the active participation of the private sector ; (d) serve as the holding company of subsidiary companies; (e) manage and operate through private sector companies developmental projects outside the jurisdiction of subsidiary companies and Special Economic Zones; (f) establish a mechanism in coordination with the appropriate local government units to effect meaningful consultations regarding plans, programs and projects; and (g) plan, program and undertake the readjustment, relocation, or resettlement of population within the Clark and Subic military reservations and their extensions. In addition, BCDA possesses special corporate powers that enabled it to (a) construct, own, lease, operate and maintain public utilities as well as infrastructure facilities; (b) reclaim or undertake reclamation projects as it may deem necessary in areas adjacent or contiguous to the

[1] *http://kahimyang.info*

Conversion Authority's lands; (c) invest its funds and other assets other than those of the Special Economic Zones; (d) exercise the right of eminent domain; and (e) exercise oversight functions over the Special Economic Zones as declared under RA 7227.

With its vision of "leading the way towards the sound conversion and development of former military baselands into self-sustaining, globally competitive investment centers resulting in the balanced and sustainable growth of their environs, in particular Central Luzon" and its core purpose/ mission "to transform baselands into beacons of globally competitive, sustainable economic zones as part of nation building", BCDA observes the following policy framework in its conversion activities: (a) Master Development Planning of properties; (b) Consultation with the affected local government units of BCDA plans; and (c) Privatization.

BCDA has total landholdings of approximately 35,745 hectares, spread in Northern and Central Luzon and in Metro Manila. This includes Fort Bonifacio, Villamor Air Base, Fort Abad, Camp Melchor, Camp Atienza and Camp Claudio. Outside Metro Manila, BCDA owns the (a) Poro Point Freeport Zone (PPFZ) in San Fernando, La Union; (b) Bataan Technology Park (BTP) in Morong, Bataan; (c) John Hay Special Economic Zone (JHSEZ) in Camp John Hay, Baguio City; and (d) Clark Freeport and Special Economic Zone (CFSEZ) in Clarkfield, Pampanga.

BCDA, as a Government Owned and Controlled Corporation (GOCC), is engaged in the following: (a) real estate/ property development; (b) infrastructure development; (c) utilities; (d) economic zone and freeport development; and (e) socialized housing/ housing for the military. It has formed subsidiaries managing the BCDA properties that are all 100% owned. These are the Clark Development Corporation (CDC) for the management of CFSEZ, Poro Point Management Corporation (PPMC) for the management of PPFZ, John Hay Management Corporation (JHMC) for the management of JHSEZ, Bataan Technology Park, Inc. (BTPI) for the management of BTP, North Luzon Railways Corporation (NLRC) and BCDA Management and Holdings, Inc. (BMHI). The Clark International Airport Corporation (CIAC), a former subsidiary of BCDA, was transferred to the Department of Transportation and Communications (DOTC) through Executive Order (EO) 64 issued in December 2011. By law, BCDA has oversight functions over the Subic Bay Metropolitan Authority (SBMA). In addition, BCDA is also affiliated with other private companies operating inside its Fort Bonifacio property: (a) a 45% interest in Fort Bonifacio Development Corporation (FBDC); (b) 10% in Bonifacio Water Corporation (BWC); (c) 33% in Bonifacio Estates Services Corporation (BESC); and (d) 25% in Bonfacio Communications Corporation (BCC).

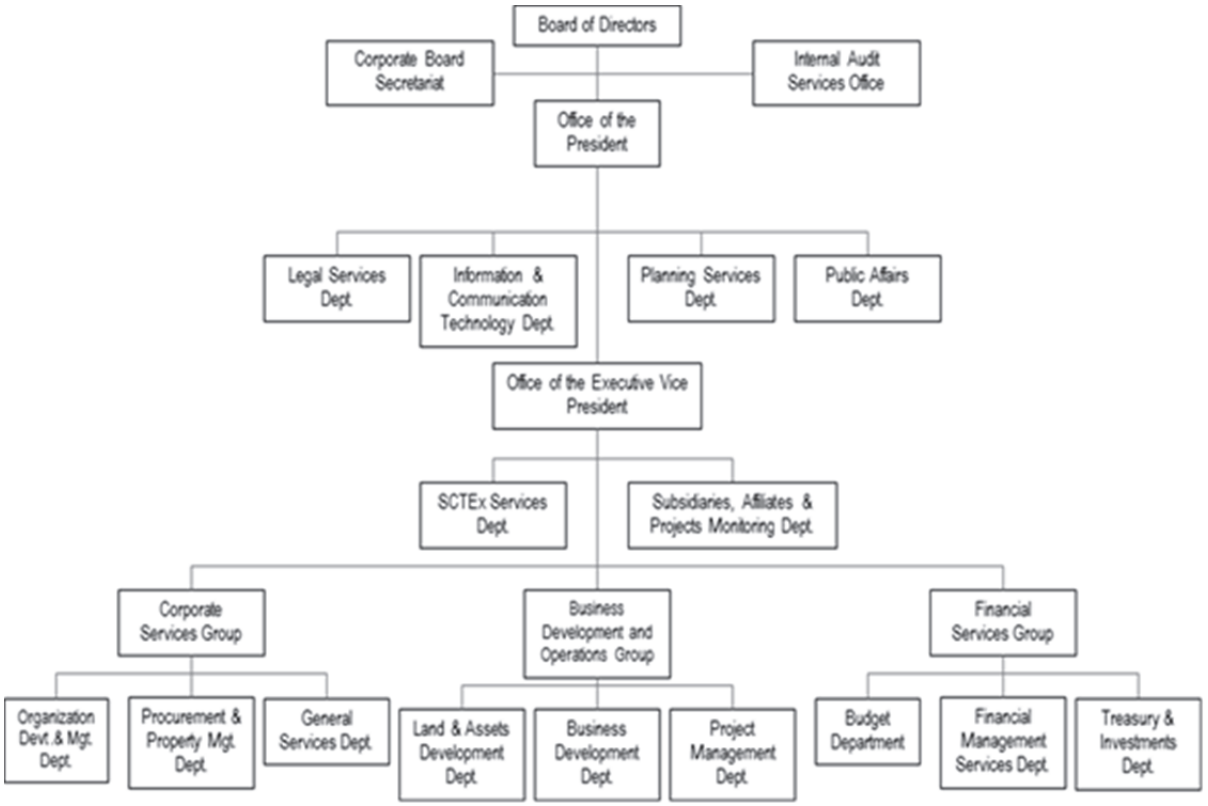
BCDA undertakes infrastructure projects to enhance accessibility to the BCDA economic zones, most notable is the Subic-Clark-Tarlac Expressway (SCTEX) project. The SCTEX, which started operation in 2008, is a 93.77 km, 4-lane divided toll road limited access highway that features 11 interchanges, four major bridges, 30 minor bridges, 47 underpasses, 303 drainage structures, and toll road facilities and equipment. Other infrastructure projects in the pipeline are the (a) Kennon Road Improvement Project; (b) Taguig-Makati-Pasay Monorail and (c) Poro Point Airport Mall and Terminal.

Moreover, BCDA supports its chartered beneficiaries with the Armed Forces of the Philippines (AFP) as the major stakeholder from the revenues it generates from the disposition of its assets. Since its creation in 1992 until September 2012, BCDA has generated PhP 55.81 B from the disposition of former Metro Manila camps. Of this amount, (a) 39% or PhP 21.79 B has been remitted to the Bureau of Treasury for the AFP, (b) 20% or PhP 10.89 B went to BCDA's share in the proceeds, and (c) 13% or PhP 7.27 B went to the share of other beneficiary agencies.

BCDA is a self-sustaining GOCC, not reliant on yearly budget appropriations from the National Government.

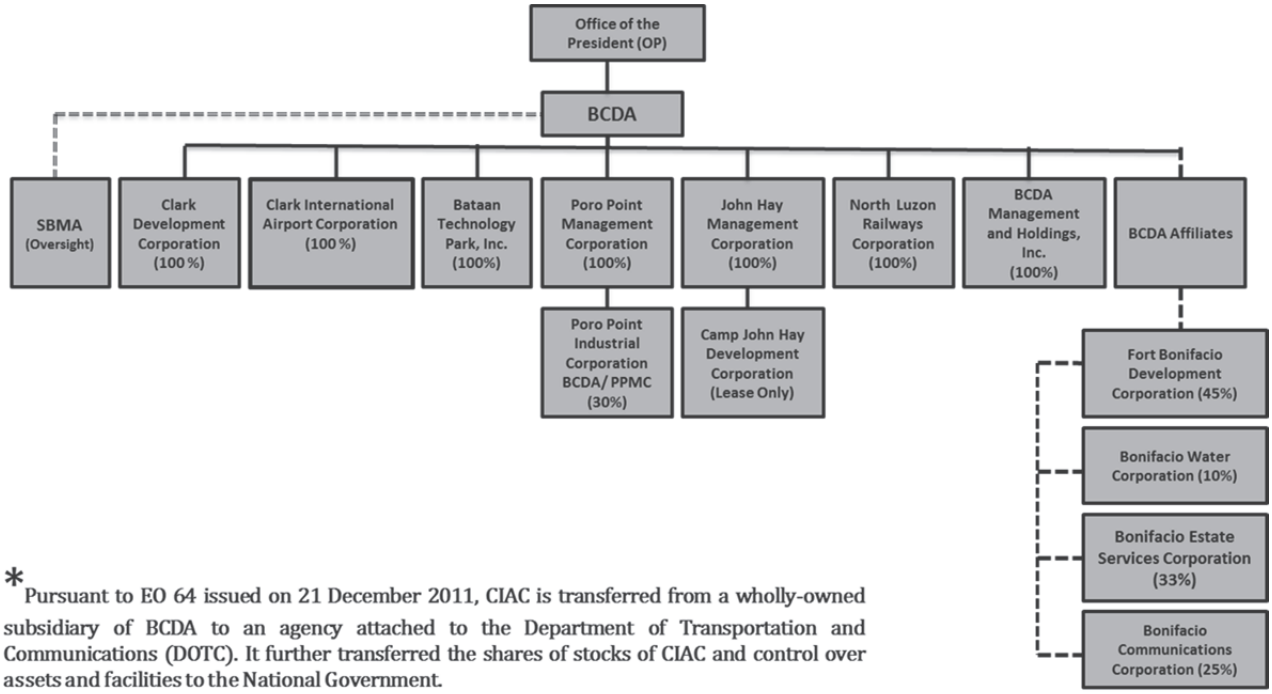
6.1.2.3 Organizational Structure

The organizational staffing structure of BCDA is shown in Figure 6.1.2, while the corporate and ownership structure, such as 100% owned filial or affiliated companies, is shown in Figure 6.1.3.



Source: BCDA

Figure 6.1.2 BCDA Organization Chart



* Pursuant to EO 64 issued on 21 December 2011, CIAC is transferred from a wholly-owned subsidiary of BCDA to an agency attached to the Department of Transportation and Communications (DOTC). It further transferred the shares of stocks of CIAC and control over assets and facilities to the National Government.

Source: BCDA

Figure 6.1.3 BCDA Corporate and Ownership Structure Chart

6.1.2.4 Budget and Financial Situation

The financial condition of BCDA as of 31 December 2011 is of a Total Assets of PhP 127.816 Billion, with total liabilities for PhP 46.694 Billion, and Equity of PhP 81.122 Billion.

6.1.2.5 Staffing Situation

The staffing situation of BCDA is as follows: All personnel are full time employees, having no contract-staff currently hired.

Table 6.1.1 BCDA Staffing

Department	Staff
Office of the President % CEO	5
Corporate Board Secretariat	3
Internal Audit Services Office	8
Legal Services Department	15
Public Affairs Office	7
Planning Services Department	5
Information Technology Department	10
Office of Executive Vice President	5
Security Services Department	2
SCTEX Services Department	6
Subsidiaries Affiliates & Projects Monitoring Dept.	12
Financial Services Group	4
Financial Management Services Department	7
Budget Monitoring Department	8
Treasury & Investment Department	8
Business Development and Operation Group	4
Land and Assets Development Department	8
Business Development Department	7
Project Management Department	8
Corporate Services Group	3
Organization Development and Management Dept.	2
Personnel and Compensation & Benefits Division	10
Procurement and Property Management Dept.	12
Premises Administration & Transportation Services Dept.	16
Records Management & Office Services Division	7
Total	182

Source: JICA Study Team

6.1.3 North Luzon Railway Corporation (NLRC)

6.1.3.1 General Background

NLRC was incorporated and registered with the Securities and Exchange Commission as a wholly-owned subsidiary of BCDA, whose primary purpose is to develop, construct, operate and manage a railroad system to serve Metro Manila, and Central and Northern Luzon.

Pursuant to executive Order No. 859, series of 2010, NLRC became an attached agency of the DOTC. Under the direction of the DOTC, NLRC shall provide a fast, reliable, and efficient railway system that connects the Ninoy Aquino International Airport (NAIA) and CIA, hereinafter referred to as the "*Project*".

Primary Purpose

To develop, construct, operate and manage a railroad system to serve Metro Manila, and Central and Northern Luzon;

Secondary Purposes

- To develop, construct, manage, own, lease, sublease and operate establishments and facilities of all kinds along the railroad system for residential, commercial, business, mixed development, institutional, recreational, tourism, amusement, and other purposes;
- To develop, construct, manage, own, lease, sublease, operate, secure, maintain the resources, and generally carry out all the activities of a railway line, i.e. commercial and waste transportation, drainage and sewerage, telecommunications and utility systems and common facilities, all in accordance with the Business Plan and internationally and locally accepted design parameters.
- To purchase, acquire, own, lease or sell and convey real properties such as lands, buildings and warehouses and machinery, equipment and other personal properties as may be necessary or incidental to the conduct of the corporate business, to pay in cash, shares of its capital stock, debentures and other evidences of indebtedness, or other securities, as may be deemed expedient for any business or property acquired by the Corporation, and to enter into joint venture agreements as may be deemed necessary subject to applicable provision of law;
- To borrow and raise money from both local and international financial institutions necessary to meet the financial requirements of its business; to issue bonds, promissory notes and other evidences of indebtedness; and to secure the repayment thereafter of mortgage, pledge, deed of trust or lien upon the properties of NLRC, or to issue pursuant to law, shares of its capital stock, debentures and other evidences of indebtedness in payment for properties acquired by NLRC or for money borrowed in the prosecution of its lawful business;
- To devise, formulate and conduct business research, business studies, and surveys; to create, install and utilize business systems, methods, controls, layouts and plans, all as are required or expedient to the management, administration or operation of NLRC's assets.
- To invest and deal with the money of NLRC in such manner as may from time to time be considered wise and expedient for the advancement of its interests; and to sell, and dispose of or transfer the businesses, properties and goodwill of NLRC or any part thereof for such considerations and under such terms as may be approved by the Board;
- To grant concessions, rights to persons, corporations, associations or entities to establish, operate and manage all types of establishments and facilities, which include, but are not limited to residential, commercial, business, recreational, tourism and development centers, roads/infrastructure, power and electrical, water and water distribution, drainage, sewerage,

telecommunications, security and other utility systems and activities covered by the railway system;

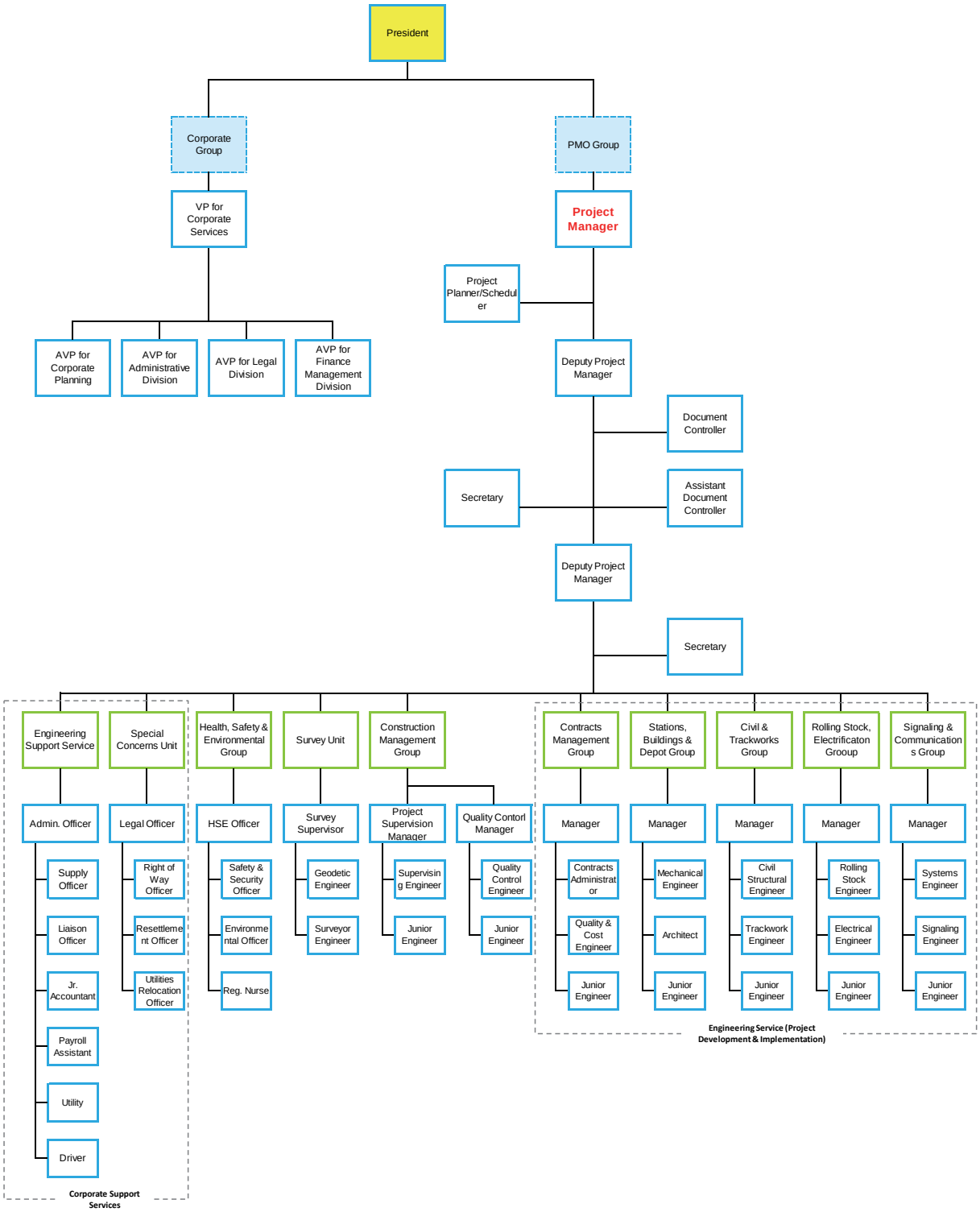
- To acquire or obtain from any government authority, national, provincial, municipal or otherwise, or any corporation, company or partnership or person, such charters, contracts, franchise, privileges, exemptions, licenses and concessions as may be conducive to any of the objectives NLRC;
- To establish and operate one or more branch offices or agencies to carry out any or all of its operations and businesses without any restrictions as to the place or amount, including the right to hold, purchase, or otherwise deal in and with real and personal property anywhere in the Philippines;
- To create, maintain, manage, and regulate the method, plan and systems of security and maintenance, protection and preservation of peace and order and safety of individuals, establishments, facilities, utility systems and activities mentioned in the Primary Purpose, inside and within the peripheries of the area under NLRC's control.
- To conduct and transact any and all lawful businesses, and to do or cause to be done any one or more of the acts and things herein set forth as its purpose, within or without the Philippines, and in any and all the foreign countries, and to do everything necessary, desirable or incidental to the accomplishment of the purposes or the exercise of any of one or more of the powers herein enumerated, or which shall at any time appear conducive to or expedient for the protection or benefit of NLRC.

6.1.3.2 Organization Structure

Figure 6.1.4 shows the organization structure of NLRC.

6.1.3.3 Budget and Financial Condition

As of 2012, the Corporate Operating Budget was PhP153,397,407, of which 48% corresponds to Personal Services, 50.6% to Maintenance and other Operating Expenses, and 1.4% Capital Outlay.



Source: NLRC

Figure 6.1.4 NLRC Organization Structure Chart

6.1.4 Philippines National Railway (PNR)

6.1.4.1 Historical Background

The state-owned Philippine National Railways (or Pambansang Daangbakal ng Pilipinas in Filipino), commonly abbreviated as PNR, is the sole operator of the most extensive intra-island railway on Luzon, the largest island in the Philippines.

It operates two commuter rail services in Metro Manila and the Bicol Region. The Bicol service is currently under rehabilitation in preparation for the resumption of the Bicol Express run to Naga City in Camarines Sur province, and eventually to the southern terminal in Legazpi City in Albay. The existing and well-patronized commuter service in Metro Manila is part of the metropolitan transit system and is referred to as the Orange Line.

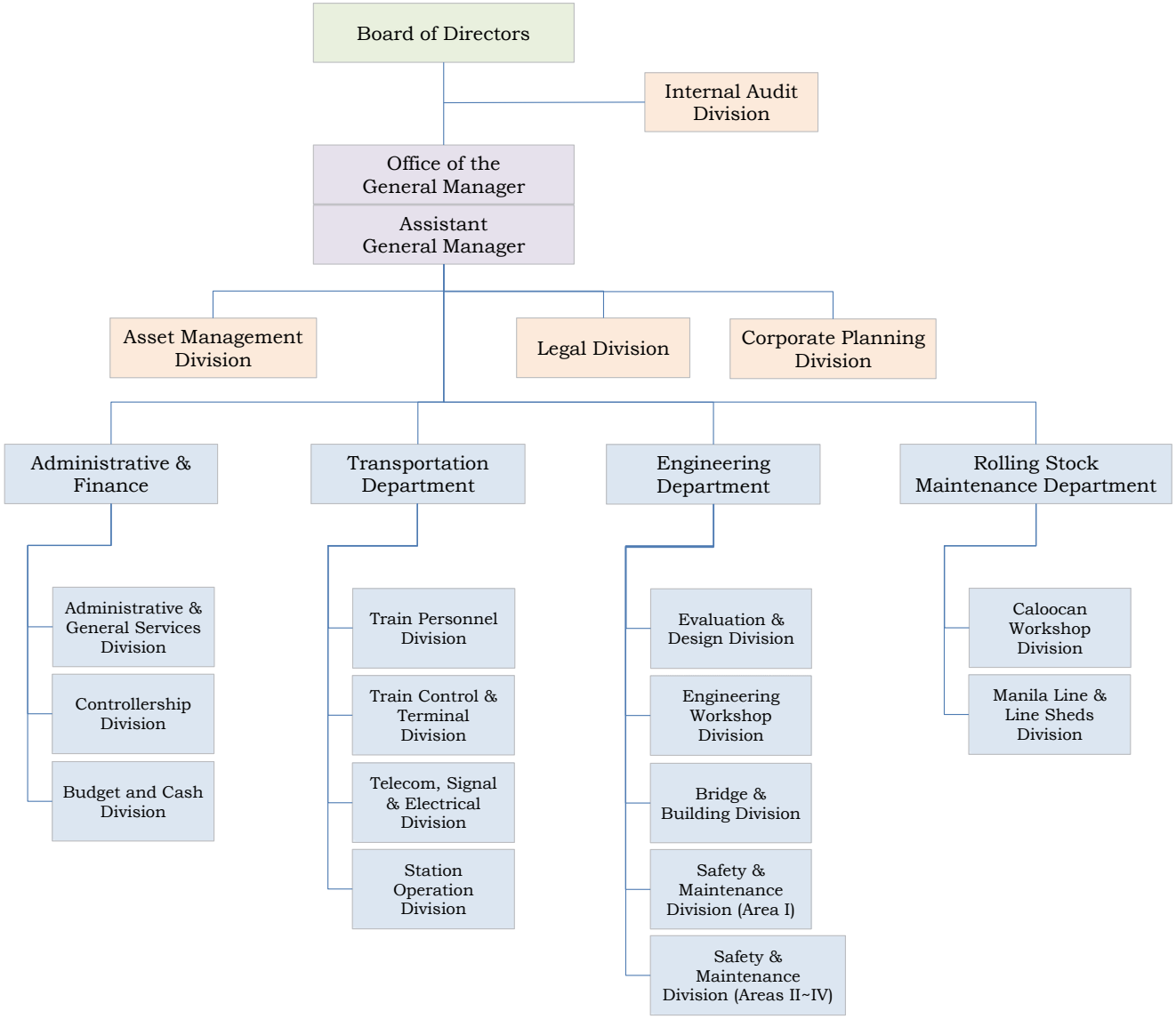
PNR officially began operations on June 26, 1875 as the Ferrocarril de Manila-Dagupan, during the Spanish colonial period, and later becoming the Manila Railroad Company (MRR) during the American colonial period. It became the Philippine National Railways on June 20, 1946 by virtue of Republic Act No. 4156. The PNR is an attached agency under the Department of Transportation and Communications.

After 121 years, the PNR is one of the oldest and thriving mass transport systems in the country. Pursuant to its existing Charter, the PNR's term of existence is for fifty years and was due to expire on June 20, 2014. The Republic Act No. 10638 was signed into law by the President of the Philippines on June 16, 2014, amending Section 1 of RA 4156 and extending the corporate life of the government agency for another 50 years. To contribute in the rapid growth of the Philippine economy, the role of the PNR is to provide mobility in transport system at minimum passenger and freight prices possible.

6.1.4.2 Current Organization

The current organization of PNR is headed by a Board of Directors, and the daily management of the PNR is under the responsibility of the Office of the General Manager. Currently, the General Manager is Mr. Joseph Allan C. Dilay. The members of the Board of Directors are: Mr. Manuel H. Torres, Chairman; Mr. Rene K Limcaoco, Co-Chairman; Mr. Joseph Allan C. Dilay, Vice Chairman & GM; Mr. Michael Frederick Musngi, Mr. Ruben S. Reinoso, Mr. Cesar V. Purisima, Mr. R. Primitivo de Guzman, and Mr. Ruben B. Medroso, Directors.

The Organization Chart of PNR is shown in Figure 6.1.5. The staffing, as December 2013, is shown in Table 6.1.2, showing permanent staff and on Job Order staffing.



Source: PNR, as of December 2013

Figure 6.1.5 Organization Chart of PNR

Table 6.1.2 PNR Staffing

Unit	Permanent Staff	Job Order Staff
Board of Directors	**7**	
Internal Audit Division	**3**	**3**
Office of General Manager	**28**	**86**
General Manager	8	
Legal Division	8	86
Asset Management Division	8	
Corporate Planning Division	4	
Administrative & Finance Department	**30**	**79**
Office of Department Manager	2	
Administrative & General Services Division	12	79
Controllership Division	6	
Budget and Cash Division	10	
Transport Department	**66**	**300**
Office of Department Manager	5	
Train Personnel Division	28	
Train Control and Terminal Division	13	300
Telecom, Signal & Electrical Division	4	
Station Operation Division	16	
Engineering Department	**86**	**623**
Office of Department Manager	6	
Evaluation and Design Division	9	
Engineering Workshop Division	17	623
Bridge and Building Division	27	
Safety and Maintenance Division (Area I)	8	
Safety and Maintenance Division (Areas I ~ IV)	19	
Rolling Stock Maintenance Department	**21**	**156**
Office of Department Manager	3	
Caloocan Workshop Division	11	156
Manila Yard and Line Sheds Division	7	
Grand Total	**241**	**1247**

Source: PNR, as of December 2013

6.1.4.3 Current Services

1) Green & Orange Lines

The Philippine National Railways owns two different rail lines, namely the North Main Line (Green Line) and the South Main Line (Orange Line), along with the three spur lines, which serve various parts of Luzon. The only operating line, which is presently under rehabilitation, is the South Main Line (Orange Line), which serves as the regional rail backbone of Southern Luzon.

The PNR currently operates in the Manila metropolitan area and the provinces of Laguna, Quezon, Camarines Sur and Albay. In the past, the PNR also used to serve the provinces of Bulacan, Pampanga, Tarlac, Nueva Ecija, Pangasinan and La Union on the North Main Line, and Batangas on the South Main Line. The North Main Line will be partly replaced under the current Northrail project. Plans are also afoot to revive previously discontinued services.

2) Commuter Express

The Commuter Express (also known as the Metro Commuter), commonly called the Commex, serves as the commuter rail service for the Manila metropolitan area, extending as far south as Binan, in Laguna. The PNR uses GE locomotives hauling Commex passenger cars, as well as newly procured Hyundai Rotem diesel multiple units (DMUs), for this service.

Commex service using the new DMUs is currently offered between Tutuban and Alabang in Muntinlupa City, while a daily Commex run between Manila and Biñan City, Laguna runs using GE locomotives. Currently, Commex trains make 38 daily trips, 19 in each direction.

3) Bicol Commuter

The Bicol Commuter service serves as the commuter rail backbone of the Bicol Region, serving stations between Tagkawayan, in Quezon province and Ligao City, in Albay, with Naga City in Camarines Sur acting as a central terminus. The service was launched on September 16, 2009, in time for the feast of Our Lady of Peñafrancia, but was once suspended due to typhoon damage and is pending full rehabilitation.

When service is restored, Bicol Commuter trains will make seven trips a day, alternating between Tagkawayan, Sipocot, Naga and Ligao as termini. Five trips will run using a Commex DMU sent to the Bicol Region, while two trips will use GE locomotives.

6.1.4.4 Station Layout

All PNR stations are at-grade, using a side platform layout. Most have only basic amenities: platforms and ticket booths, while rehabilitated stations along the Metro Manila line have been fitted with wheelchair ramps. Several stations have extended platforms, having an upper platform catering to DMU services, and a lower platform for regular locomotive-hauled services.

6.1.4.5 Peak Ridership

While there are spotty records for actual ridership levels and quantities during the PNR's "best years" during the late 1960s and early 70s, existing data on train operations show such daily passenger figures or ridership during peak seasons as follows:

For the Metro Commuter Operation, an estimated 47,000 passengers rode 24 motor cars at 62 trips per day to six routed destinations. This was when services extended between Tutuban and such destinations as San Jose, Nueva Ecija; Carmona, Cavite; Calamba and College, Laguna; Malolos, Bulacan; and Guadalupe.

For Mainline North, PNR had six trips daily from Tutuban to San Fernando, La Union using 14 passenger cars. Estimated peak ridership was at 3,000 passengers daily. For the long-distance trains of the Mainline South, the estimated peak ridership was at 7,560 passengers daily on ten trips using 36 cars to various destinations in the Bicol Region.

6.1.4.6 Virtual Monopoly on Land Travel

The factors surrounding these figures included PNR's virtual monopoly of long-distance land travel and commuting, when it had much less competition in either the Metro Commuter or the two Mainline train operations. Highways were less developed, there were not LRTs, and no diversion roads.

The PNR then had 47 open stations from Manila to Legazpi and 26 to San Fernando, La Union. In Metro Manila, all commuter stations were manned by PNR Station Personnel, while the company itself employed more than 7,000 personnel in plantilla positions compared to 264 today.

6.1.4.7 Rehabilitation and Revival

PNR used to operate over 797 km (495 miles) of route from La Union down to Bicol. However, continued neglect and damage from natural calamities in past decades reduced PNR's efficiency and railroad coverage. Persistent problems with informal settlers in the 1990s contributed further to PNR's decline. In 2006, Typhoons Milenyo and Reming caused severe damage to the network, resulting in the suspension of the Manila-Bicol services.

In 2007 the Philippine government initiated a rehabilitation project aiming to remove informal settlers from the PNR right-of-way, to revitalize commuter services in Metro Manila, and to restore the Manila-Bicol route as well as lost services in Northern Luzon. The government actively pursued the rehabilitation and revival of Philippine rail transport through various investments, despite the numerous problems involved.

By 2011, work was ongoing for the total reconstruction of rail bridges and tracks, including replacement of the current 35-kilogram track with newer 50-kilogram tracks and the refurbishing of stations. The first phase, involving the conversion of all the tracks in the Manila metropolitan area, was completed in 2009. On July 14, 2009, PNR launched its diesel multiple units (DMU) newly acquired from South Korea.

In mid-2011, a test run of the Bicol Express between Manila and Naga City was conducted although it encountered a problem with the tracks and typhoon-damaged embankment in the Malaguico, Sipocot area. Full repairs have been undertaken since then.

6.1.4.8 Rolling Stock: Maintenance and Increase in Hauling Capacity

Five types of rolling stock run on PNR's lines. These are the locomotives, the Commex passenger cars, baggage cars, diesel rail cars or DRC, and the newly acquired Manila commuter trains, the Korean DMUs. There are 14 locomotives, 18 Commex passenger cars, two baggage cars and eight DRC currently operating.

PNR recently (November 2010) acquired surplus sleeper coaches and passenger cars from Japan Railways East and more rolling stock are expected to arrive. As of July 2011, these units have been installed with safety window screens and the exteriors repainted.

PNR’s hauling capacity has also been increased with repair, reconditioning, and repainting of seven Diesel Electric Locomotives (DEL). At the same time, passenger convenience once the Bicol run is resumed will be augmented with on-board dining as the repair and conversion of the line’s dining car has been completed.

Source: JICA Study Team

Figure 6.1.6 Rolling Stock and Existing Facility of PNR

6.1.4.9 Budget and Financial Situation

According to the Commission of Audit (COA) Annual Audit Report of CY 2013, issued on August 2014, the financial highlights are as shown below.

Table 6.1.3 PNR Financial Highlights

(in million pesos)

Comparative Financial Position

	2013	2012	Increase / (Decrease)	%
Assets	52,868.619	53,102.553	(233.934)	0.4
Liabilities	26,114.602	25,956.031	158.571	0.6
Equity/Capital Deficiency	26,754.017	27,146.522	(392.505)	1.4

Comparative Results of Operations

	2013	2012 As restated	Increase/ (Decrease)	%
Total rail and non-rail revenue	401.023	397.641	3.382	0.9
Personal Services	99.198	100.953	(1.755)	1.7
Maintenance & Other Operating Expenses	567.912	638.315	(70.403)	11.0
Financial Expenses	225.308	404.682	(179.374)	44.3
Total other income (expenses)	(25.670)	244.327	(269.997)	110.5
Subsidy from National Government	254.605	128.653	125.952	97.9
Net loss	262.459	373.329	(110.87)	29.7

Source: COA, Annual Audit Report, CY 2013

The opinion of the Auditor was adverse on the fairness of presentation of the financial statements of the PNR as of December 31, 2013 because a number of reasons stated in that report, such as not fairly presenting figures of land assets, overstating equipment assets acquired from 1948 to 2002, undisclosed obligations with contractors, etc.

The Auditor summarized the status stating that "As at December 31, 2013, PNR reported a huge negative operating cash flow at P301.243 million, indicating that it could not meet its debt service requirements to foreign creditors which in the past were advanced by the National Government totaling P22.703 billion, and its unrecorded liabilities and statutory obligations to other government agencies and contractors of at least P1.330 billion. Under its present state and condition whereby its internally-generated cash was not sufficient to cover its regular operating expenses and capital expenditures, PNR needs substantial amount of subsidy from the National Government yearly and/or other sources of revenues to sustain its operations and to cover the budget deficit".[2]

The recommendation given to PNR's Management by COA's Auditor is summarized below:

a. undertake a complete physical inventory of all PNR assets, which to date has not been complied with by Management;

b. cause the appraisal/proper valuation of assets to have a reasonable estimate of the actual value of the resources of the PNR;

c. formulate plans on improving PNR's financial position, such as collection of receivables from various lessees and vendees of PNR real property; strengthening monitoring control of proceeds from sale of train tickets and collections from non-rail revenue; disposal of unserviceable and obsolete assets no longer used in operations; and, ascertaining other potential sources of funds/capital;

[2] *COA Annual Audit Report for PNR, CY 2013, Executive Summary, page iii*

d. Improve the accounting system for proper recording of transactions to provide reliable information and financial reports that are vital in decision making by top management;

e. Comply with our recommendation in the CY 2010 Annual Audit Report that Management develop a Manual of Approvals that would define limits of approving authority and Manual of Standard Operating Procedures as guide in carrying out business operations and financial transactions. To that date the Manuals have not been completed.

6.1.5 Light Rail Transit Authority (LRTA)

The Light Rail Transit Authority (LRTA) is a wholly government owned and controlled corporation attached to the Department of Transportation and Communications (DOTC).

By virtue of Executive Order No. 603, as amended by EO No. 830 dated September 1982, and EO No. 210 dated July 7, 1987, the LRTA was created and mandated to be responsible primarily for the construction, operation, maintenance and/or lease of LRT systems in the Philippines. It has, therefore, the sole responsible of the operation and maintenance of all lines under its jurisdiction (Line 1 & 2), with no sharing of responsibility with DOTC. DOTC is the primary policy, planning, programming, coordinating, implementing and administrative entity of the executive branch of the government on the promotion, development and regulation of a dependable and coordinated network of transportation and communications systems, as well as in the fast, safe, efficient and reliable transportation and communications services[3].

LRTA owns the existing LRT Line 1 and LRT Line 2; and retains the power of prescribing the fares and planning of the network expansion/extension. The mission of LRTA is to provide safe, efficient, reliable and responsive mass transport services in the urbanized areas of the country, particularly in Metro Manila, and in conjunction with other existing modes of public transportation. Figure 6.1.7 shows the organizational structure of LRTA.

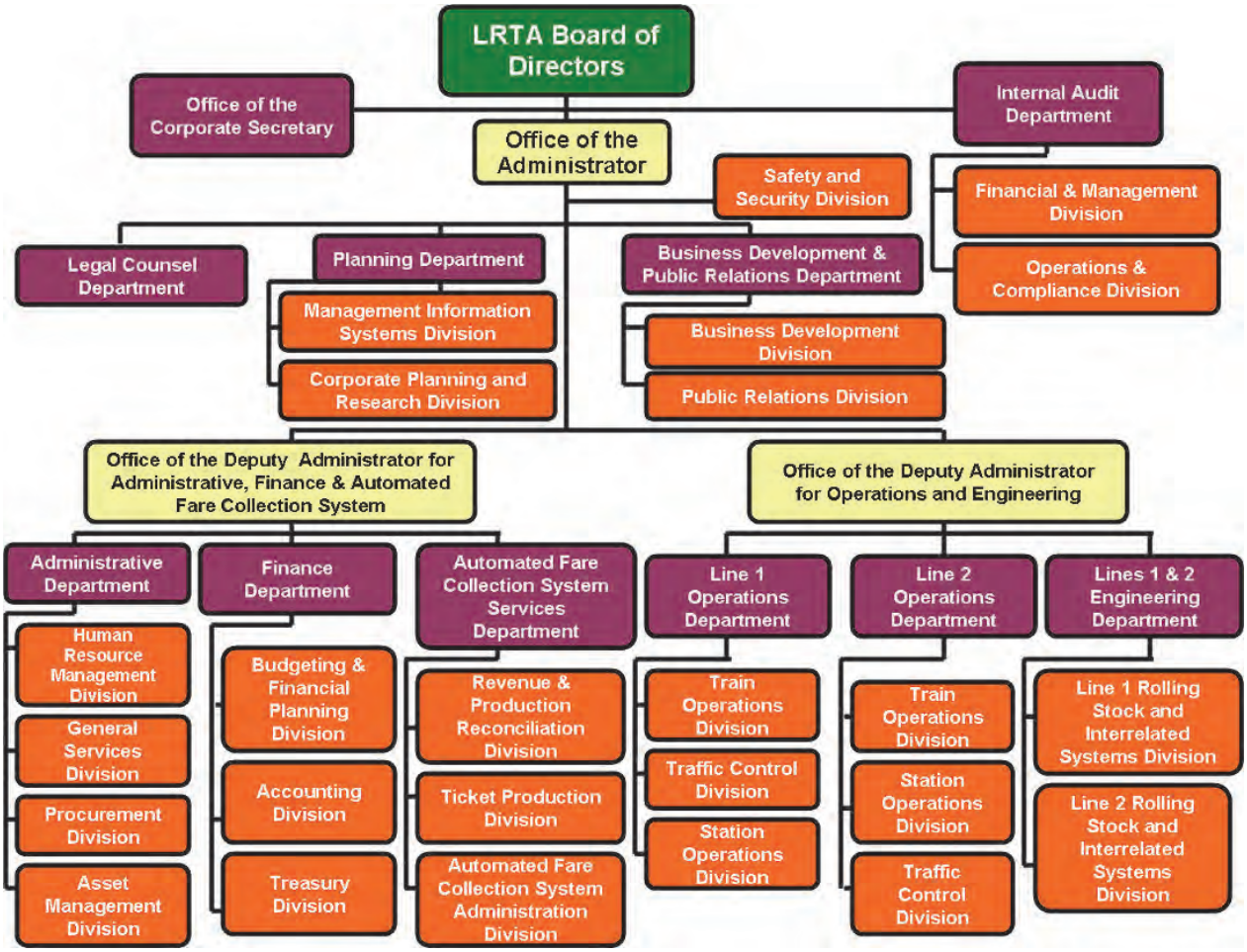
The Board of Directors is composed of eight (8) ex-officio cabinet members such as the Secretary of the DOTC, as Chairman, the Secretaries of the DPWH, DBM, DOF and NEDA, the Chairman of the MMDA and the LTFRB, the Administrator of the LRTA and one (1) representative from the private sector. The Board is tasked to issue, prescribe, and adopt policies, programs, plans, standards, guidelines, procedures, rules, and regulations for implementation, enforcement, and application by the LRTA Management. The Board also convenes to resolve operations-related issues and concerns and other matters requiring immediate attention and resolution.

At the helm of the organization is the Administrator who is supported by two Deputy Administrators and ten regular Departments, namely, Planning, Legal, Finance, Administrative, Internal Audit, Line 1 Operations, Line 2 Operations, Line 1&2 Engineering, AFCS, and Public Relations and Business Development.

A pioneer of the urban railway industry since 1984, LRTA has become the country's prime mover in the rail transport sector serving the needs of millions of Filipinos by exploring avenues where the LRT system could continuously provide efficient transport services while promoting economy and efficiency of operations.

As of 2011, the LRTA has a total manpower complement of 1,715 of which 325 are permanent/regular employees and 1,390 are contractual personnel. A regular employee is a civil servant and is eligible for benefits. A contractual Employee is not a Civil Servant and has no eligibility. The breakdown of the LRTA personnel is as follows:

[3] *DOCT Official Website*



Source: Study Team

Figure 6.1.7 Organizational Structure of LRTA

Table 6.1.4 LRTA Staffing

Section	Number of Staff		
	Regular	Contractual	**Total**
Administration	52	53	105
Finance	67	156	223
Engineering	38	28	66
Internal Audit	12	1	13
AFCS	21	60	81
BDU	6	4	10
planning	2	34	36
Operations	70	-	70
Office of Administrator	5	-	5
Office of Corporate Secretary	2	-	2
Safety & Security	10	-	10
Legal	6	-	6
MIS	20	-	20
Public Relations	6	-	6
Office of DA Finance	4	-	4
Office of DA Eng.	4	-	4
Station Teller			
Line 1	-	647	647
Line 2	-	123	123
Train Operators			
Line 1	-	187	187
Line 2	-	97	97
Total Filled Positions	325	1,390	1,715

Source: Study Team

6.2 Proposal for Implementation Plan (long term)

6.2.1 Organizational Structure

There are three possible organizational levels that could be created and applied for the implementation of new mass transit projects, to wit:

(i) Supervisory and regulatory agency;

(ii) Implementation (O&M); and

(iii) Maintenance Provider.

a) Proposal for Establishment of Philippines Railway Authority (PRA)

The creation of an autonomous Philippines Railway Authority (PRA) [4] as a governing body for setting transport policy, regulatory parameters, and for implementing all railway programs is recommended for the long term vision of the railway sector in the Philippines. The main objectives are to ensure delivery of regulatory obligations and to assure satisfaction levels of passengers equivalent to the best in railways and other forms of transport.

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

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

(ii) Health and safety regulation

- Accident and incident investigation;
- Regulation and certification;
- Safety approvals, safety directive, interoperability, train driving licenses and certificates, and rail vehicle accessibility;
- Inspections and audits;
- Conduct inspections and audits to check that the rail industry has the management systems in place effectively controlling health and safety risks;
- Enforcement of health and safety legislation;
- Safety guidance and research;
- Provide on-site and written advice and guidance on how to comply with the law;
- Worker and infrastructure safety; and
- Occupational health - Moving the health agenda forward

(iii) Land acquisition power;

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

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

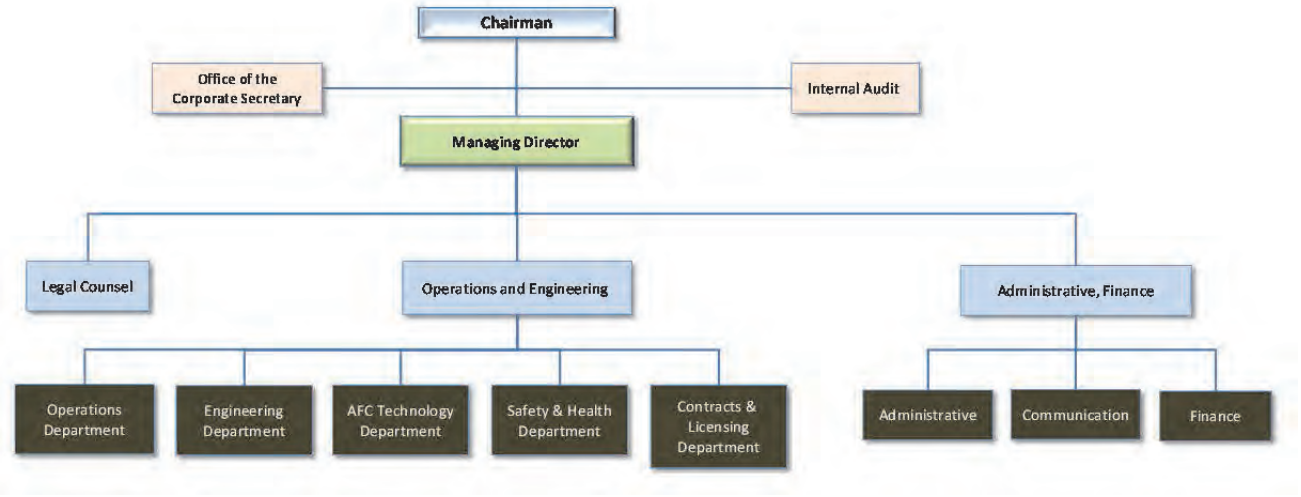
(v) Setting up a transparent, consistent, efficient administrative mechanism to create a level playing field for all participants and protect the interests of all stakeholders;

[4] *Proposed name. Final name to be decided by Philippine authorities.*

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

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

The PRA would be funded through a combination of license fees and a railway safety levy. Economic regulation activities are funded through the license fee while the health and safety activities through the safety levy. Figure 6.2.1 shows proposed organizational chart of the new PRA, and Figure 6.2.2 shows the concept of the new PRA and its relationships with existing and future entities.



Source: JICA Study Team

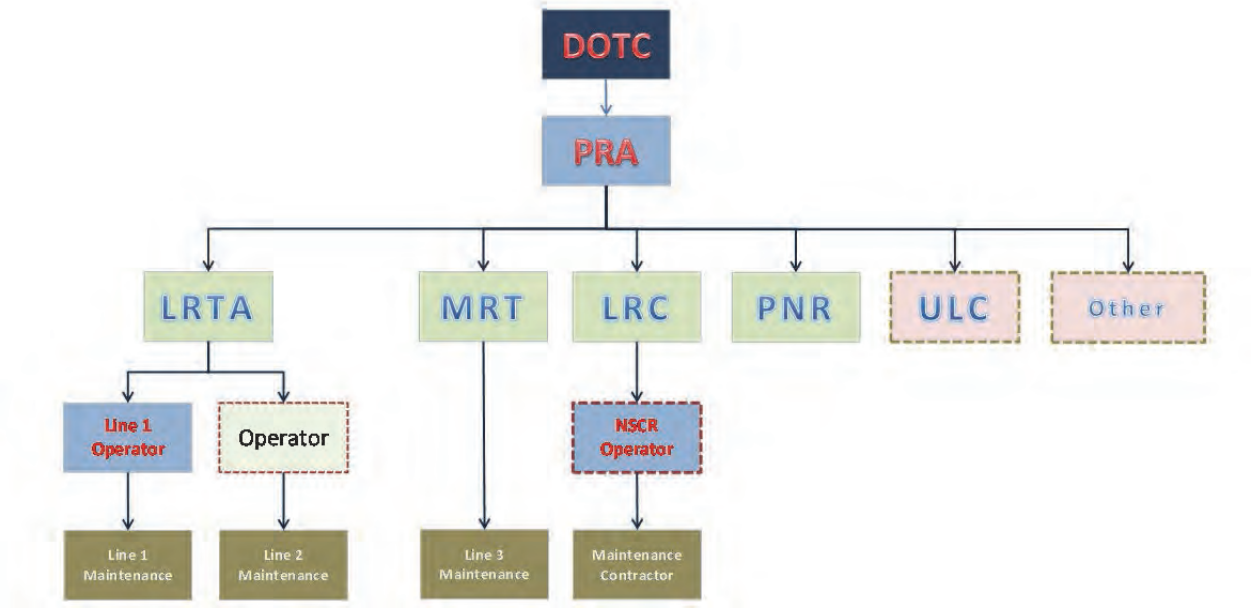
Figure 6.2.1 Proposed Organizational Chart for PRA

b) Implementing and Operating Agency (Owner/Concessionaire)

The NSCR would be the first modern suburban mass transit project in Metro Manila or even the entire Philippines. It is recommended that the operating organization will be a newly established agency under the umbrella of the future PRA, also under the existing Government agencies and supported by GOP and DOTC. Whether there will be a newly founded agency or using an existing entity, it should be decided in the immediate future by the main stakeholders, such as DOTC, PNR, and BCDA.

This section describes the organization plan of the operating organization or the Luzon Railway Corporation (LRC)[5] in terms of its positioning, role and responsibility as Railway Supervisory/Operator & Implementing Agency, and indicates those responsibilities and tasks that could be given in concession according to the type of PPP scheme, if any, adopted during the implementation of the NSCR. Figure 6.2.2 shows the concept of the new PRA and its relationships with existing and future entities. The LRC legal set up and by-laws should be similar or mirrored to the legal framework of NLRC and LRTA.

[5] *Proposed name*



Source: JICA Study Team

Figure 6.2.2 Concept of a New Hierarchy for Railways in the Philippines

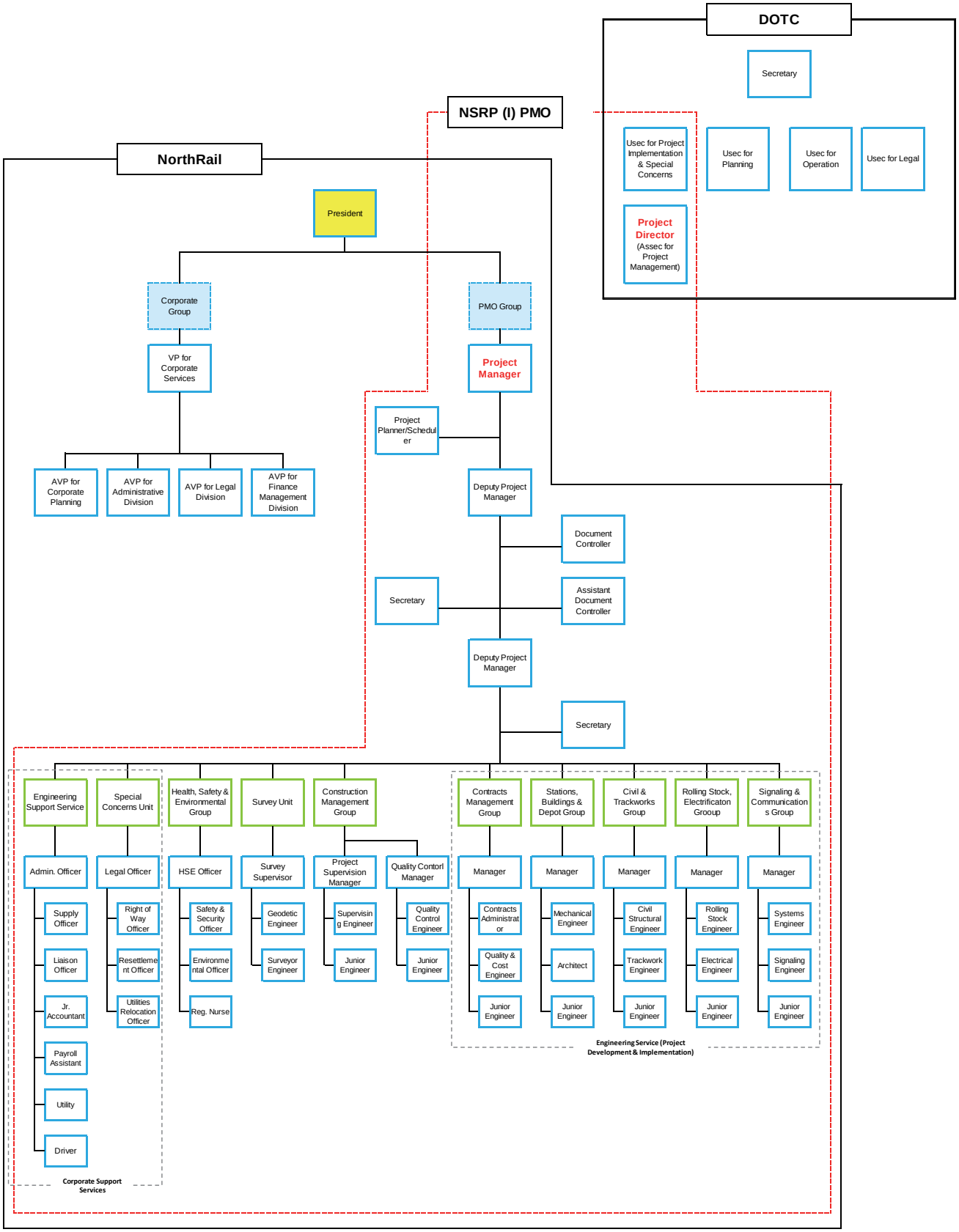
c) Creation of PMO

During the implementation of the project, a Project Management Office (PMO) should be created as the organization to be in charge of the actual implementation of the project and liaison with the Consultant, Contractor, and other concerned stakeholders. As the formal establishment of the LRC and PRA would take time, an interim PMO, within the authority of DOTC, shall be set up. This PMO, whether as interim or in final form, could be an existing entity, like NLRC, or a new unit within DOTC.

In case of an interim PMO, it should take responsibility for the initial duties until the formal establishment of the PMO within LRC. The staff of the former should be absorbed by the latter. The staff of this PMO will be critical for the success of the project and the LRC. The main scope of works of the PMO is summarized below as follows:

- Reviews the Consultants design methods, standards and criteria used in the preparation of the design;
- Assures that the Contractor's work complies with the plans and specifications of the contract by conducting regular site inspections;
- Monitors work accomplishment of the contractors;
- Analyzes and interprets financial statements/reports;
- Responsible for all matters relating to taxes and transactions related to the Bureau of Internal Revenue;
- Responsible for the safekeeping of all project records and correspondences;
- Coordinates with LRC Accounting Division and Commission on Audit regarding financial transactions of the PMO;
- Coordinates with the ODA Bank's Representatives regarding the Bank's Guidelines, which includes, but not limited to, environmental & social safeguards, procurement, monitoring of implementation, and disbursements financed from ODA loans, if any;
- Prepares all financial reports other than the PMO's financial statements as may be required by LRC, NEDA and fiscal authorities/other agencies; and
- Monitors and assists in the verifications of disbursements that are financed under the ODA loans (Foreign Currency).

For a project of the scope of the NSCR, a typical organization would be as shown in Figure 6.2.3.



Source: NLRC

Figure 6.2.3 Organizational Structure of PMO

The particular roles of some of the departments are mentioned below:

Office of the Project Manager

This Office shall be in charge of the supervision and management of all the functions of the NSCR Project. The Project manager (PM) should have the authority to approve, or recommend for approval, all technical, financial and contractual documentations to DOTC. The PM will serve as the direct liaison with the Executive Agency (DOTC). This office is composed by the Project Manager and a Chief Engineer, assisted by 5 more supporting staff.

Financial and Administrative Division

This office shall be in charge of the Budget, Accounting and Disbursement functions of the PMO. It shall be also in charge of all Personnel, Legal, Property, Supplies and Liaison matters of the PMO. It will generate pertinent financial reports of the PMO, inventory reports, personnel appraisals and other pertinent reports. It should revise, check and recommend for payment the billings from Contractors and Consultants. This office is composed by a Division Manager and assisted and advised by accountants, administrative, and document control staff, in total around 12 persons.

Engineering Division

This office shall be in charge of all the civil and structural aspects of the project to include review of design, supervision of excavation, foundation works, steel fabrications, structural works, trackworks, and pre-cast element fabrication. It will be also in charge of the design review and supervision of electrical, mechanical, signaling, telecom and fabrication works of the Project. It should generate pertinent reports and advise the PM. This office is composed by a Division Manager and assisted and advised by one civil engineer per contractual package (seven for viaduct and one for depot civil), one expert specialist for trackworks, 3 E&M systems and one for rolling stock, in total around 14 persons professional staff and 11 supporting staff.

Technical Services Division

This office shall be in charge of public and community relations during project implementation, including RAP and Land Acquisition matters, and setting-up of an efficient management operation system for the PMO. It will be also in charge of contractual and safety matter, coordination with traffic management related agencies and utility relocation agencies. It should generate pertinent reports and advise the PM. This office is composed by a Division Manager and assisted and advised by eight experts in Contracts, Safety, RAP, Land Acquisition, Planning, Public Relations, Traffic and Utility aspects, including the supporting staff a total of 13 persons.

This organizational set-up would be valid in either case mentioned above: in case of the PMO being formed based on an external agency of DOTC, or within DOCT using own human resources and external recruitment. PMO staff requires full-time commitment to the project, while the Executive level at DOTC would be in charge of the overall review and approval process of all major decisions of the Project.

6.2.2 Scope of Work

The following Table 6.2.1 shows the list of tasks LRC is responsible for in the service operation and maintenance. This is the key to which tasks an individual party can access, review, handle and ultimately how a task is routed and approved. Among the tasks and duties mentioned in Table 6.2.1 below, the Operations (III) and Maintenance (IV) are the tasks that could be given in concession to a private party in case such party has entered into a PPP with LRC and requires return on investment.

Table 6.2.1 LRC Tasks and Duties

No.	Task Category	Description of the Task Category
I.	Management	To formulate policies, prescribe and promulgate the rules and regulations for the attainment of the objectives of the PRA Implements, enforces, and applies the policies, plans, standards, guidelines, procedures, decisions, rules and regulations issues, legal affairs, and public relations.
II.	Administration	The administration-related departments and section shall advise and assist the Management in the formulation and implementation of rules and regulations necessary to carry out the objectives and policies of the authority concerning administrative, finance, accounting, budget, human resources, etc.
III.	Operation	To ensure the safe, reliable and efficient operating of the railway and satisfactory service to the passengers on a day-to-day basis.
IV.	Maintenance	To perform the daily and the long term planning and execution of scheduled and unscheduled, preventive and corrective maintenance actions to ensure overall systems are ready for required operation at all times.
V.	Engineering & Construction	Advise and assist the Management in the formulation and implementation of rules and regulations necessary to carry out the objectives and policies of the PRA/LRC concerning engineering. Monitor and be counterpart of Consultants and supervise Contractors.

Source: JICA Study Team

6.2.3 Organization Structure and Staffing of LRC

6.2.3.1 Organization Structure

Consistency of responsibility and autonomy will facilitate integration of the O&M perspective into system design, which will reduce lifecycle costs and achieve long-term sustainability. Such a system would also make it possible to identify future LRC leaders (technical managers required for the O&M phase) during the F/S and construction phases. Early identification of future leaders from the PMO organization will lead to early capability-building activities in the organization, as they develop competency and acquire a holistic understanding of the integrated systems.

The LRC organization shall start with a core team (i.e., PMO), and it will gradually evolve into its full form before start of the O&M phase. With the LRC in charge of all phases, the engineers, supervisors, technicians, and operators (required for O&M phase) can be trained during the construction phase by the system contractors and Original Equipment Manufacturers (OEMs) to equip them with necessary knowledge and skills to handle supervisory tasks for the O&M activities effectively. The technical training should be done by visiting successful cases overseas and by inviting contractors and OEMs to Manila. There should also be independent training on management and operational skill development, such as financial and business planning, maintenance auditing and service operations and general problem-solving.

All successful overseas metro systems, such as the Tokyo and Delhi Metros, share four key principles in their organizational design:

- The rail business unit is designed as a function-based organization. This is necessary to achieve the required level of competency in each railway system function, which needs to have specialized functional areas.
- The non-rail business unit (non-core) is designed differently from the rail business unit (core). This is important because the culture, skills, recruitment process, and business unit basis differ for the two businesses. Railway businesses require rigid adherence to technical standards to ensure safety and achieve specific operating standards, while non-rail businesses need creativity and flexibility to enhance non-fare box revenue.
- All decision-making authority is delegated to the board. Complete empowerment of the LRC Board of Directors can achieve transparent corporate governance, faster decision-making, and rapid project implementation.
- An internal independent safety monitoring unit is important for controlling the system's safety and security by monitoring daily O&M activities. Since a railway system involves running trains through narrow passages with a high density passenger load, it is critical to ensure safe and secure operations.

6.2.3.2 Staffing

Operations and maintenance system are established in the following steps;

1) Planning/Basic Design Stage

The hardware plan for the railway is essentially something that must be decided based on what sort of system will implement a certain kind of operation. Therefore a person who mainly carries out that operation is required when planning a railway.

Generally, in an urban railway, a local government authority will, based on urban transport policies, independently carry out facility planning based on an operations structure and a standard of provided services.

In order to implement this, the LRC must be established prior to the planning stage of NSCR, or the main planning body is set up and a system is put into place for possible discussion by the members who can fulfill the primary role of the LRC in the future.

Therefore, it is firmly suggested to develop the NSCR, the LRC or the LRC preparatory organization (collectively referred to as the "PMO") as soon as possible.

2) Construction Bidding/ Construction Management Stage

After the completion of basic planning and procurement of the necessary capital for construction, implementation of bidding and ordering and construction management will be conducted by the LRC. At this stage, it is also necessary to procure the needed personnel in order to implement outsourcing of construction management as well as bidding.

Therefore, it is necessary to start the recruitment of personnel six months before the completion of basic planning, and when the basic planning is completed, it will only be necessary to secure the suitable personnel for bidding works.

3) Staff Training towards the Start of Revenue Operation

Prior to the start of business operations, it will be necessary to train the large number of personnel. Therefore it is recommended that a number of instructors shall be employed and carried out on-site training in prior to staff recruitment. Staff training shall be carried out by Philippine side, it is considerable to offer some training programs by JICA or Japanese railway operators if necessary.

The personnel who will conduct training to the driver shall be trained one year in oversea. After one year of oversea training with proper education to become instructors, the personnel will conduct training to the driver including test drives prior to the start of operations for part or a section of the completed area. In case the period of training in the Philippines will take one year and the test drive will take six months to complete, training of the driving instructors will have to take two and half years before the start of operations. Since it will take a long time to train everyone, recruitment will have to start more than three years before the start of operations.

Operation control center personnel require six months of on-site training before the start of test driving. In order to be able to start training, recruitment will need to be done one year before starting operations. Furthermore, two personnel are required to undergo an instructional course in oversea to become leaders.

The training period for station personnel should take half a year from the start of test driving. In prior to that, one in ten number of station personnel shall trained one month in oversea as instructors. Furthermore, recruitment to secure the necessary number of station personnel shall be carried out half a year before the start of operations.

6.2.4 Possibilities of Technical Assistance for Project Implementation and O&M Bodies

1) Policy for Training and Skills Development

Technical Modules for the different NSCR systems should be formulated to enhance the technical competency of the maintenance teams that work for the company and the community at large which are the direct beneficiaries of the kind of service and maintenance the company will make.

The Operator, wit the assistance of the Maintenance Contractor, aims for a better, faster and more competitive and performing workforce through a Training and Skills Development Plan that will ensure that employees have the knowledge required for their respective jobs, improve morale and instill pride in the quality of workmanship.

Conduct of needs analysis and performance analysis to help determine the kind of training modules to offer and to identify the personnel who will avail of such program. Other techniques that will be used in determining training needs would include supervisors' reports, personnel records, management requests, observations, tests of knowledge and questionnaire surveys.

- The different departments are required to give training to further update and augment the skills of the new and present employees of the company. These refer to the technical requirements of the maintenance program. Funding will be allocated to these areas of concern.
- All employees that do not have extensive experience in their particular assignments shall undergo training. Likewise, refresher courses must be run internally in each section in the determined intervals or as defined by the section managers.
- The HR will coordinate with the respective sections in the performance appraisal, normally scheduled on a quarterly basis. The information in this activity will have impact on the Needs Analysis.

Training/Seminar schedules for the whole year will be properly scheduled to ensure that regular working routines are not compromised. Venues will be coordinated with other existing institutions here and abroad to avoid creation of separate training facilities and resources.

Supervisory and Managerial development is given equal priority by the Operator. This is an attempt to further improve current or future management performance by imparting knowledge, changing attitudes and increasing skills. Outside seminars, university related programs (MBA), and continuing educational programs are some examples.

2) Applicability of Various Japan's Capacity Development Schemes

a) Long-term Experts

Japan's training schemes would be applied in cooperation with the relevant agencies, private companies and railway operators who are involved with railway engineering and technology and who would introduce the concepts and methodologies regarding construction, operation, maintenance, etc. These entities would consist of organizations such as JETRO (Japan External Trade Organization), JARTS (Japan Railway Technical Service), JTCA (Japan Transport Cooperation Association), OCAJI (Overseas Construction Association of Japan), IDCJ (International Development Center of Japan), and railway operators such as Tokyo Metro.

It is good to promote the exchange of LRC officials by invitation to study tours in Japan, to experience and inspect Japan's experience and technology on construction, operation control, maintenance, and business model. Such a study tour would focus on the following:

- Introduction of the latest operation technology in Japan.
- Inspection and on-site visits to facilities such as the control center, construction sites, etc.
- Seminars of the legal/financial framework and Japan's experience of business models

b) Dispatch of Experts

Dispatch of experts to DOTC in timing of establishment of PMO. The proposed tasks of long/short term experts are as follow.

Long- term Experts

- Cooperation with India government officials involved in project formulation as well as with Japanese diplomatic missions
- Technology transfer related to railway technology
- Cooperation with DOTC on establishing technical specifications & standards

Short-term Experts

- Provision of stage-by-stage technical guidance: a) Assistance with building legal, financial, and contractual systems; b) Assistance with building management system for NSCR and related business models; c) Assistance with establishment of organization for NSCR operation
- Training of drivers, operations staff, etc.
- Technology transfer for operation, which includes inspection and diagnostic technologies, operations management, delay recovery knowhow, etc.
- Technical support to establish technical standards & specifications

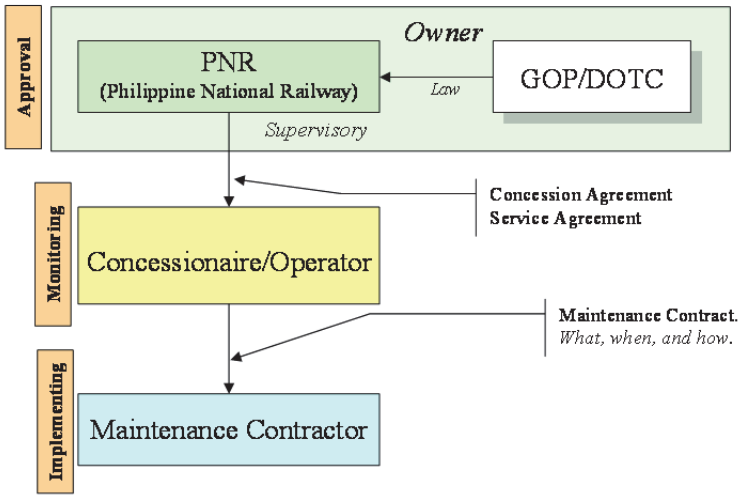
6.3 Proposed Implementation Plan for NSCR (short term)

6.3.1 Proposed Operation & Maintenance Scheme

The setting of LRC mentioned above is considered to be the best scenario for the implementation of NSCR, including the establishment in the long term of the PRA. However, the time restriction imposed by a very difficult road to establish a new entity in Philippines, both due to bureaucratic and legislative hurdles, makes almost impossible to have the LRC in place on time for Operation. Thus, it has been advised thru a letter to NEDA by DOTC that, as proposed early in this section, the Pre-Operational activities should be taken by NLRC as the PMO. The Operation stage would be carried out by a private Concessionaire under the supervision of PNR, as stated by DOTC in letter to NEDA clarifying the Institutional aspects of the project.

The proposed operation & maintenance scheme, which is a general description of the case of an existing, but outdated agency, will be the Owner/Supervisory entity, is independent from the mode of implementation that would be finally selected, whether a full ODA, a two-tiered PPP, full PPP or GAA, etc., thus, suitable to any funding scheme.

Taking into consideration all available information, site conditions, potential technical and financial capabilities of the PNR, as mentioned in previous section, it is suggested that a private and experienced Concessionaire/Operator shall be in charge of operations, and in turn it shall outsource the maintenance activities, preferably to a contractor closely linked or associated to the main OEM (Rolling Stock). The Concessionaire/Operator shall outsource to a Maintenance Contractor all the maintenance activities, including, among others, light & heavy maintenance, troubleshooting, and procurement of capital and consumable spare parts.



Source: JICA Study Team

Figure 6.3.1 Functional Organization Structure for O&M Scheme

The reason for choosing this scheme is that the PNR as the implementing and supervisory agency would not have been established yet by the time the first line starts operation.

As mentioned in Section 6.1.4.9 by COA, the financial condition of PNR cannot generate cash sufficient to cover its regular operating expenses, so it is not recommendable that a company in such condition be directly operating and maintaining the NSCR. Moreover, due to different technologies of PNR and NSCR, it is recommended that the Operation and Maintenance be given in concession to an experienced commuter railway operator.

Likewise, due to the complexity and difficulty of the maintenance of the E&M systems, and the condition of having a Warranty period in effect right after the opening for commercial revenue, it is highly recommendable to subcontract (outsource) all maintenance activities to a well experienced and capable contractor, preferably to the rolling stock OEM, as it is one of the critical and more complex railway subsystems that should be properly maintained.

Benefit of outsourcing is to introduce principle of competition by appropriately setting of the performance standard of maintenance works, it may make the procurement of good contractors. However, outsourcing will be with period of contract, when the new contractor procured appropriate operations takeover to secure continuity of operations will be necessary.

A further step in the evaluation of the implementing agency will be to check the capability of each existing department against the needed SOW for the respective department.

6.3.2 Scope of Work

The outline of responsibilities for and between the owner/Authority (A), the Concessionaire/Operator (O), and the Maintenance Contractor (C) are shown in Table 6.3.1.

The basic concept of sharing of duties is that the Owner approves, the Operator monitors, and the Contactor implements the Maintenance Plan, which is prepared based on policies and guidelines for maintenance, and the OEM maintenance guidelines. They all should be bound by two contracts: a Concession Agreement between PNR and the Operator (in case of Net Cost Scheme) or Service Agreement (in case of Gross Cost Scheme), and a Maintenance Contract between the Operator and Contractor for a period between 3 to 5 years.

Table 6.3.1 Tasks & Duties Matrix for Maintenance

Maintenance Tasks		Responsibility		
		A	O	C
1	Formulate policies and guidelines in the maintenance of rolling stock, E&M subsystems, and civil works		☑	
2	Approve policies and guidelines in the maintenance of rolling stock, E&&M subsystems, and civil works	☑		
3	Implement policies and guidelines in the maintenance of rolling stock, E&M subsystems, and civil works			☑
4	Inspect repair maintenance activities of the maintenance contractor		☑	
5	Implement all maintenance activities related to rolling stock, E&M subsystems, and civil works			☑
6	Approval of special repairs and corrective maintenance activities		☑	
7	Approval of large rehabilitation programs of capital equipment	☑		
8	Monitor Maintenance progress implementation of all maintenance activities by using CMMS		☑	
9	Monitors the performance of the contractor and oversee the proper implementation of Quality Assurance/Quality Control of all maintenance / repair works.		☑	
10	Audit/approve status reports of the maintenance of the tools and equipment;		☑	
11	Supervise and monitor the Contractor to plan and procure local and foreign spare parts, material, tools and equipment;		☑	
12	Plan and procure local and foreign spare parts, material, tools and equipment;			☑
13	Supervise the control of inventories and the issuance of spare parts;		☑	
14	Responsible for the control of inventories and the issuance of spare parts;			☑
15	Prepare annual materials/spare parts budget (local and imported) for the operation and maintenance of the system;			☑
16	Assist in managing the procurement process		☑	

Source: JICA Study Team

The monitoring and supervision of the maintenance activities should be done using a Computerized Maintenance Management System (CMMS). Currently, the software MAXIMO© is one of the most widely used as CMMS.

Capital equipment (rolling stock, subsystems, etc.) replacement due to end of life cycle or new acquisition due to capacity expansion is the responsibility of the Owner or Concessionaire depending of the type of contract, if any.

Accordingly, all parties (the Owner, Operator, and Maintenance Contractor) should adopt the concept of fully integrated teams.

The following measures should be taken in consideration to avoid the issues seen in other railway systems;

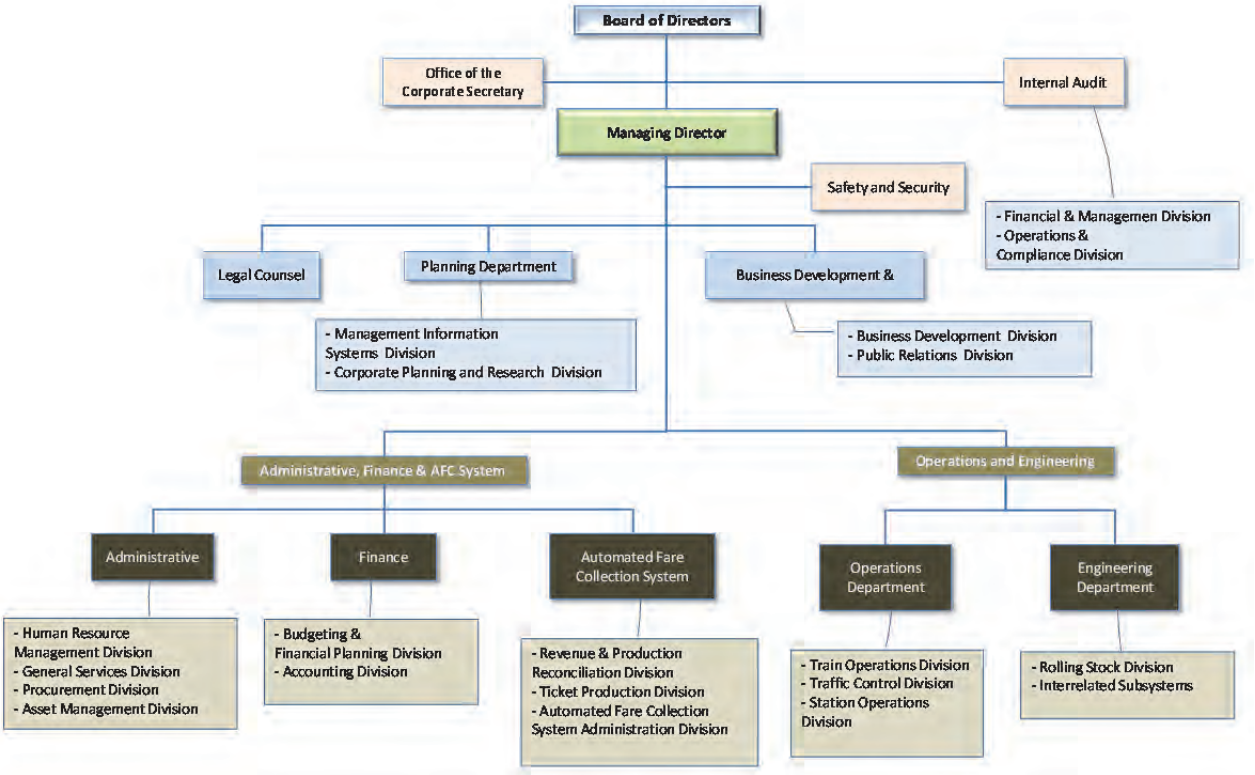
- It is important that the Owner/Operator be able to have some hands-on control over the maintenance process in order to maintain the growth of the capacity building of the in-house workforce at all levels, especially the technician level.
- Although in the beginning, all works should be assigned to the Maintenance Contractor, eventually, PNR would desire to have more control and expertise through Capacity Building programs over the years in order to reach a level where the what and when are controlled by the Owner/Operator.
- Approved training programs should be carried out periodically to the benefit of the PNR's in-house technical staff in all related activities of the O&M of the system.

Eventually, PNR should be able to take more responsibilities, control, and risks in time when the Concession Agreement for the NSCR expires, and PNR would have to take control.

6.3.3 Organization Structure

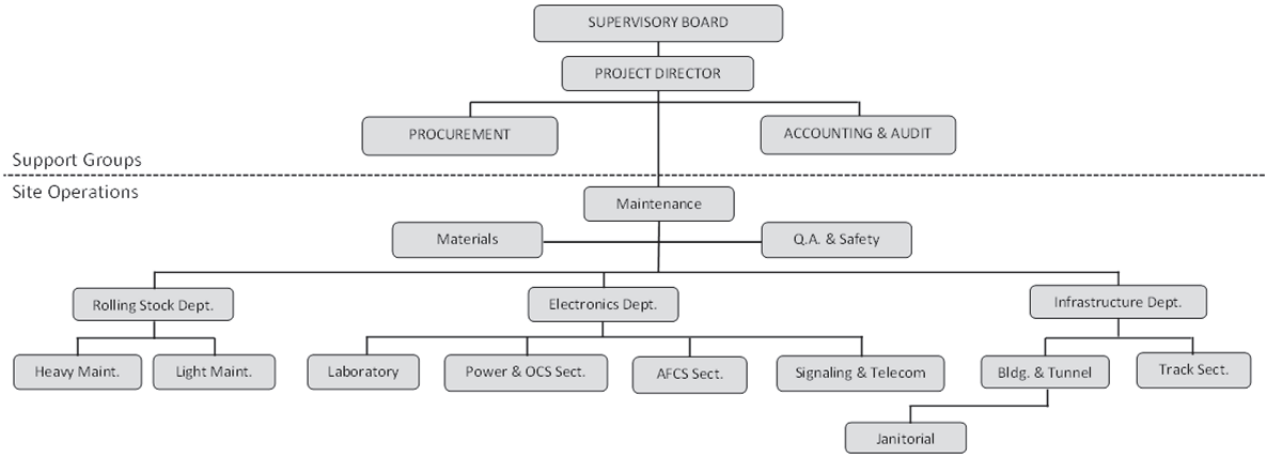
The Operator and the Maintenance Contractor's objective in selecting and developing the organizational structure is to ensure that the organization will provide clear lines of formal communication and control, and effective informal communications (networking). The organization must also function smoothly both internally and in its relationship with its counterpart and the various Agencies that will be involved directly or indirectly with the project. It will clearly identify the functional requirements related to the management of this contract. It will provide the correct balance of management and operational staff, and the optimum numbers, categories and disciplines of staff to ensure the technical and managerial success of the maintenance activities for NSCR.

Accordingly, the Operator/Maintenance Contractor should take the guiding principle in its organizational structure and adopt the concept of fully integrated teams. The entire organization could be subdivided into a Management/Administration Group and a Site Maintenance Group. The recommended functional structures are shown in the Figure 6.3.2 for Operator/Supervisory Agency and Figure 6.3.3 for Maintenance Contractor.



Source: JICA Study Team

Figure 6.3.2 Organization Chart of Operator



Source: JICA Study Team

Figure 6.3.3 Organization Chart of Maintenance Contractor

The proposed SOW of each Department shown in Figure 6.3.2 is described in this subsection. For easy reference, the Operator would be called LRC, as proposed in Section 5.2.

Office of the Managing Director

- Formulates and recommends to the LRC Board, plans and policies related to the administration/management and operation of the NSCR System and the future expansion or extension projects.

- Implements, enforces, and applies the policies, plans, standards, guidelines, procedures, decisions, rules and regulations issued, prescribed or adopted by the LRC Board, PRA (when established), the DOTC and the Office of the President.
- Manages the affairs of LRC in accordance with applicable laws, orders, rules and regulations.
- Spearheads the conduct/execution of studies concerning the expansion of the NSCR System's network and other related development requirements in consultation and coordination with appropriate agencies.
- Spearheads the conduct of periodic performance, operational and financial audits to ensure the effective and efficient use of resources in the accomplishment of tasks and the achievement of the goals and objectives of LRC.
- Oversees the enforcement and implementation of safety and security rules and regulations set by PRA.
- Responsible for the planning, development and conduct of public relations programs and activities of LRC.

Internal Audit Department

- Advises the Board of Directors on all matters relating to management control and operations audit;
- Reviews and appraises systems and procedures/processes, organizational structure, assets management practices, financial and management records, reports and performance standards of the agency/units covered;
- Analyzes and evaluates management deficiencies and assists top management by recommending realistic courses of action; and
- Conducts management and operations audits of LRC activities and determines the degree of compliance with their mandate, policies, government regulations, established objectives, systems and procedures and contractual obligations.
- Conducts separate evaluations of the effectiveness of the internal controls of management systems such as the human resource management system, financial management system, quality management system, risk management system and their sub-systems.
- Evaluates the effectiveness, efficiency, economy, and ethical conduct of operations, including the appraisal of the operating systems and their sub-systems.

Safety and Security

- Prepare plans and actions related to Safety and Security as established by PRA and the Government
- Supervises the activities of the Security Contractor who provides the Guards;

Legal Department

- Acts as legal consultant/legal counsel and gives legal advice on official matters;
- Represents LRC as a agency, the Managing Director and other officials of LRC in civil or criminal cases arising from the performance of official duties before the court/administrative bodies/tribunals;
- Conducts legal research work and studies on legal queries and renders opinions on such matters;

- Reviews and recommends approval of contracts entered into by LRC; and
- Reviews/undertakes drafting of proposed rules, regulations, orders, circulars, and other regulatory measures regarding operational activities of LRC

Planning Department

- Responsible for the conduct of feasibility and other related studies relative to the identification of projects, evaluation of the economic, financial, technical and operational acceptability of project proposals, and the funding/financing and approval of projects proposed by relevant government authorities.
- Formulates corporate goals/objectives, policies, short, medium and long term corporate plans and programs of the LRC.
- Directs all the IT activities of the LRC including the application of computer-based information systems and related principles and techniques in all aspects of railway management and operation.
- Prepares periodic reports on operations and provides data, statistics and other relevant information on NSCR system operation to the public and other concerned entities/agencies.

Business Development and Public Relations Department

Overall supervision of the conduct of research, feasibility studies, data gathering, and statistical analysis and the formulation/development of plans and programs for LRC's non-rail revenue generated activities. Ensures the promotion of the NSCR system and LRC.

a) Business Development Division

- Conducts research, feasibility studies, data gathering, statistical analysis and formulates/develops plans and programs for LRC's non-rail revenue generated activities;
- Conducts assessments of current business development and concessions and recommends the trend most advantageous to LRC;
- Prepares statistical projections and analysis on business of LRC non-rail revenue generated transactions;
- Formulates, prepares, develops and/or recommends policies, rules, procedures and/or regulations for the evaluation, review and implementation of proposals;
- Oversees and initiates the proper implementation of approved non-rail revenue generated transactions for NSCR; and
- Identifies and prepares reports on available and potential LRC assets, areas/spaces for allocation and evaluation of the highest/best use, for possible business opportunities.

b) Public Relation Division

- Formulates and implements an effective and efficient information program through mass media (print, radio and television) to achieve greater public awareness of LRC's programs and projects;
- Ensures that complaints, requests and inquires pertaining to the services of the NSCR are promptly attended to; and
- Handles all activities relating to media, press conferences, interviews etc.

Administrative Department

- Formulates and implements guidelines regarding personnel management and development, and general services for the LRC.
- Maintains economic, efficient, and effective services relating to personnel, records, supplies, equipment, custodial works and related services.
- Handles and develops real estate properties, buildings and other ancillary structures and the efficient use of the same for income generation purposes.
- Formulates and implements long and short term administrative plans and programs in line with the objectives and policies of LRC/Government.
- Maintains an efficient procurement and property management system.
- Takes charge of comprehensive insurance coverage for all LRC assets.

Finance Department

- Prepares and recommends financial policies, short-term and long-term financial plans and programs, systems and procedures and implements the same upon approval by the Board.
- Responsible for all financial transactions and advises the Managing Director and the Board on all matters pertaining thereto.
- Undertakes studies on funding programs of the NSCR system projects (rehabilitation of existing system and future projects) in coordination with the appropriate agencies.
- Prepares and submits all financial reports required by various fiscal authorities and other government agencies requiring such reports.

Operations and Engineering Department

- Operation Department, consisting of Train Operation Division (mainly drivers); Traffic Control Division (OCC); Station Operation Division; and Station Tellers, takes charge of the day to day operation of the existing NSCR.
- Engineering Department covers the following roles:
- Oversees the construction, expansion/extension of new NSCR and/or new projects.
- Conducts rehabilitation and maintenance of the existing NSCR system.
- Supervises the activities of the Maintenance Contractor.
- Evaluates the operational feasibility of proposed projects in accordance with prescribed standards.
- Utilizes and controls equipment, spare parts, and other machineries essential for the efficient operation of the system.
- Provides operational inputs in the planning for new projects.
- Participates in detailed engineering and design of the various infrastructure projects of LRC.

Automated Fare Collection System Services (AFCS) Department

The scope of works of this department will greatly depend on the final outline of the on-going Common Ticketing System Project. Thus, until then this subsection remains pending.

6.3.4 Staffing of Operator and Maintenance Contractor

The proposed staffing requirements are shown in Table 6.3.2.

Table 6.3.2 LRC Staffing

Unit	Operator	Maintenance Contractor	Janitorial Services	Security Services
Management	**35**			
Board of Directors	10			
Internal Audit Division	13			
Office of the Corporate Secretary	4			
Office of Managing Director	4	4		
Safety and Security	4			
Guards				120
Administration	**93**			
Legal Counsel	6			
Planning Department	10			
Business Development & Public Relation	7			
Administrative Department	30	10		
Finance Department	40	15		
Operation Department	**215**			
Department Management	10			
Train Drivers	120			
Train Control (OCC)	40	8		
Station Operation Division	45			
Janitors			195	
Engineering Department	**57**	**391**		
Department Management	38	20		
Rolling Stock Division	6	90		
Interrelated Systems Division	10	228		
Viaduct and Building Division	3	53		
AFC System Department	10	10		
Station Tellers	60			
Totals	**470**	**438**	**195**	**120**
Grand Total	**1223**			

Source: JICA Study Team

6.4 The Prospect for a Public-Private Partnership (PPP) Scheme

1) Project Implementation Alternatives

Large-scale infrastructure projects, in the past, usually rely on pure public funding with budgets prepared yearly by the implementing agencies and, when approved, become part of the annual national budgets as stipulated in the General Appropriations Act. Foreign funds are often infused to a large extent through ODA.

Due to the lack of fiscal resources and the need to accelerate infrastructure development, thePublic-Private Partnership (PPP) mode of implementation evolved and is bringing in more projects to be realized. Although it has only started gaining substantial grounds in recent years, the PPP had an early beginning as the Build-Operate-Transfer (BOT) in the 19936. The advantages and disadvantages of this implementation modality is given in Table 6.4.1.

Table 6.4.1 Advantages and Disadvantages of PPP

Advantages	Disadvantages
The private sector can bring in specific knowledge and know-how in efficient management and operation. In addition, private funds increases the resources of the public sector for better service; freeing up funds that may be allocated to other projects.	PPP tender process is usually longer and more complex than the traditional public procurement method. Transaction costs are much higher so the private entity ends up spending a huge sum for bid submission.
The flexibility of PPP schemes, together with the possibility for the private party to generate a profit is a strong incentive to innovate, optimize and take advantage of opportunities for business development. The objective is always value for money.	Various parties can be involved in a PPP and the contractual framework needed for regulating all the responsibilities, risks, and covenants is complex. Moreover, conflict resolution for PPPs are cumbersome compared to the traditional public procurement contracts.
A PPP scheme allows for the allocation of some of the risks to private sector and other stakeholders other than the government agencies.	There is entrenched public perception that the use of some public infrastructure or public service should be free or government subsidized.
Operation and maintenance requirements are taken into account right from the beginning of the project, creating better conditions for the development of the project. This improves cash flows and reduces costs.	
Customer satisfaction is always the goal of the private sector. As such, this can be built in the contract as an incentive to the PPP contractor to provide high level of service.	
The PPP contract can incorporate incentives for the private sector to complete the project on time and within budget.	
PPP can lead to the development of specific economic sector of high entrepreneurial value.	

Source: Compiled from CEDR Project Group Funding and PPP Center presentations

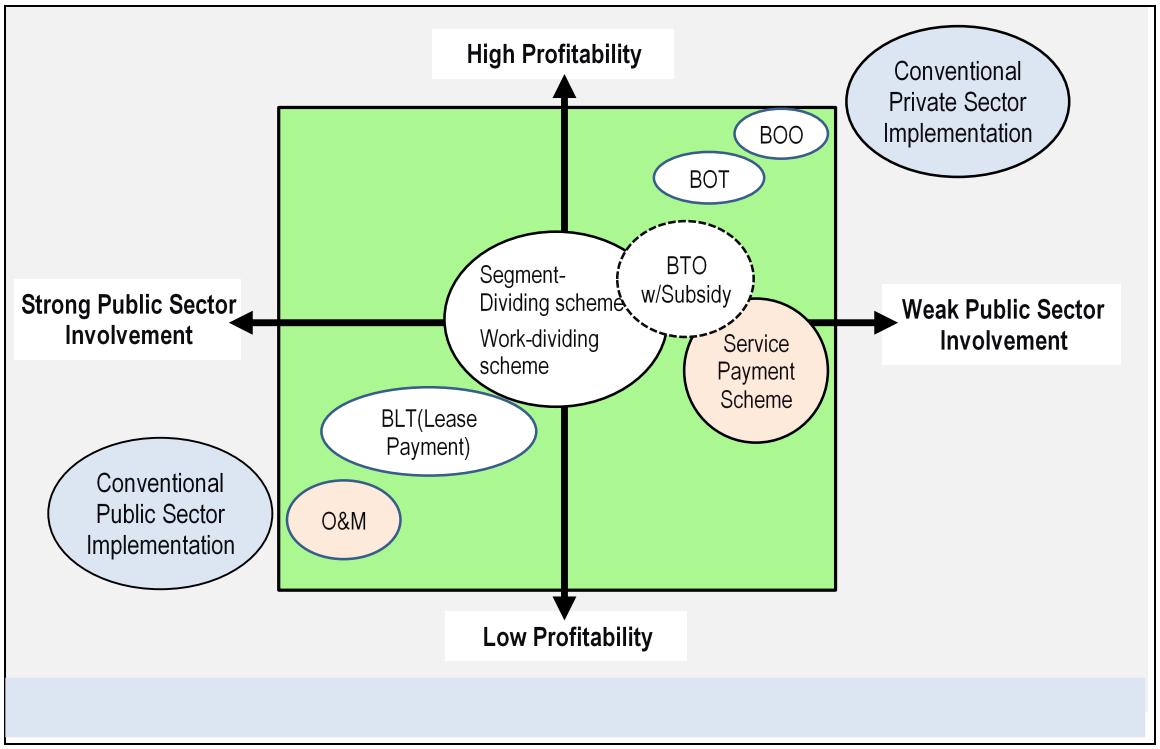
PPP now has several variations, which can be differentiated through the involvement of the private entities (refer to Figure 6.4.1). A PPP contract outlines the responsibilities of each party and clearly allocate risks.

[6] *To formalize its adoption in the development of infrastructure, Republic Act No. 7718 (also known as the BOT Law) was enacted into law in 1993.*

Source: PPP in Infrastructure Resource Center, World Bank

Figure 6.4.1 Contractual Variations of a PPP

In the Philippine context, the Build-Own-Operate (BOO) scheme had the least-risk to the government. On the other hand, it is the Build-Lease-Transfer (BLT) scheme that reduces the investor's risk (refer to Figure 6.4.2).



Source: CTI/JICA "Preparatory Survey for PPP Infrastructure Development Projects in the Philippines, 2010

Figure 6.4.2 The Different PPP Modalities and Corresponding Risk Allocations

2) BOT Initiatives for Mass Transit Development

The BOT was first used as the modality in developing phase 1 of LRT-2. It was a scheme by DOTC that was conceived even before the passage of the BOT Law in 1993. The undertaking utilized the asset and cash flows of LRT-1 as leverage. JICA (previously OECF) was the foreign source of financing.

Under the Light Rail Transit Authority (LRTA), a Project Management Office (PMO) was created to oversee civil works, rolling stock, power system, signaling, telecommunications, system integration, and contract administration. Tendering for the various components from supply and installation was done by the PMO. The responsibility covered bidding, evaluation, construction, and handover. The private sector designed and built LRT-2 and returns on investments was realized from the revenues of the two lines for a fixed period of time. This experience, however, was not profitable for DOTC as expected.

Another attempt was the MRT-3 on EDSA, which started as an unsolicited proposal to PNR in 1989. However, it was only in 1996 that the project got implemented with a new group of investors. It was structured as a Build-Lease-Transfer (BLT) scheme with DOTC as the operator but the concessionaire remains as maintenance provider. The private investor had no market risk since government guarantees periodic lease payments for trains that will be made available.

The 3rd attempt at PPP was in 1998 for the LRT-1 south extension. LRTA entered into a joint-venture (JV) arrangement with SNC-Lavalin who submitted an unsolicited proposal. It was also a failure and LRTA paid about $20 million to terminate the JV deal in 2004.

Another apparent attempt is for the planned 20-km line MRT-7 from EDSA (corner of North Avenue) of Metro Manila to San Jose del Monte of Bulacan. The same proponent that packaged MRT-3 submitted an unsolicited proposal in 2006. This project includes a 22-km highway, at a cost of US$1.2 billion. The Commonwealth Avenue alignment was originally planned as a BRT line that would be upgraded into rail in the future[7] and as a future extension of LRT-4 on Quezon Avenue or Radial Road 7. The project is meant to be a Build-Gradual Transfer- Operate and Maintain (BGTOM) but it is no different from the MRT-3 contract. The Government guarantees payment regardless of ridership. The Performance Undertaking from the Department of Finance (DOF) was just recently issued in 2014. Assuming the project starts construction in 2016, it could be operational by 2019.

When a new administration took over in July 2010, the implementation of the LRT-1 south extension project was revived as a PPP undertaking by DOTC. This was thought to be implemented under a Built-Transfer (BT) scheme for the civil works, and a Build-Transfer-Operate (BTO) for the electromechanical components with private concessionaire investing on the latter. However, there was a rethinking of the allocation of responsibilities with financing and construction of civil works transferred to the private sector while government takes over the electromechanical component. In short, there was a reversal of roles. The allocation of taxes on real assets was left to the private sector. In addition, a rigid regime of fare regulation was imposed. This turn of events only made the project unattractive to the investors as there was no bid submission in August 2013. As such rebidding was conducted and only one bidder[8] came forward and was awarded the project in September 2014. The timeline for the DOTC to move the project from NEDA approval of the investment into actual signing of the contract-to-build was more than 30 months.

Another project successfully tendered on PPP is the Common Ticketing or Automated Fare Collection System (AFCS) for the LRT-1, LRT-2 and MRT-3. This was awarded in 2014, and is scheduled to be completed and operational by the latter part of 2015. The winning bidder is AF Consortium (a partnership between the Ayala and Metro Pacific, with MSI Global of Singapore as the contracted systems provider). It will mean the use of contactless card system that would allow daily commuters to use a single ticket when they ride the 3 rail lines.

[7] *Following the MMUTIS Plan of 1998.*
[8] *The Ayala-MPIC consortium.*

3) Possibility of Applying PPP

The given FIRR of NSCR project, as it is estimated at 9.4%, will not be attractive enough for any private proponent to consider since a required reasonable rate of return is at least 15%. As such, a PPP scheme may be difficult to apply for the project.

A typical PPP scheme is the national government shoulders the cost of the civil works, land acquisition and compensation, and utility relocation. On the other hand, the private sector proponent assumes the costs of the consultant, E&M, rolling stock, and the O&M cost. In return, it will receive all the revenues during the concession period.

The PPP law of the Philippines stipulates that the government is prohibited to take a share of more than 50% of total project cost. Civil works account for close to 50% of total project cost. Therefore, based on the low FIRR results, the Philippine government should consider implementing the project with ODA funding. Counterpart funding of the government will be limited to land acquisition cost and compensation, and utility relocation cost. It is suggested that under this scheme, the government will build the entire infrastructure facility covering civil works, E&M system, track works, and rolling stock – using private contractors. Operations and maintenance of the commuter railway system can be outsourced to the private sector through a concession agreement.

CHAPTER 7

ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

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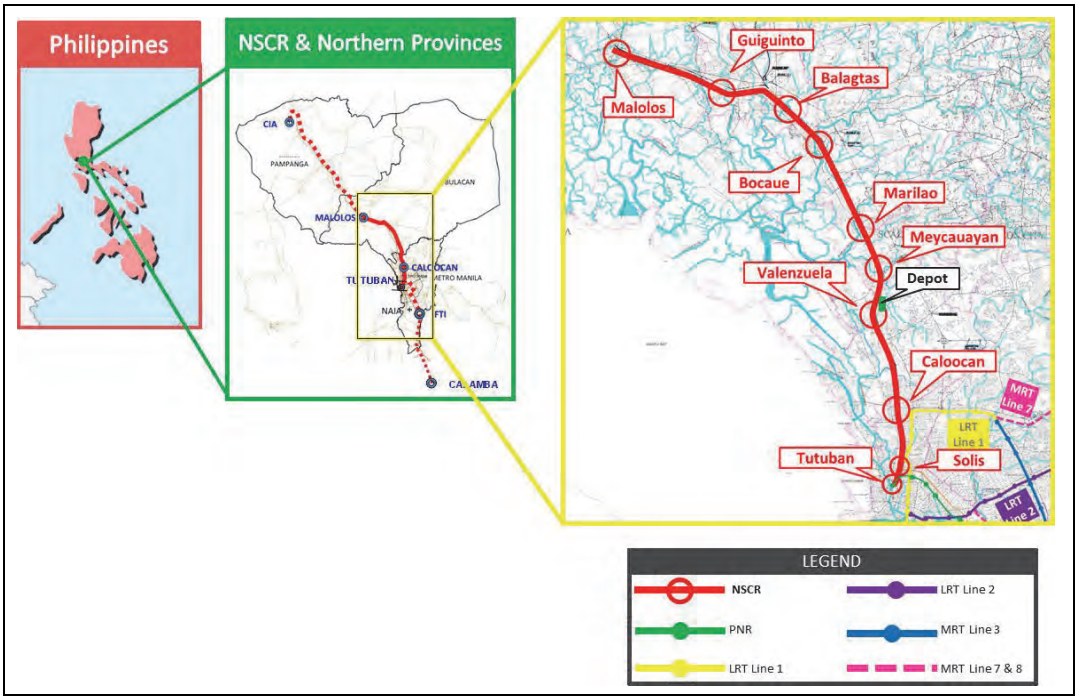
7.1 Environmental Impact Assessment Report

This section summarizes the Environmental Performance Report and Management Plan (EPRMP) submitted by DOTC to the Environmental Management Bureau, Department of Environment and Natural Resources (DENR-EMB) in February 2015 to obtain the Environmental Compliance Certificate (ECC) for the NSCR project from Malolos to Caloocan (Refer to the EPRMP for details).

7.1.1 Project Outline

7.1.1.1 Project Location and Area

The North South Commuter Rail (hereinafter referred to NSCR) Project will run from Malolos, Bulacan to Tutuban, City of Manila (Figure 7.1.1. The line will be passing through 6 cities and municipalities of Bulacan Province (Malolos, Guiguinto, Balagtas, Bocaue, Marilao, and Meycauayan), and 3 cities of Metro Manila (Valenzuela, Caloocan and Manila). In all, there will be 10 stations, and the total length from Malolos to Tutuban will be 37.9 kilometers. The entire line will utilize the existing PNR right-of-way.



Source: JICA Study Team

Figure 7.1.1 Location Map of Malolos to Tutuban NSCR Project

7.1.1.2 Background of the Project

The original Northrail Project was conceived by the Bases Conversion Development Authority (hereinafter referred to as BCDA) through its establishment of the North Luzon Railway Corporation (hereinafter referred to as NLRC), which was created to spearhead the reactivation of the rail service north of Metro Manila which has long been abandoned by PNR.

The Northrail Project was divided into 4 phases, Phase I of which was the Clark Special Economic Zone to Caloocan City. Phase I was planned to have two sections:

Section 1 – Malolos to Caloocan

Section 2 – Clark to Malolos

Section 1 was supposed to have been constructed first because it was completely along the PNR ROW, had a viable ridership potential, and travel demand was not dependent on the opening of the Diosdado Macapagal International Airport in Clark. It was initially conceived to provide commuter service from Caloocan to Malolos with stations at Valenzuela, Marilao, Bocaue and Guiguinto.

For the Northrail Project, the DENR EMB has issued two ECCs for Phase I. The first ECC was issued for the Clark to Valenzuela section: ECC 9907-036-120D dated November 11, 2000 and the second ECC was issued for the Valenzuela to Caloocan section: ECC 0706-014-7110 dated December 18, 2007.These ECCs were issued to NLRC as project proponent.

The Northrail Project as described above however was partially implemented due to legal and technical issues.

In 2013, the DOTC revived the Northrail Project as NSCR with Technical Assistance from JICA.

On 18 Jul. 2013, DOTC discussed with DENR-EMB the environmental considerations for NSCR (Phase 1: Malolos – Caloocan), and DOTC explained that the project outline of NSCR project is the same as the Northrail Project.

In his letter to DOTC dated 28 November 2013 (Annex C), former EMB Director, Atty. Juan Miguel Cuna confirmed the validity of the said ECCs, issued for the Northrail Project, to be applicable for the NSCR Project.

During the feasibility study in the NSCR Project, however, the fundamental components of the project, such as the project scope, purpose, etc., have been modified. Based on the modification, the EMB recommended that the 2 ECCs would be integrated into one ECC with the scope from Malolos to Tutuban, and advised the JICA Study Team to conduct an EIA to complete an Environmental Performance Report and Management Plan (EPRMP) for the entire Malolos - Tutuban section.

This EMB advice was in accordance with the recent EMB Memorandum Circular No. 2014-005 dated July 07, 2014, which categorized the NSCR project as Category A (Environmentally Critical Projects), sub-categorized as A-2 (Existing and to be expanded, modified and/or rehabilitated), single project. This requires the submission of an EPRMP with the monitoring data for the Valenzuela to Caloocan whose ECC was available in the Northrail Project. The processing and decision will be done at the EMB Central Office level.

Table 7.1.1 ECC for Northrail Project and NSCR Project

Section		Clark-Malolos	Malolos - Valenzuela	Valenzuela – Caloocan	Caloocan – Tutuban
ECCs	ECC by Northrail Project (ECCs become void after issuance of ECC for NSCR Project)	ECC 2000		ECC 2007	None
	ECC for NSCR Project	-	← **Integrated ECC 2015** →		
Required EIA documents to be submitted to EMB			EPRMP		

Source: JICA Study Team

7.1.2 Project Alternatives

The project alternatives (zero option, route plan, depot location, and structure type) are evaluated in 3.2, Chapter 3.

7.1.3 Environmental and Social Conditions

This section discusses the state of the existing environment before the onset of the proposed project. The baseline data presented in this section are based on primary and secondary data collection. Primary data were obtained through field surveys, consultation meeting and interviews with key stakeholders, and sampling and analyses of environmental parameters. Secondary data were collected from the Comprehensive Land Use Plan (CLUP) of the affected LGUs and relevant government authorities such as the DENR.

7.1.3.1 Social Environment

1) Demography of Impact Areas

The EIA study for the NSCR Project will cover 10 cities and municipalities traversed by the project. Currently, the available demographic data for the affected areas are on a city/municipality level. Table 7.1.2 summarizes the latest population of the cities and municipalities covered by proposed alignment.

Table 7.1.2 Table of Population (2010)

City/Municipality	Population	Population Density (persons per hectare)	Land Area (hectares)
Malolos	234,945	35	6,725
Guiguinto	90,507	33	2,750
Balagtas	65,440	32	2,866
Bocaue	106,407	33	3,187
Marilao	185,624	55	3,374
Meycauayan	199,154	90	2,210
Malabon	353,337	179	1,971
Valenzuela	582,088	130	4,459
Caloocan	1,489,040	270	5,580
Manila	1,652,171	429	3855

Source: NSO

2) Indigenous and Ethnic People

There are no Indigenous Cultural Communities and Indigenous Peoples in the cities and municipalities covered by NSCR Project.

3) Local Benefits / Employment and Livelihood

a) Local Economy of Cities and Municipalities in NSCR

i) Province of Bulacan

Bulacan's proximity to Metro Manila has contributed to its industrialization. Various companies have put up manufacturing and industrial plants in Bulacan (Table 7.1.3). The manufacturing sector has since played a significant role in the over-all economy of the province. Based on initial results of the 1995 NSO census, the manufacturing sector is the second leading economic activity because it offers some 113,051 individuals employment opportunities in the various sub-sectors of this particular activity. This number represents at least 15 percent of the total employment in Bulacan (for 1995) making it the second leading sector in terms of providing employment opportunities to Bulakenos.

However despite the highly urbanized nature of the province, agriculture remains to be the major economic activity in the area. Aside from the services and manufacturing sectors, agriculture is the third leading sector in terms of total number of employed individuals. The rural areas still mostly depend on agriculture and fisheries as a source of income. Some of the major crops are rice, corn, vegetables, and fruits such as mangoes and various kinds of fishes and seafood.

Based on trend analysis, the sector's contribution in the overall economy of the province will diminish in view of the massive rush of urban development.

Table 7.1.3 List of Industrial Sites in Bulacan

Industry	Location
First Bulacan Industrial City	Malolos City
Intercity Industrial Estate	Wakas, Bocaue
Bulacan Agro-Industrial Subdivision	Calumpit
Bulacan Metro Warehouse (BMW) Center	Guiguinto
Meycauayan Industrial Subd. I, II, III & IV	Meycauayan
Meridian Industrial Compound	Meycauayan
Muralla Industrial Project	Meycauayan
First Valenzuela Industrial Compound	Meycauayan
Sterling Industrial Park Phase I, II, III & IV	Meycauayan
Grand Industrial Estate	Plaridel
Sapang Palay Industrial Estates	San Jose del Monte
Agus Development Corporation	Sta. Maria
Bulacan ICT Park	Marilao
Golden City Business Park	Wakas, Bocaue
Sterling Industrial Park	Marilao

Source: JICA Study Team

Table 7.1.4 List of Industry Sectors in Bulacan

	Malolos	Guiguinto	Balagtas	Bocaue	Marilao	Meycauayan
Banking Institutions	32	7	12	6	7	30
Financial Institutions	18	-	-	-	-	1
Cooperatives	51	18	5	16	26	26
Hotels / Lodging Houses	12	3	4	2	10	5
Number of Rooms	376	59	26	-	269	102
Resorts/ Recreation Centers	14	7	7	7	14	8
Markets/Supermarkets	13	5	4	9	8	19
Industrial Estates	1	4	-	3	9	13
Manufacturing Industry - Food Processing	6	7	-	8	82	9

Source: Bulacan Socio Economic Profile

ii) Malabon

Malabon industries, on the other hand, include sugar refinery, patis making, cigar making, fishing and export of distilled perfume produced from flower extract.

iii) Valenzuela City

According to the 2007 Sectoral Studies, Valenzuela City had a total of 7,695 commercial establishments. The most dominant is the wholesale and retail sector, which particularly pertains to trade and repair of motor vehicles, motorcycles and personal and household goods. This comprises 41.99 percent of the total number of establishments. Real estate rentals and business activities followed and accounts for about 21.73 percent. Large commercial centers are also located in the city including SM Supercenter Valenzuela located in Karuhatan, Puregold Supermarket in Dalandanan, Royal Family Mall and CVC

Supermarket in Paso de Blas and South Supermarket in Karuhatan.

About 62.02% of the total number of manufacturing industries in Metro Manila is located in Valenzuela City. Metal works, machine shops, fabricators had the biggest share in terms of the number of followed by manufacturers of plastic and rubber products, food products and beverages, garments and wearing apparels and manufacturers with machinery. Some of the manufacturing industries which arose include those engaged in machinery, and packaging and repacking. About 22% of the manufacturing establishments were concentrated in Marulas and Canumay. Karuhatan, Ugong, Maysan, Malinta and Lawang Bato each have more than a hundred manufacturing establishments. All other barangays have at least one industry operating in their area except for Wawang Pulo.

There are two public markets in Marulas and Pulo this is being managed by the city government. There are also privately-managed wet and dry markets located in six barangays operating in the city. In terms of agricultural crop production, about two percent of the city's total land area is devoted to it. About two percent (2%) or 89.70 hectares of the city's total land area is devoted to agricultural crop production. These are located in Barangays Bignay, Canumay, Lawang Bato, Malinta, Parade and Punturin. The crops produced, rice, corn and vegetables, are either for household consumption or sold to the markets for family's subsistence. There are also six commercial and two semi-commercial livestock, poultry farms are operating in the city located in Barangays Canumay, Parada, Veinte Reales, Lawang Bato, Maysan and Bignay. Fishpond areas, on the other hand, are located in Barangays Balangkas, Bisig, Coloong, Isla, Malanday, Tagalag and Wawang Pulo.

iv) Caloocan City

The City of Caloocan, being strategically positioned in the northern portion of Metropolitan Manila, is considered as the gateway of the metropolis towards North Luzon. Being as such, the City continues to be the premier center for trade and industry in CAMANAVA (Caloocan-Malabon-Valenzuela-Navotas) area. Within the last seven years (2000–2006), the City has registered its highest number of business establishments in 2006 at 15,199 establishments. However, from 2000 to 2006, number of business establishments showed an unstable rate of change having its lowest figures at 10,287 establishments in 2002. About 65.28% of these economic activities in 2006 were engaged in trading, 27.70% in services and the remaining 7.02% were in manufacturing, mostly located in South Caloocan.

A. Bonifacio Monument area serves as the Central Business District (CBD) of Caloocan City. This area covers approximately 102 hectares of land, with various business establishments like variety stores, specialty shops, banks, business and professional offices, restaurants, malls, department stores, theaters and other entertainment facilities. Considered as the CBD's advantage points are the presence of a 90-meter wide Circumferential Road (EDSA), the Rizal Ave. Extension, Light Rail Transit (LRT), major modes of transportation such as buses and jeepneys, different communication facilities and other public utilities. As a result, the area extends its services to its neighboring cities and municipalities like Malabon, Navotas and Valenzuela, and areas as far as Marilao and Meycauayan, Bulacan. With a developed trading, banking and other complimentary industrial activities, it now serves as an alternative financial and transaction center, to Manila, Makati and Quezon City.

Growth of commercial strips with chain of eateries like Jollibee, Max's Restaurant, Barrio Fiesta, Hap Tian, Kentucky Fried Chicken and other restaurants and food chains now extends up to Rizal Avenue Extension and 10th Avenue. At present, there are also 40 commercial and savings banks situated along these major roads.

The Caloocan City Commercial Complex, formerly Plaza Rizal Park, which is located in front of the Caloocan City Hall, also housed the various business establishments, like food chains, salons, computer shops, convenience store, coffee shops and others. Sangandaan area on the other hand, having minor concentric development is slowly growing into a medium-intensity commercial site. Once the long overdue expansion of Samson Road is realized, it is expected that this area will become another Central Business District (CBD).

Intersections of C - 3 Road and A. Mabini Street, and C - 3 Road and Rizal Avenue Extension (RAE) are both business potential sites capable of accommodating High- Intensity Commercial Development. Said areas have ideal road pattern, capacity, and location, modes of transportation, communication facilities and distribution of goods to other areas.

Due to the existence of small parcel of lands along these major arteries, land consolidation is imperative to adapt high intensity commercial activities. Likewise, underdeveloped spaces for foot traffic along these areas needs to be addressed.

Areas in North Caloocan which shows potentials for commercial growth are the following: (i) Camarin Zabarte Roads intersection, (ii) junction of Susano, Camarin and Congressional Roads, (iii) Block Phase 1 Bagong Silang, Sta. Quiteria Road, Tala Road and (iv) Quirino Hi-way (Caloocan side). Despite being potential sites, economic progress along these areas are limited due to its existing narrow roads, insufficient transportation facilities and support facility services like communication, water supply and other public utilities.

v) City of Manila

Manila's economy is diverse and multifaceted. With its fully protected harbor, Manila serves as the Chief Seaport of the Country, one of the busiest in the world.

Diverse manufacturers produce industrial-related products such as chemicals, textiles, clothing, and electronic goods. Local entrepreneurs process primary commodities for export, including rope, plywood, refined sugar, copra, and coconut oil. Food, beverages and tobacco products are also locally produced. The food-processing industry is one of the most stable major manufacturing sectors in the City.

Manila has 27 public markets and talipapa that are strategically located in its 6 legislative districts. These markets are classified according to average monthly income during the preceding three months: Class A (PhP60,000 or more); Class B (PhP30,000 – 59,000); Class C (less than PhP30,000) (SEPP 2005).

Major modes of land public transport in Manila are bus, taxi, FX, jeepney, and tricycle while informal land transport systems are kalesa, pedicab and kuliglig. The Philippine National Railways (PNR) and the Light Rail Transit Authority (LRTA) operate the railway systems in Manila. The PNR has 6 terminals or stations within Manila, which includes Blumentritt, España, Laong Laan, Pandacan, Pedro Gil, and Tutuban. The LRT-1 (Yellow Line) that runs along the length of Taft Avenue (R - 2) and Rizal Avenue (R - 9), and the LRT - 2 (Purple Line) that runs along Ramon Magsaysay Blvd (R - 6) are the only mass rail rapid transit lines traversing Manila. As the chief seaport of the Philippines, the Port of Manila along Manila Bay served as the City's main entry/exit point accessible via passenger/ cruise ships, while the Pasig River can be traversed via ferry service.

Manila is the premier international port in the country and one of the major domestic ports for inter-island shipping. It will continue as one the main entry points for passengers, immigrants from the island provinces, imported goods and products from various parts of the country. It will also remain as a major exit point for the country's exports.

b) Labor Force and Employment

i) Bulacan Province

Bulacan has a high employment rate of 89.7% as shown by 2007 provincial records. The total working population in Bulacan is estimated at 1,413,000 who were engaged in various income-generating activities. The increase in the labor force is attributed mostly to the service sector, which accounts for almost 60 percent. This includes wholesale and retail trade, transportation, storage and communication, community, social and personal services. The industry sector consisting of manufacturing, construction, electricity, gas and water and mining constitutes 30% of the province's labor force. On the other hand, agriculture comprises the rest of the total employment in Bulacan.

ii) Malabon

For Malabon, about 400,390 or 66.4% of the total number of families derive their income in the form of salaries either sourced out from agricultural-type or non-agricultural-type of industry. About 19% source their income from non-agricultural type of industry such as wholesaling and retailing, manufacturing, community, social, recreational and personal services, transportation, storage and communication services and construction.

iii) Caloocan City

As of April, 2003, Caloocan City's potential labor force was estimated at 882,000 or 3.39% over the record of year 2000 labor force. Economically active force was posted at 535,000 (60.66%) of which 426,000 or 79.63% were employed and 109,000 or 20.37% are unemployed. On the other hand, labor force, which is economically inactive, was posted at 347,000.

In 2003, the City has an unemployment rate of 20.37%. The City ranked 4th in NCR cities and municipalities with highest unemployment rate in 2003. Based on 2000 - 2003 report, the City's projected labor force was estimated to reach 1,126 (in thousands) by 2010.

iv) City of Manila

Manila is predominantly a service-oriented city. It is one of the most densely populated cities in the country, next to Navotas, and it is fully built-up. Thus very little agriculture, forestry, mining and quarrying are undertaken. The leading industries, namely: textile/garments, food, personal products, chemical/pharmaceutical, and rubber/plastic products, are generally light, labor-intensive activities. They take advantage of the city's substantial labor and the labor supply from the rest of the metropolis. Service sector employment has steadily dominated the share in total employment, to average about 80% from 1994 - 1999. The rest are employed in industry sector with a minuscule number in agriculture, possibly backyard vegetable growing and small-scale fishing.

Like major global cities, Manila has become less of a center of manufacturing but more of a center for services, amenities and leisure. Given the centrality of the city in the National Capital Region, it provides employment, services, amenities and facilities for a large floating population that does not reside in the city. Unfortunately there is no data on labor force status.

4) Land Use Classification

Areas within the PNR ROW have already been cleared when the Northrail Project Phase 1 (Clark to Caloocan) was initiated for the Malolos to Caloocan segment. Likewise, the Caloocan to Tutuban segment has also already been cleared. In general, the areas within the PNR ROW are clear of any structures.

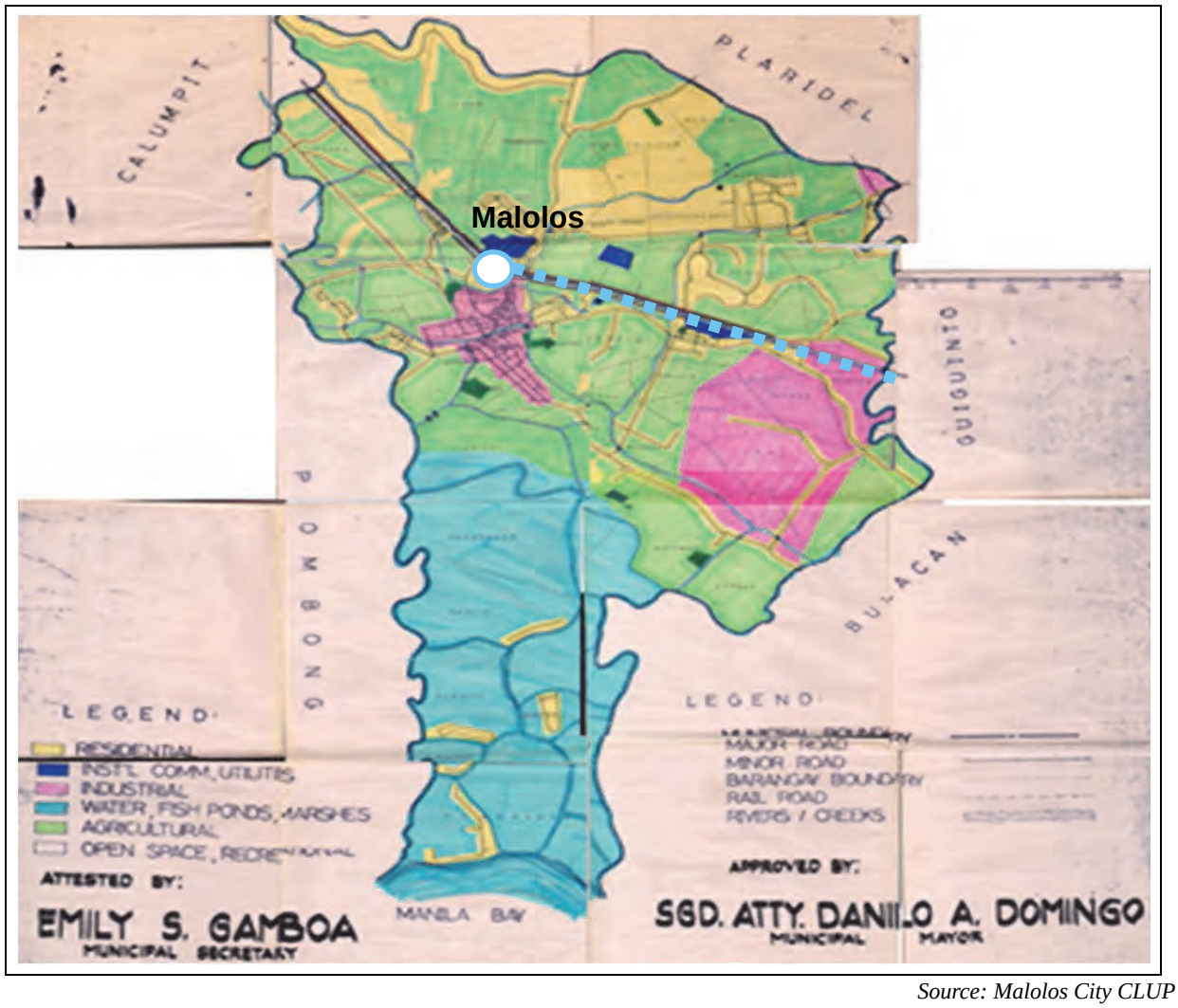
Land use analysis extending 250 m from each side of the alignment boundary shows that the proposed NSCR project traverses various land uses and development conditions, including commercial, agricultural, industrial and residential areas along the Malolos to Caloocan section. Areas become more densely built-up as the proposed railway project travels through the urban centers of Caloocan and Manila at approximately 3.5 kilometers (km). Hence, land uses and development conditions are predominated with built-up areas that are commercial and residential in nature.

The section that follows provides a summary of the existing land uses by municipality or city.

a) Malolos

Majority of the land adjacent to the PNR alignment is utilized for commercial uses, with some institutional facilities due to its close proximity to the McArthur Highway (Figure 7.1.2). Notable institutional structures situated in the immediate vicinity of the proposed railway are La Consolacion University in Brgy. Catmon, Sacred Heart Hospital, Holy Infant School of Malolos and Holy Spirit Academy in Brgy. Bagong Bayan. The alignment also passes along the industrial park of First Bulacan Industrial City in Brgy. Tikay. Other land uses within the 250 m radius from the railway are residential and agricultural, particularly rice paddies.

A number of viaduct columns/piers which were constructed under the Northrail Project Phase 1, exists along the Malolos stretch. The old PNR Station in Malolos is currently being utilized as Northrail Security Contractor's office.



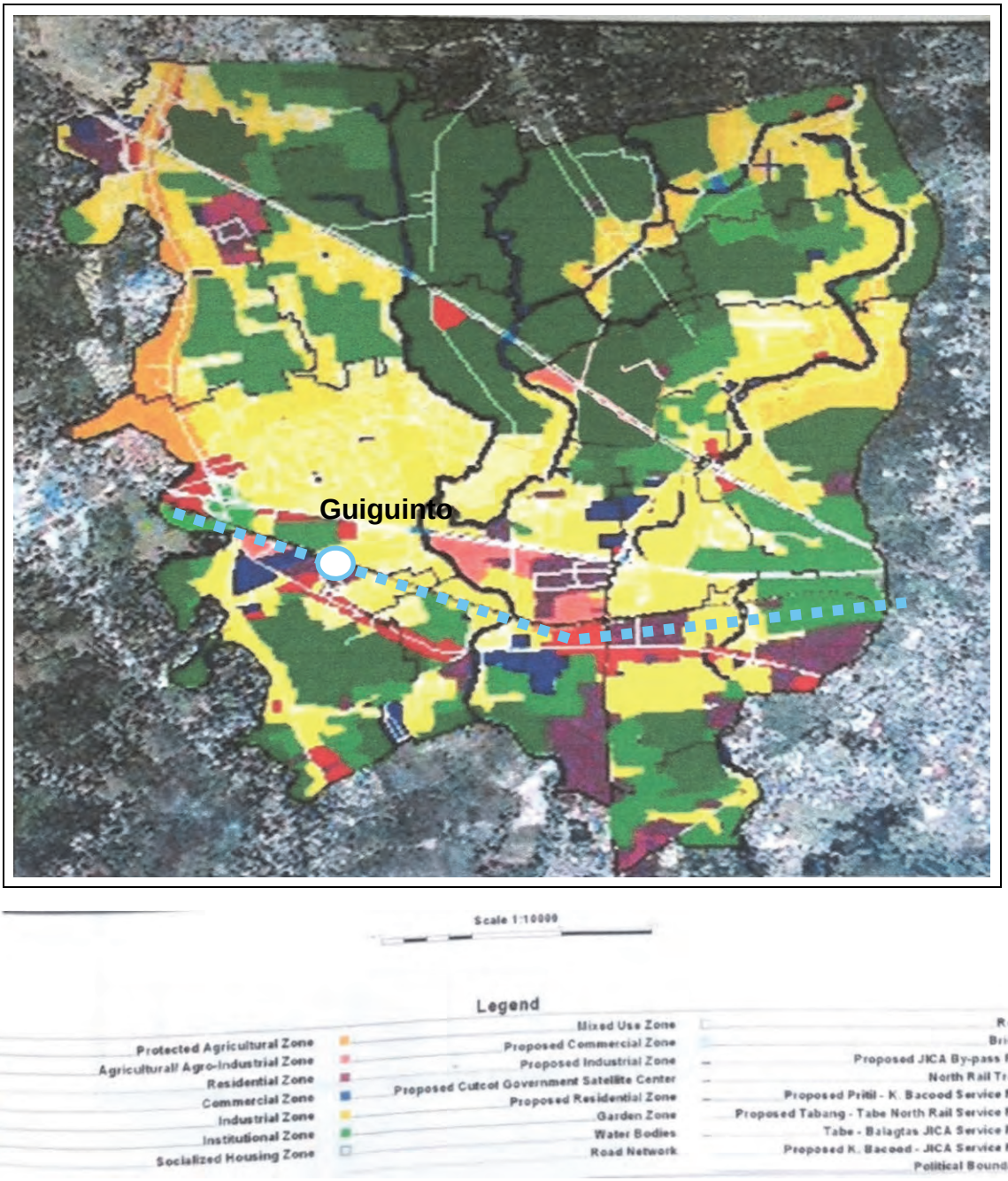
Source: Malolos City CLUP

Figure 7.1.2 Malolos City Land Use Map Showing NSCR Alignment

b) Guiguinto

The corridor extends for about 4.66 km in Guiguinto and passes through mixed land uses including agricultural for rice cultivation, industrial, low density residential areas, commercial and open spaces (Figure 7.1.3).

The proposed site for the Guiguinto Station in Tabang is adjacent to a vacant area covered with vegetation on its northern side, and the Technical Education and Skills Development Authority and an industrial facility on the southern portion. The road along the PNR ROW is also currently being accessed by residents on their way to a nearby residential area. The station is also close to several ornamental plant culturing facilities. Horticulture, particularly in Tabang, abounds as this area is a popular destination for ornamental plants market.



Source: Municipality of Guiguinto CLUP

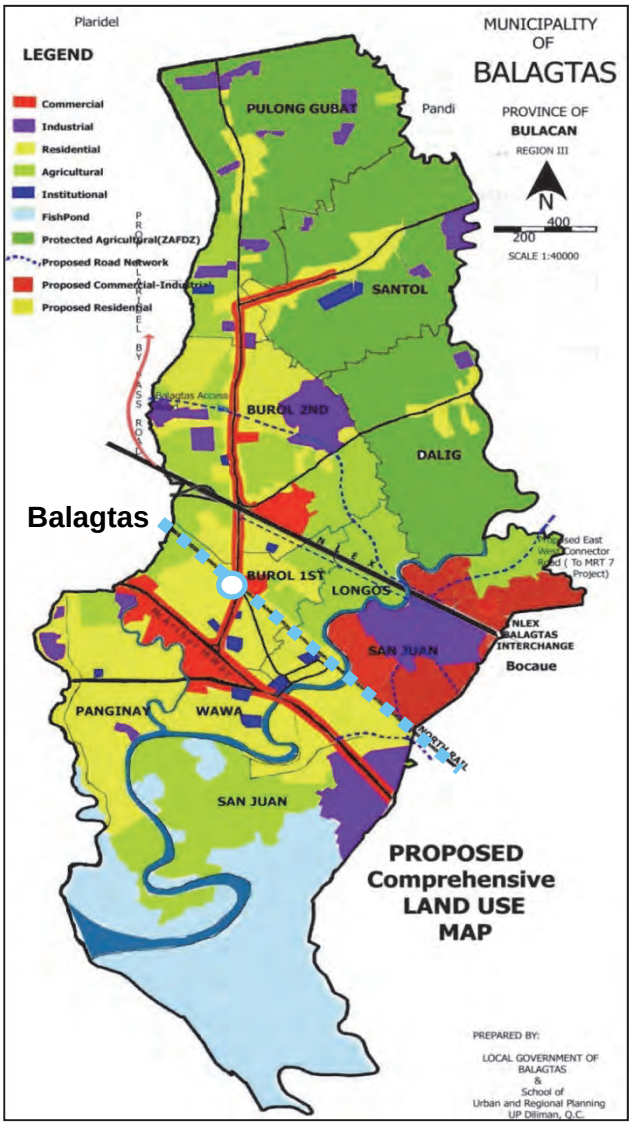
Figure 7.1.3 Land Use Map of Municipality of Guiguinto Showing NSCR Alignment

c) Balagtas

In Balagtas, the proposed railway extends for approximately 3.96 km, passing through Barangays Borol 1st, Longos and San Juan (Figure 7.1.4). Land use along the sides of the PNR ROW in Brgy. Borol 1st and Brgy. Longos is predominantly low density residential, with scattered institutional and commercial areas. Most of the commercial areas in Balagtas are located along Mc Arthur Highway, which is within 250 meters from the alignment.

However, land use becomes largely agricultural in the alignment's northern portion along Brgy. San Juan, and is classified as irrigable lands. Based on Balagtas' CLUP, the land parcel in Brgy. San Juan between the NLEX and the PNR ROW is being planned for commercial and agro-industrial development, through the establishment of the North Food Exchange Project.

The old PNR post still exists in the proposed site for the Balagtas Station. Balagtas Resort, a recreational establishment, is located adjacent to the station, along with some residential houses.



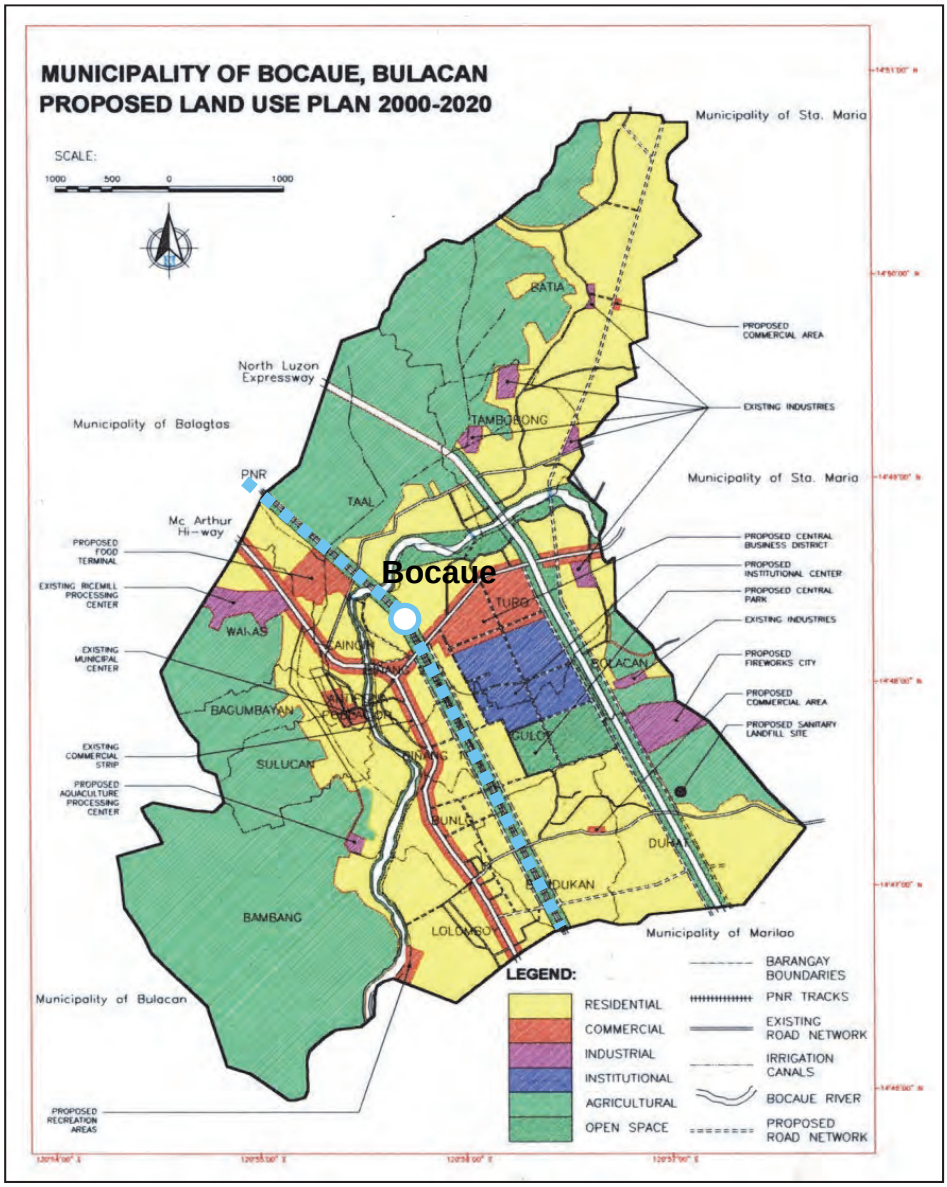
Source: Municipality of Balagtas CLUP

Figure 7.1.4 Municipality of Balagtas Land Use Map Showing NSCR Alignment

d) Bocaue

The NSCR project will extend for approximately 5.39 km in Bocaue, passing through mostly existing settlement areas in Brgys. Taal, Biñang 1st and 2nd, Turo and Bundukan (Figure 7.1.5). Commercial areas are generally situated along McArthur Highway.

The proposed Bocaue Station in Brgy. Turo is situated across Gov. Fortunato Halili Ave., where a number of fireworks dealers are lined up. However, these are more heavily located along the NLEX side. This side of Bocaue has been called a Fireworks Village due to the number of fireworks manufacturers in the area. Based on Bocaue's CLUP, there is a plan to relocate these establishments to a proposed fireworks center along the planned East Service Road of NLEX at Brgy. Bolacan, with the main of purpose of decongesting Gov. Fortunato Halili Ave, especially during Christmas and New Year's season.

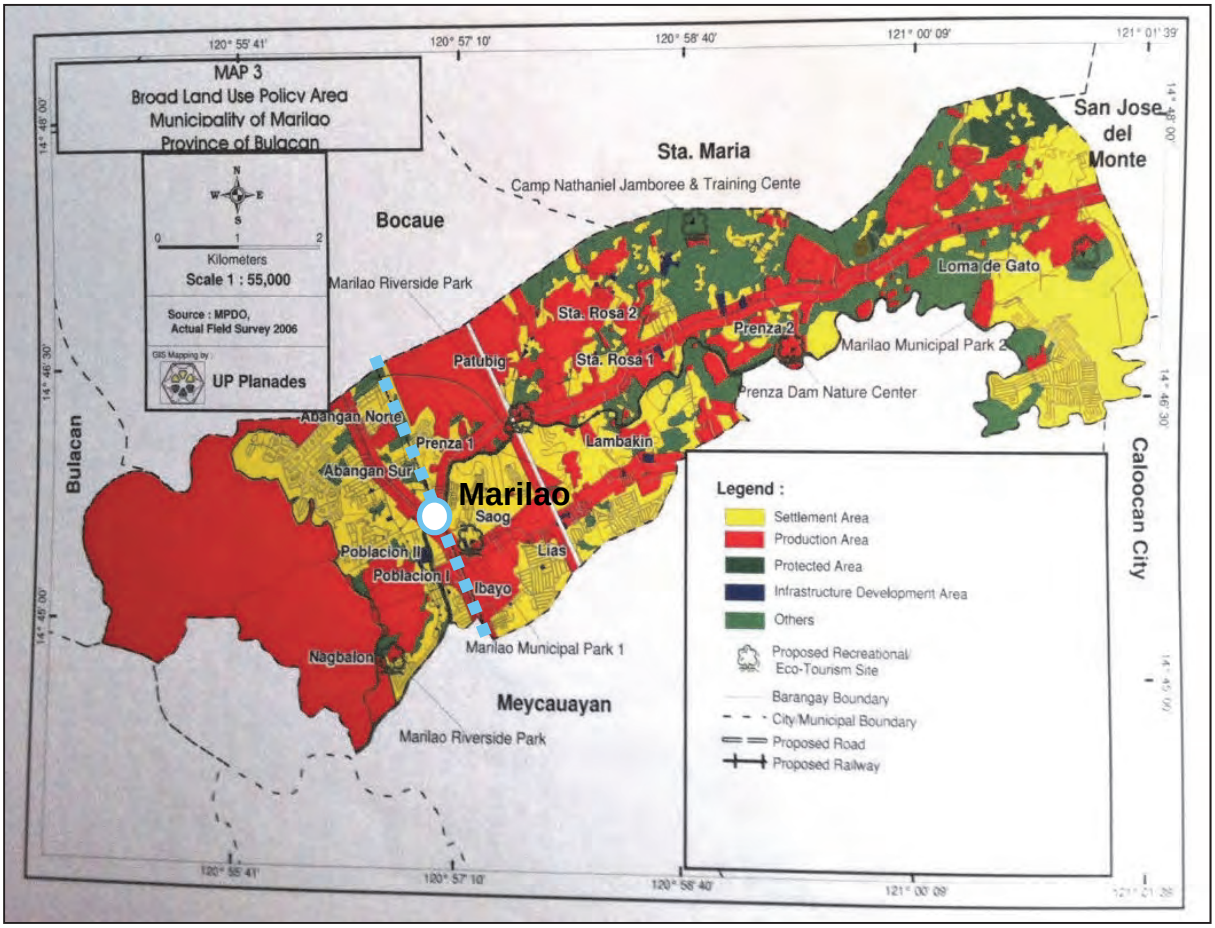


Source: Bocaue City CLUP

Figure 7.1.5 Bocaue City Land Use Map Showing NSCR Alignment

e) Marilao

The PNR alignment is generally almost parallel and within a few meters away from the McArthur Highway (Figure 7.1.6). Land use along the alignment is agricultural, residential and commercial in nature. The proposed Marilao Station will be in front of SM Marilao, located along McArthur Highway.



Source: Municipality of Marilao CLUP

Figure 7.1.6 Municipality of Marilao Land Use Plan Showing NSCR Alignment

f) Meycauayan

The proposed alignment passes through about 3.59 km in Meycauayan, traversing Brgys. Saluysoy, Pandayan, Calvario, Banga and Tugatog. The PNR alignment in Meycauayan generally runs in parallel alignment with the McArthur Highway (Figure 7.1.7). Sites along the alignment are predominantly residential and commercial in nature. Noted institutions that lie close to the PNR ROW consist of schools, colleges and churches like St. Mary's College of Meycauayan and Meycauayan College, San Bartolome de Apostol Quasi Parish, Tugatog Chapel, Our Lady of the Holy Rosary Academy of Meycauayan, Meycauayan Seventh Day Adventist Church. The old PNR Meycauayan Station in Brgy. Calvario still stands at present, bounded on its east by residential area.

Source: Meycauayan City CLUP

Figure 7.1.7 Meycauayan City Land Use Plan Showing NSCR Alignment

g) Valenzuela

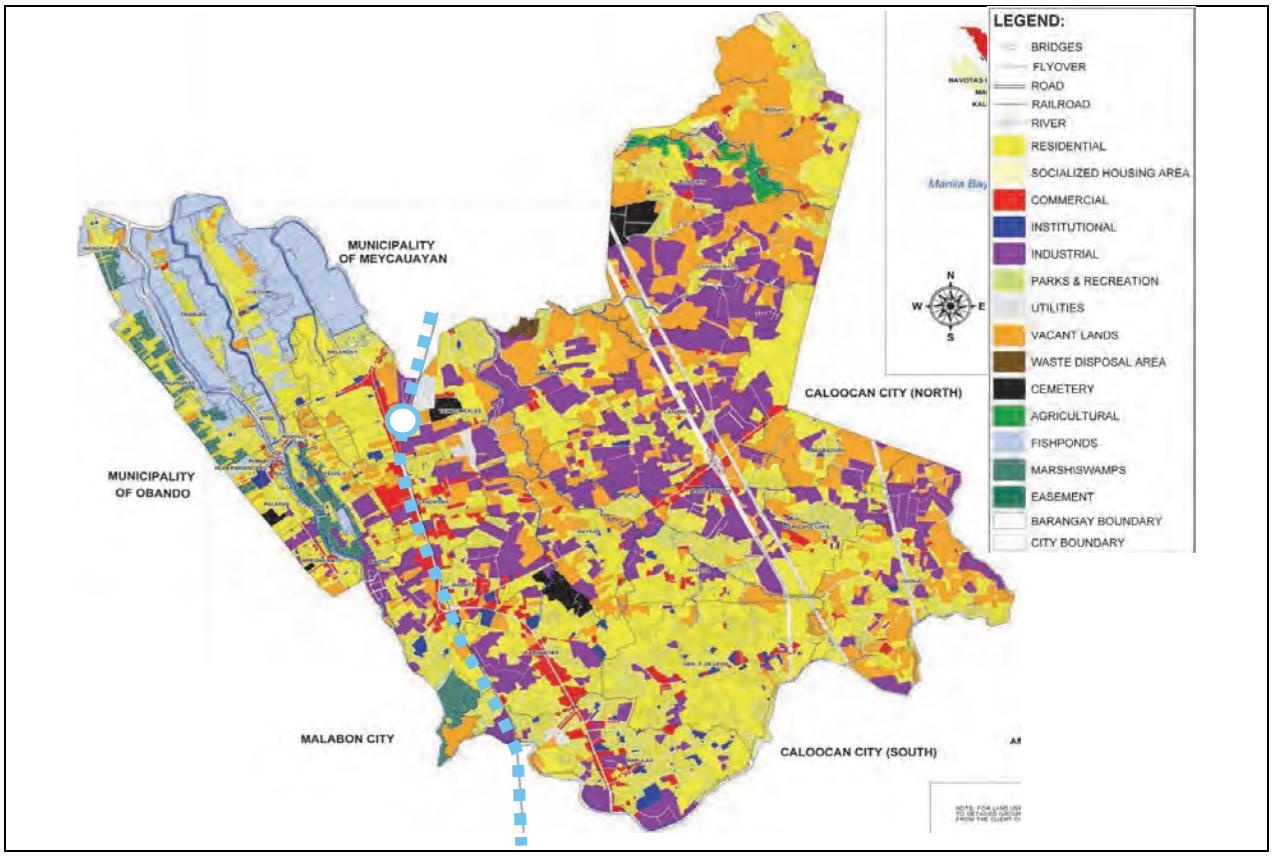
About 5.67 km of the PNR railway traverse Valenzuela City. Predominantly a mixed-use of residential and commercial land uses characterize the areas along the PNR ROW (Figure 7.1.8). Land use becomes primarily industrial as the railway passes through Brgy. Marulas and Karuhatan. Institutions such as churches and schools are also found near the alignment.

The alignment crosses three major roads as it reaches Brgy. Karuhatan: Mc Arthur Highway, Maysan Road and A. Pablo St.-Kahurahatan Road-Gen. T. de Leon Road. The alignment will also intersect with the proposed road of the NLEX - C5 Northern Link Project, which will link Valenzuela to other localities of Metro Manila.

The proposed stabling yard or parking location for trains is located in a government-owned lot within the National Food Authority (NFA), which is situated at the boundary of Meycauayan and Valenzuela. The site is a vacant area covered with grasses and becomes swampy during the rainy season. It is bounded by the NFA North District Office, First Valenzuela Industrial Company and Valenzuela Memorial Park.

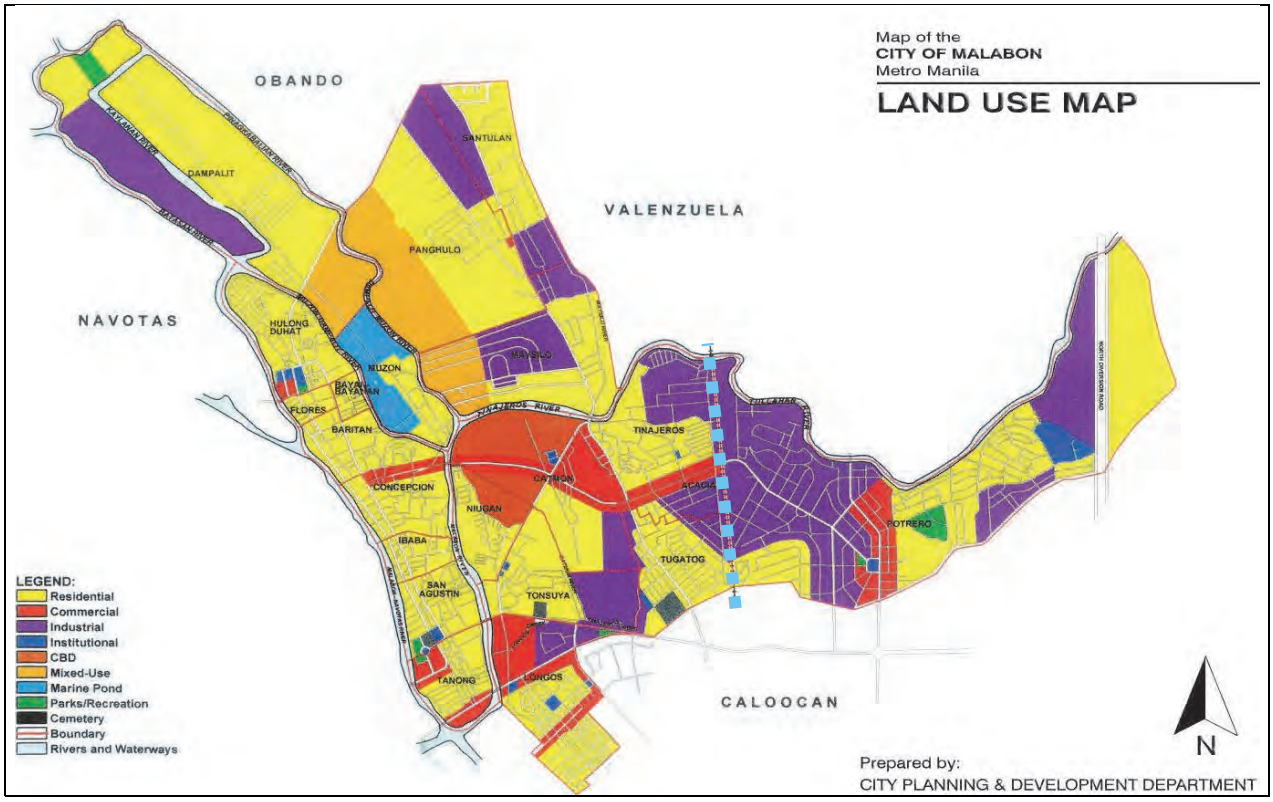
h) Malabon

In Malabon, the alignment passes through Brgys. Potrero, Tinajeros, Acacia and Tugatog. The area along the PNR railway is dominated by high-density residential, industrial and commercial land uses (Figure 7.1.9).



Source: Valenzuela City CLUP

Figure 7.1.8 Valenzuela City Land Use Map Showing NSCR Alignment



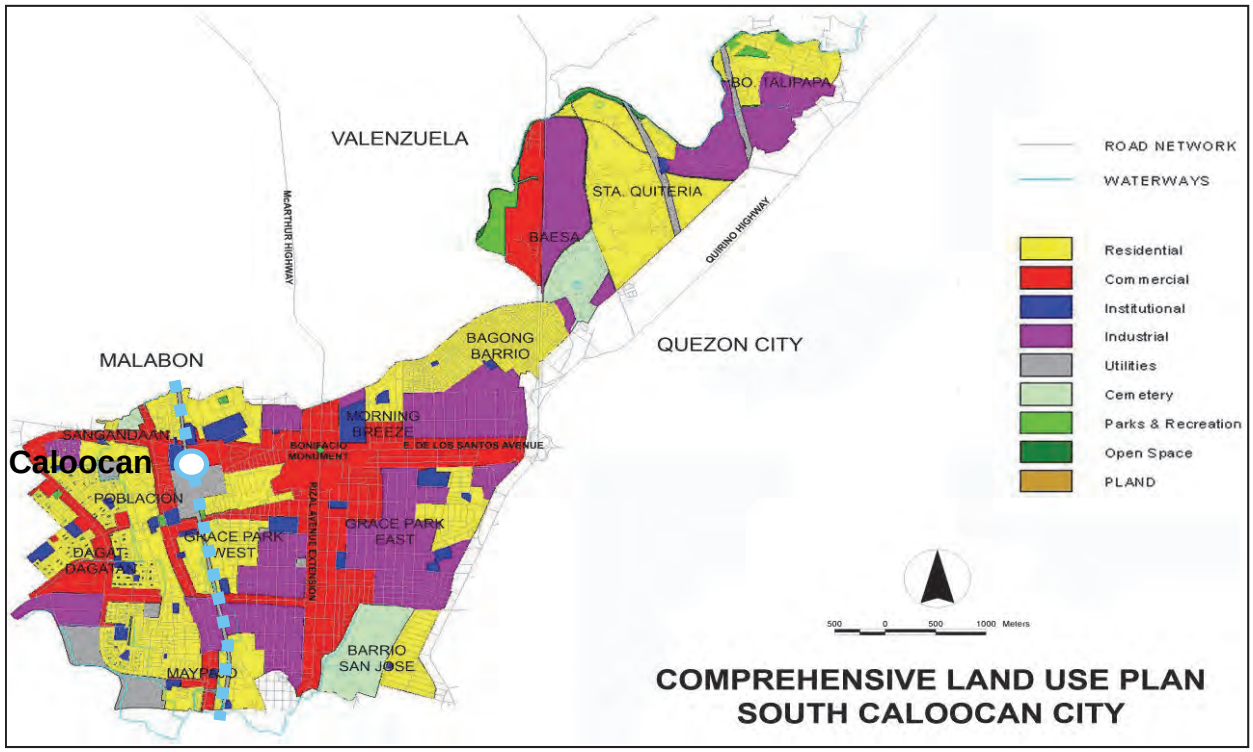
Source: City of Malabon CLUP

Figure 7.1.9 City of Malabon Land Use Map Showing NSCR Alignment

i) Caloocan

The railway runs from the barangays of Sangandaan, A. Mabini, Grace Park West and Maypajo in Caloocan City. Existing PNR Stations along the alignment are the Caloocan Station along Samson Road, Asistio Station along 10th Avenue, C - 3 Road Station along 5th Avenue and the Solis Station.

The area surrounding the PNR ROW in Caloocan includes heavily built-up areas consisting of mixed residential houses, commercial establishments and other institutional facilities such as elementary schools and churches (Figure 7.1.10). Social and government institutions noted within 100 meters from the alignment are Andres Bonifacio Elementary School, Caloocan Central Elementary School, Marulas Elementary School, Caloocan Regional Trial Court and Martinez Memorial Hospital. The alignment also traverses the Caloocan PNR Maintenance Workshop located in Sangandaan before reaching 10th Avenue from Samson Road. The Depot can accommodate 88 rail cars units. There are the old PNR Station near Samson Road and the old Caloocan Station.

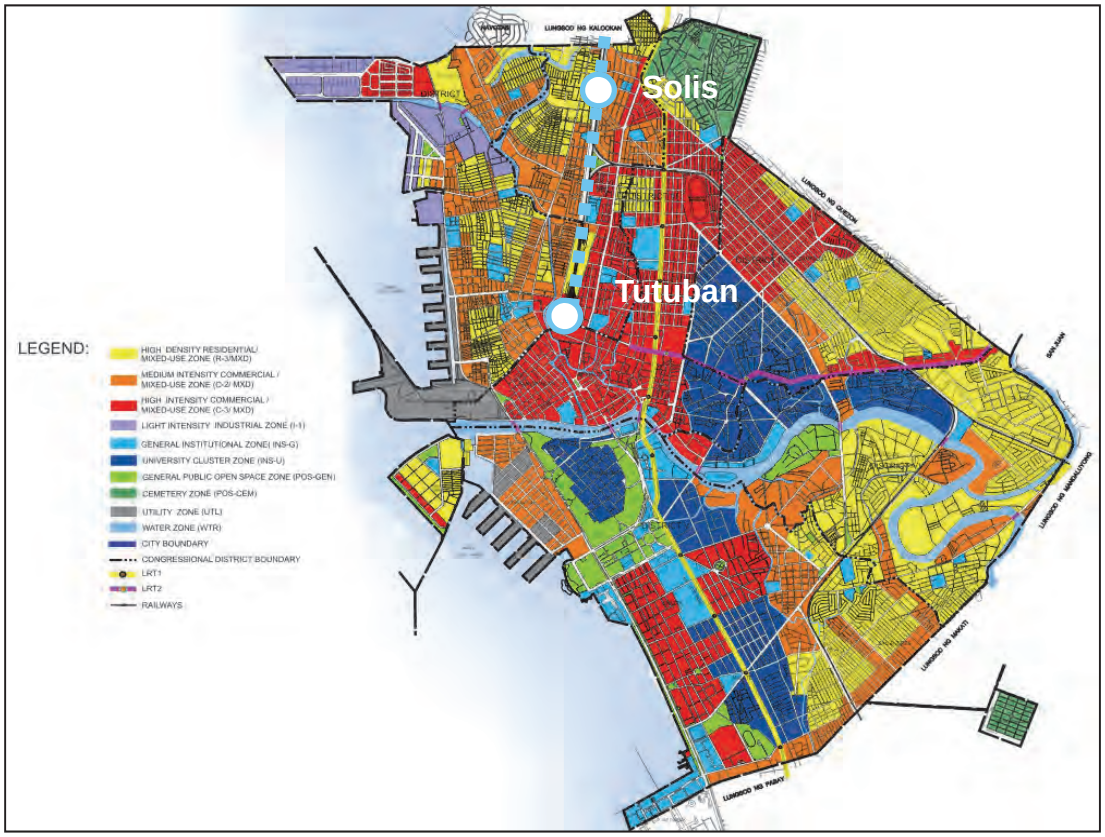


Source: Caloocan City CLUP

Figure 7.1.10 City of Caloocan Land Use Map Showing NSCR Alignment

j) Manila

The railway corridor passes through the town of Tondo in District II, Manila, after it traverses Maypajo, Caloocan. The area is characterized by high density residential mixed-use zone and medium intensity commercial mixed-use areas. The alignment ends at the PNR Solis Station. The same site is proposed as the train station for this project. Gregoria de Jesus Elementary School is located right at the back of the PNR Solis Station.



Source: Manila City CLUP

Figure 7.1.11 City of Manila Land Use Map Showing NSCR Alignment

5) Historical Cultural/Heritage

Historical structures found along the NSCR alignment include old PNR stations in Malolos, Valenzuela, Balagtas and Meycauayan. There are also minor dilapidated PNR stations in Bocaue, Guiguinto and Balagtas. These structures may be affected with the construction of the new railway. There are no UNESCO cultural heritage sites in the project sites.

7.1.3.2 Natural Environment

1) Environmentally Critical Areas (ECAs)

Environmentally Critical Area (ECA) is an environmentally sensitive area wherein significant environmental impacts are expected if certain types/thresholds of proposed projects are located, developed or implemented in it (See Table 7.1.24). Appropriate conservation and mitigation measures should be taken into account if the significant adverse impacts are unavoidable.

The following matrix (Table 7.1.5) shows the list of ECAs and the cities and municipalities where the NSCR will pass through. In all, only the following ECAs are present in the route of the NSCR:

- Area of bird habitat at a portion (pond) of the Valenzuela depot area. This will be mitigated by identifying an adjacent offset area for wetland development in order to provide an alternative area for the birds to roost.
- Areas of historic interest along the route are the old PNR stations, which will not be demolished but rather rehabilitated in accordance with NHCP guidance during construction in order to provide historic interest to the project.
- Areas of flooding and typhoons. Along the alignment, there will be portions prone to periodic flooding during the rainy season, and the corresponding mitigation measures are listed in the environmental management plan.
- Prime agricultural areas are present in portions of Malolos, Balagtas, Bocaue and Meycauayan, and these will not be touched by the project, hence they will not be affected they will remain as such even with the construction and operation of NSCR.
- Water bodies along the route include the following rivers: Guiguinto River, Balagtas River, Bocaue River, Marilao River, Meycauayan River, Malabon River, and Estero de Maypajo. However, none of these rivers are used for drinking water. The pollution levels in these rivers are high. However, they will be subject to regular water quality monitoring at the identified monitoring stations.

Table 7.1.5 Environmentally Critical Areas in Cities and Municipalities Covered by NSCR

ENVIRONMENTALLY CRITICAL AREAS	MALOLOS	GUIGUINTO	BALAGTAS	BOCAUE	MARILAO	MEYCAUA-YAN	VALENZUELA	MALABON	CALOOCAN	MANILA
1. Areas declared by law as national parks, watershed reserves, wildlife preserves, sanctuaries	None	None	None	None	None	None	None	None	None	None
2. Areas set aside as aesthetic potential tourist spots	None	None	None	None	None	None	None	None	None	None
3. Areas which constitute the habitat for any endangered or threatened species of Philippine wildlife (flora and fauna)	None	None	None	None	None	None	Proposed depot area	None	None	None
4. Areas of unique historic, archeological, geological or scientific interests	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old PNR station	Old Tutuban Station
5. Areas which are traditionally occupied by cultural communities or tribes	None	None	None	None	None	None	None	None	None	None
6. Areas frequently visited and or hard-hit by natural calamities										
- geologic hazards	None	None	None	None	None	None	None	None	None	None
- floods	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- typhoons	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
- volcanic activities	None	None	None	None	None	None	None	None	None	None
7. Areas with critical slopes	None	None	None	None	None	None	None	None	None	None
8. Areas classified as prime agricultural areas	Portions of Brgy Dakila and San Pablo	None	Portions of Brgy Longos	Portions of Brgy Bundukan	None	Portions of Brgy Tugatog	None	None	None	None
9. Recharge areas of aquifers	None	None	None	None	None	None	None	None	None	None
10. Water bodies	None	Guiguinto River	Balagtas River	Bocaue River	Marilao River	Meycauayan River	None	Malabon River	None	Estero de Maypajo
11. Mangrove areas	None	None	None	None	None	None	None	None	None	None
12. Coral reefs	None	None	None	None	None	None	None	None	None	None

Source: JICA Study Team

2) Geology and Geomorphology

a) Topography and Geomorphology

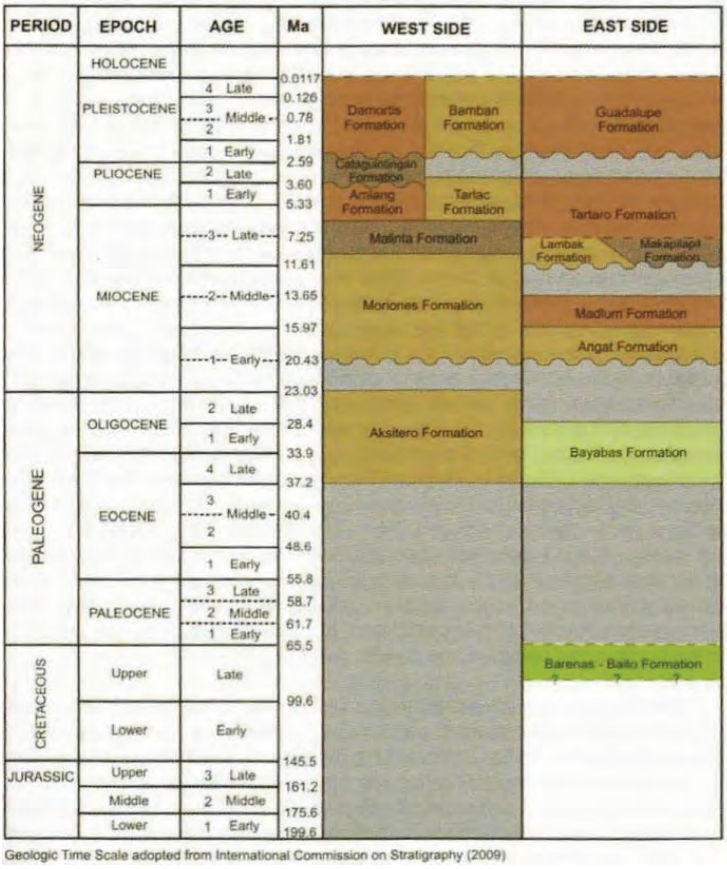
The corridor from Malolos to Caloocan and Manila is relatively flat terrain, with slopes ranging from 0 to 3%. The elevation descends gently and gradually southwards towards Manila Bay. Due to this topography active and tidal flats and alluvial plains comprise the major landforms in the vicinity of the alignment.

b) Sub-surface Geology (Lithology and Stratigraphy)

The corridor from Malolos to Caloocan to Solis belongs to the Central Luzon Basin – East Side stratigraphic grouping. The stratigraphic column for Central Luzon Basin – East Side is shown in Figure 7.1.12. The corresponding lithology and stratigraphic relations are provided in Table 7.1.6.

Alluvial formation resulting from the deposition of weathered rock materials by rivers, creeks and streams on low-level areas is the most recent geological structure covering the landmass along the alignment.

The project site in Caloocan and Manila is underlain by the Guadalupe Tuff Formation, which underlie most of Metro Manila. It consists of well-laid rock formation of tuffaceous sandstone, tuffaceous siltstone and shale being the weakest member.



Source: Geology of the Philippines, 2nd ed., Mines and Geosciences Bureau, 2010

Figure 7.1.12 Stratigraphic Column for Central Luzon Basin

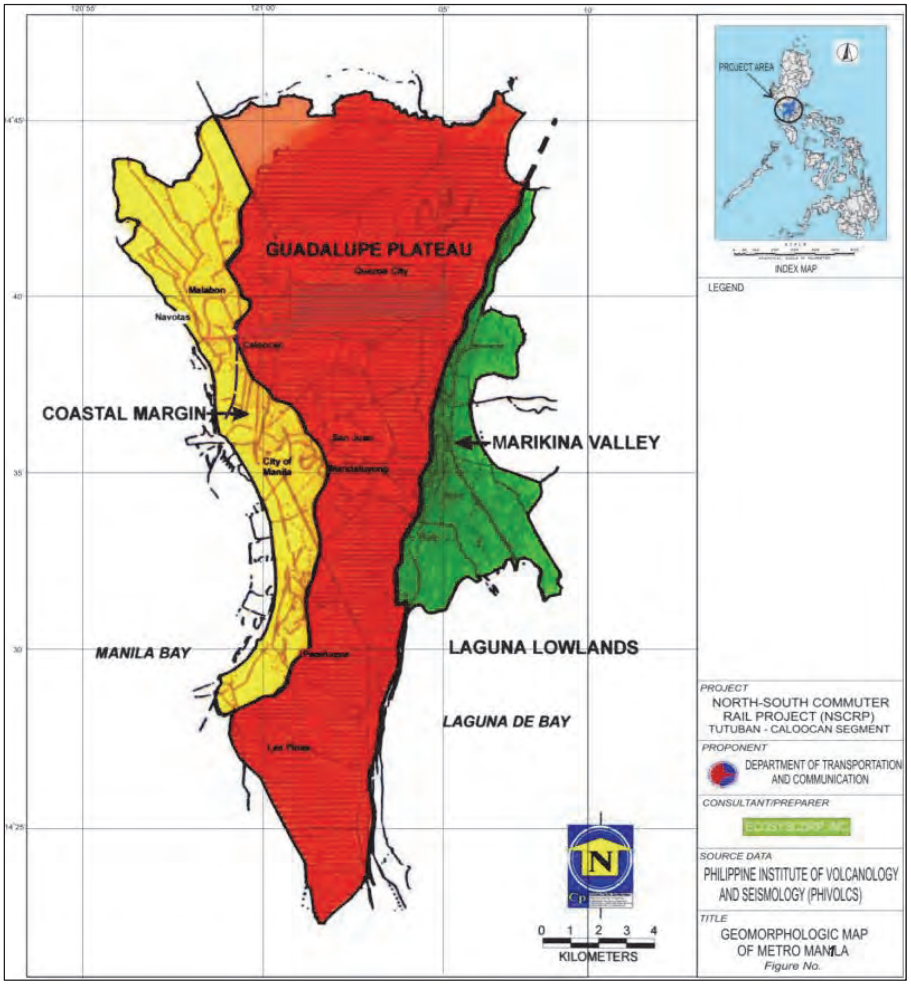
Table 7.1.6 Stratigraphy of Central Luzon Basin - East

Formation	Lithology	Stratigraphic Relations	Thickness
Guadalupe Formation	Conglomerate, sandstone, mudstone, tuff, pyroclastic breccias, tuffaceous sandstone	Unconformable over the Tartaro Formation	1,500 m – 2,200 m
Tartaro Formation	Mudstone, sandstone	Not reported	
Makapilapil Formation	Tuffaceous sandstone, mudstone	Unconformable over the Madlum Formation	500 – 800 m
Lambak Formation	Tuffaceous shale, sandstone, conglomerate	Unconformable over the Madlum Formation	> 1,000 m
Madlum Formation	Sandstone, silty shale, andesite flow, pyroclastic breccias, tuffs, greywacke, argillite, limestone	Conformable over the Angat Formation	> 1,000 m
Angat Formation	Lower calcareous shale and sandstone member; upper limestone member	Unconformable over the Bayabas Formation; overlies diorite	1,950 m
Bayabas Formation	Andesite flows, pyroclastic rocks, siltstone, sandstones, conglomerates with limestone lenses	Overlies the Barenas-Baito Formation	
Barenas-Baito Formation	Spilitic and basic to intermediate volcanic flows and breccias with intercalated metasedimentary roacks	Overlain by the Bayabas Formation	

Source: Mines and Geosciences Bureau, 2010

For the Caloocan to Manila segment, Metropolitan Manila is a composed of six geomorphic zones, namely: Manila Bay, the Coastal Margin, the Guadalupe Plateau, the Marikina Valley, the Laguna Lowlands and Laguna de Bay (Figure 7.1.13).

The Caloocan to Tutuban segment of NSCR extends from the coastal margin setting to the Guadalupe Plateau. In general, the topography of the subject segment is relatively flat and low-lying. Going north, the elevation slightly becomes higher (Figure 7.1.14).



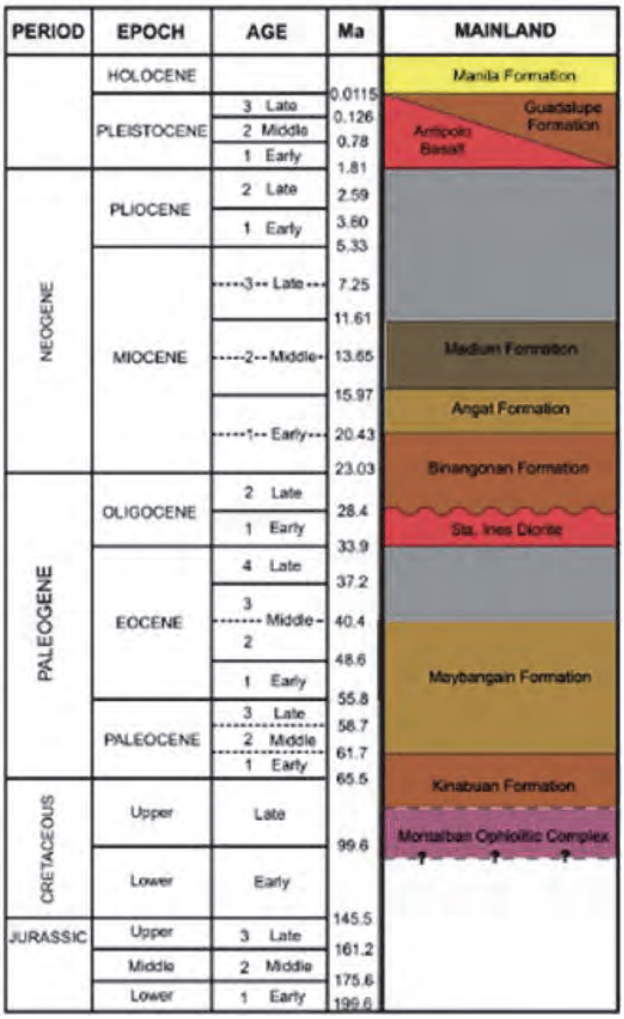
Source: PHIVOLCS

Figure 7.1.13 Geomorphologic Map of Metro Manila

Source: NAMRIA

Figure 7.1.14 Topographic Map of Western and Central Metro Manila

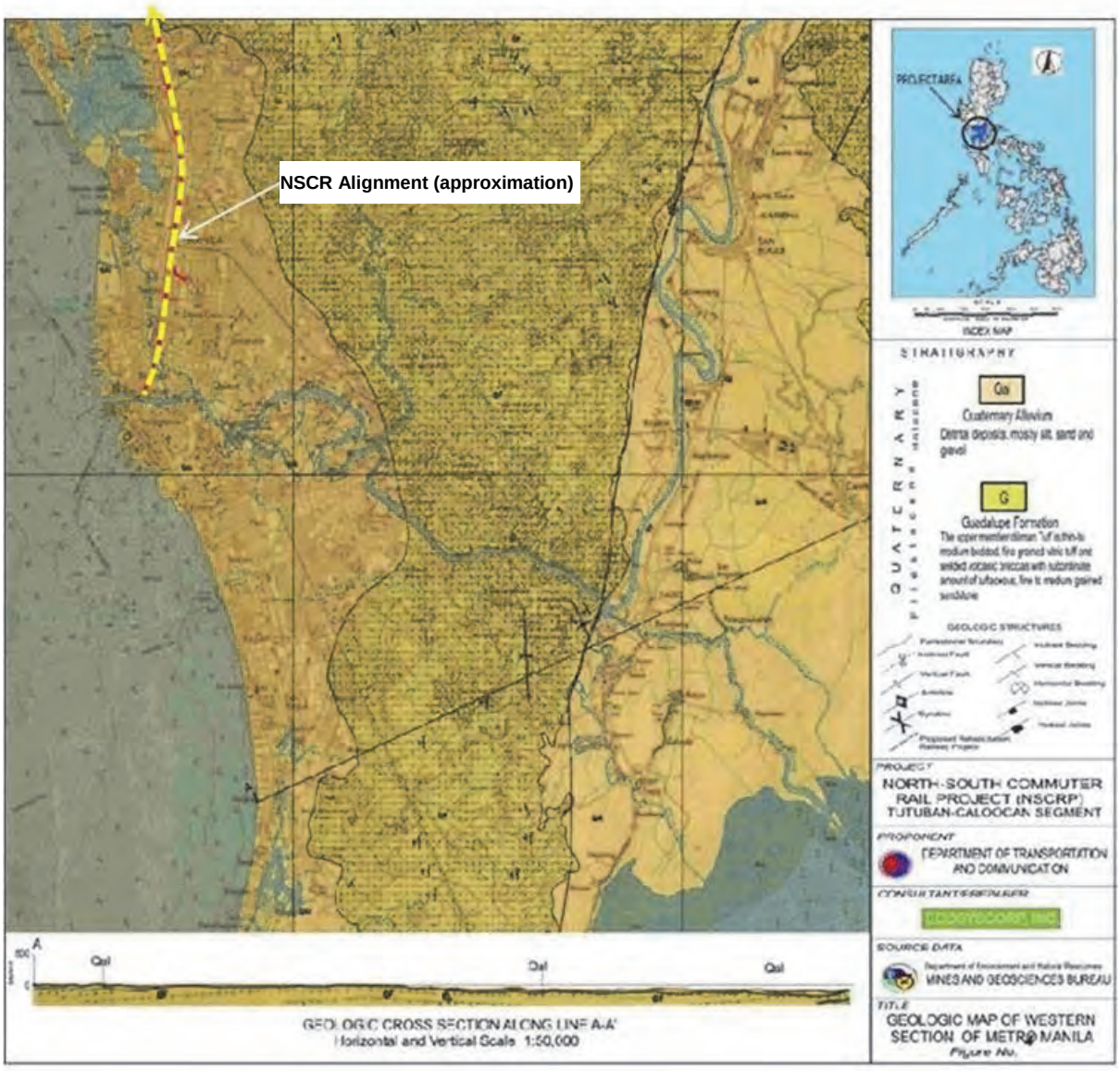
Figure 7.1.15 shows the stratigraphic column for the Southern Sierra Madre, which encompasses Metropolitan Manila and vicinities.



Source: Geology of the Philippines, 2nd ed., Mines and Geosciences Bureau, 2010

Figure 7.1.15 Stratigraphic Column for Southern Sierra Madre

The distribution of the lithologic formations for the western section of Metropolitan Manila is presented in Figure 7.1.16. Two formations are observed to underlie Metropolitan Manila, namely, Guadalupe Formation and Quaternary Alluvium/Manila Formation.



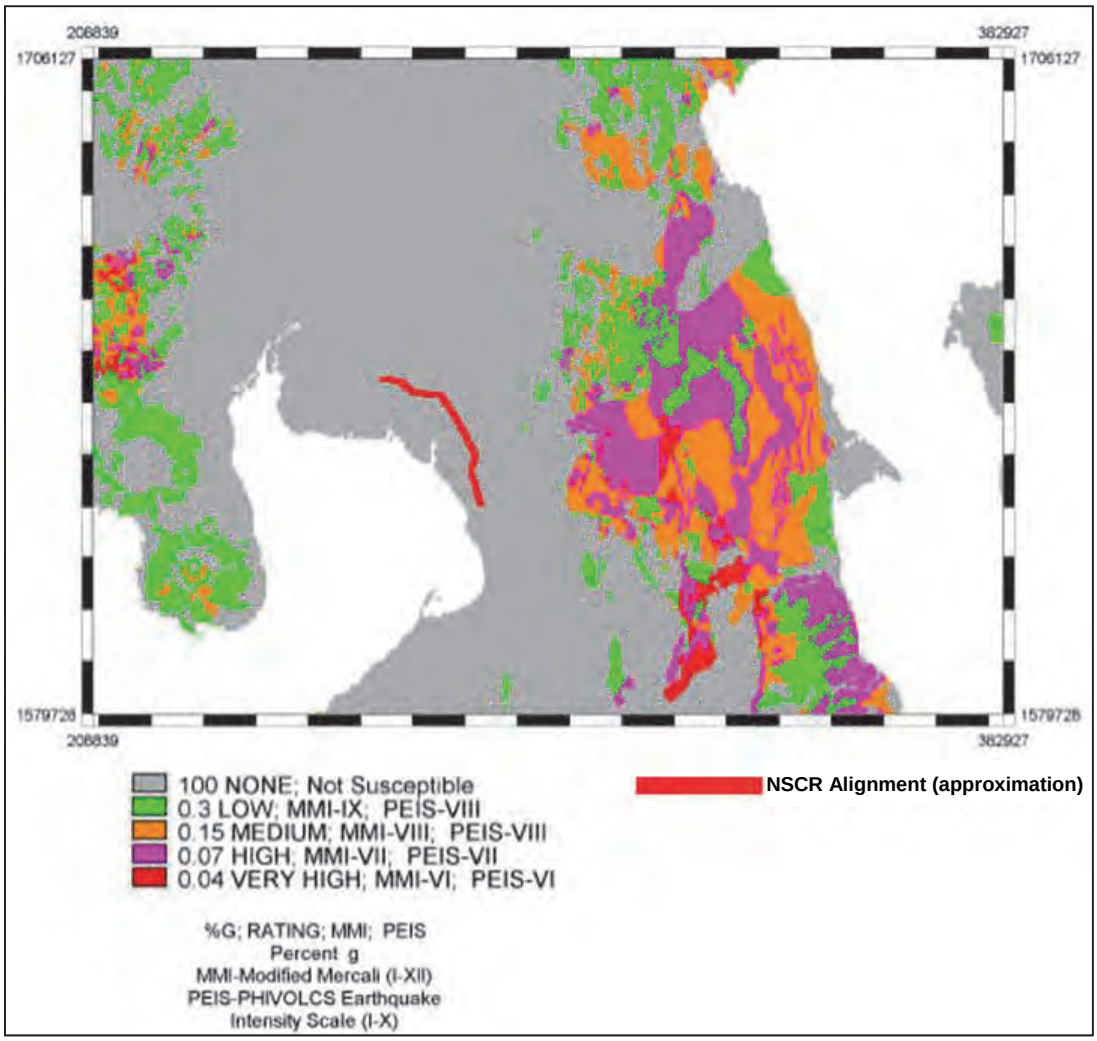
Source: Mines and Geosciences Bureau

Figure 7.1.16 Geologic Map of Western Section of Metro Manila

3) Geologic and Other Natural Hazards (subsidence, liquefaction, landslides, etc.)

a) Landslide

In terms of earthquake-induced landslide hazard, the study corridor is not vulnerable to landslide based on DOST-PHIVOLCS-generated map, as shown in Figure 7.1.17. The Map was produced by simulating the largest possible earthquake magnitude occurring in the area.



Source: PHIVOLCS-DOST

Figure 7.1.17 Earthquake-Triggered Landslide Susceptibility Map Based on Critical Acceleration Values and Earthquake Intensities

The map shows that possible landslide initiation zones at varying degrees of susceptibility from low to very high, are located in the far eastern part of the alignment from Malolos to Caloocan and Caloocan to (Tutuban), which have relatively higher elevations or slopes as compared with the relatively flat terrain of the proposed alignment. Hence, the alignment will not likely be affected by landslide.

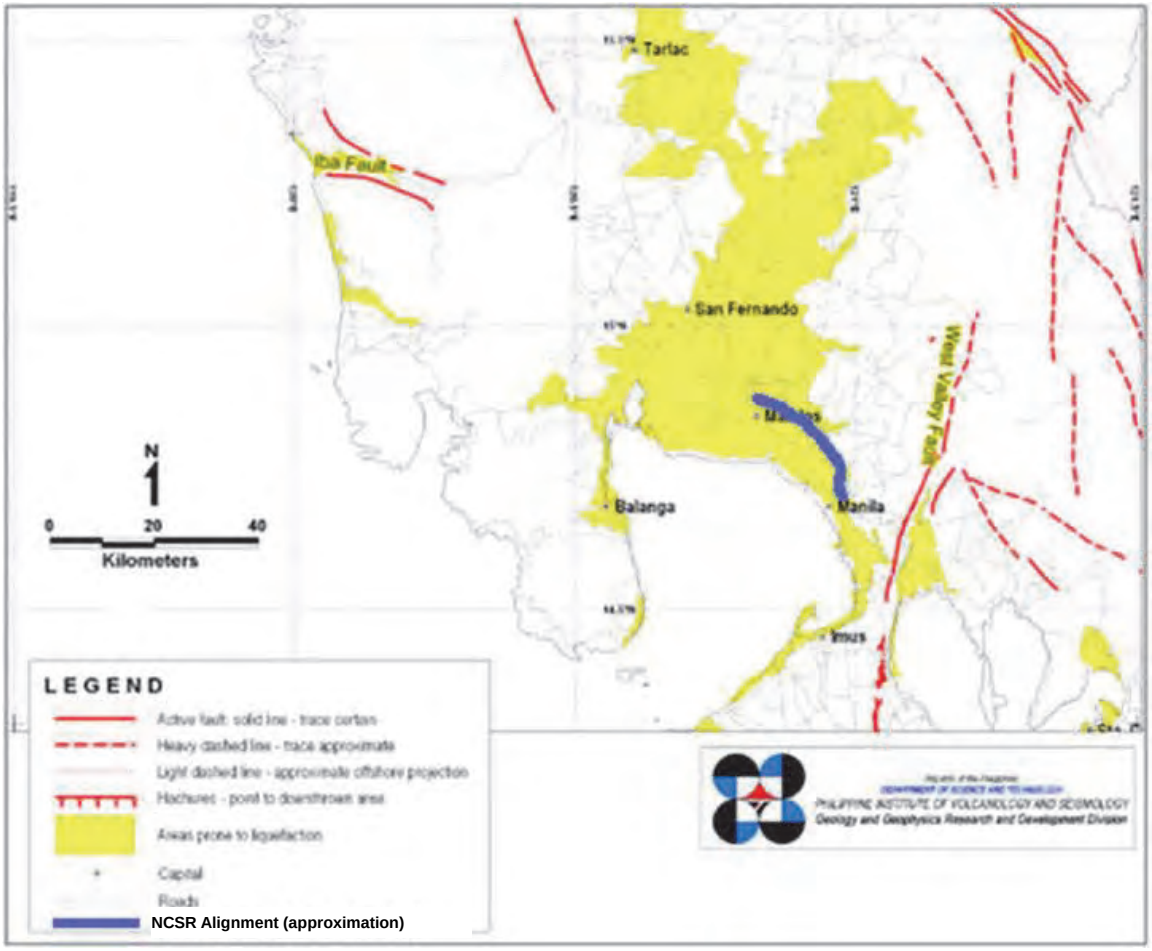
b) Liquefaction

Liquefaction hazard is the failure of the ground to support the weight of structures as a result of a phenomenon whereby an area composed of loosely compacted grains and saturated with water is hit by seismic waves. The waves cause the grains to pull slightly apart, allowing water to fill the voids and leading to a loss of overburden support.

The liquefaction hazard map for Region III and Metro Manila, shown in Figure 7.1.18 indicates that the areas in the proposed alignment from Malolos to Caloocan are generally rated as prone to liquefaction. One of the major factors causing potentially liquefiable areas along the alignment is the presence of alluvial soils, underlying the flat low-lying areas. In addition, since liquefaction only occurs in saturated soil, areas along the alignment that is expected to be liquefaction-prone are those near bodies of water such as areas along the Guiguinto River, Bigaa River, Bocaue River, Marilao River and Meycauayan

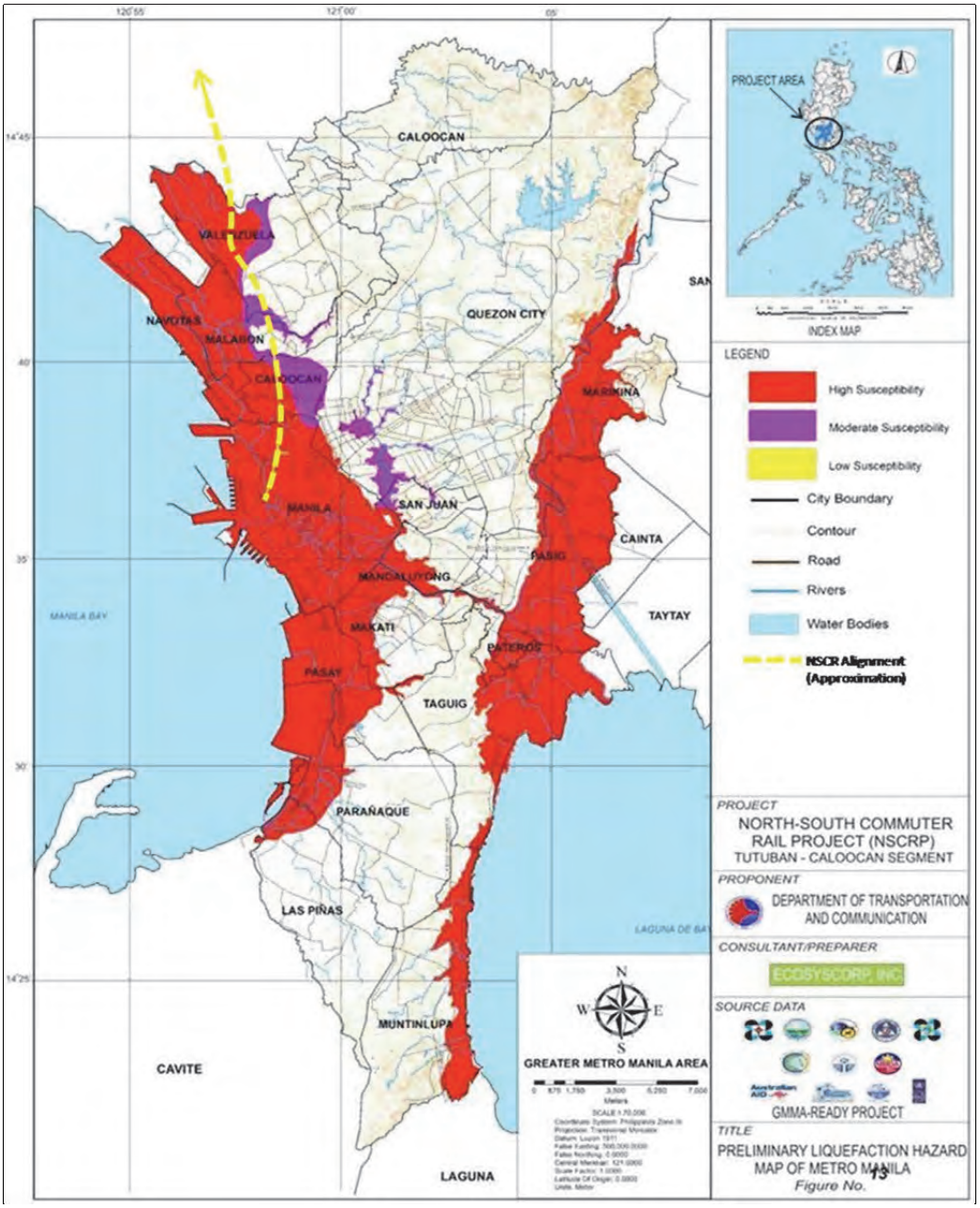
River in Bulacan, and Tullahan River in Malabon.

For the Caloocan to Tutuban Section, the ground underneath the subject segment will be generally highly susceptible to liquefaction (Figure 7.1.19). The lithologies underlying the subject area, including its geomorphic and hydrologic setting, make it more susceptible to liquefaction hazard. A major part of the segment lies on highly liquefiable terrain. The northern 15% portion lies on moderately liquefiable ground.



Source: JICA Study Team

Figure 7.1.18 Liquefaction Susceptibility Map



Source: PHIVOLCS

Figure 7.1.19 Preliminary Liquefaction Hazard Map of Metro Manila

c) Ground Subsidence

Ground subsidence due to groundwater extraction has been reported by Siringan and Rodolfo (2003) to occur in some parts of Bulacan like Malolos, Bocaue, Marilao and Meycauayan, as well as in the CAMANAVA (Caloocan, Malabon, Navotas, Valenzuela) area. Ground subsidence was measured at an alarming rate of 3 to 9 cm/year, as compared to the relatively small sea level rise of 7 to 8 mm/year due to global warming.

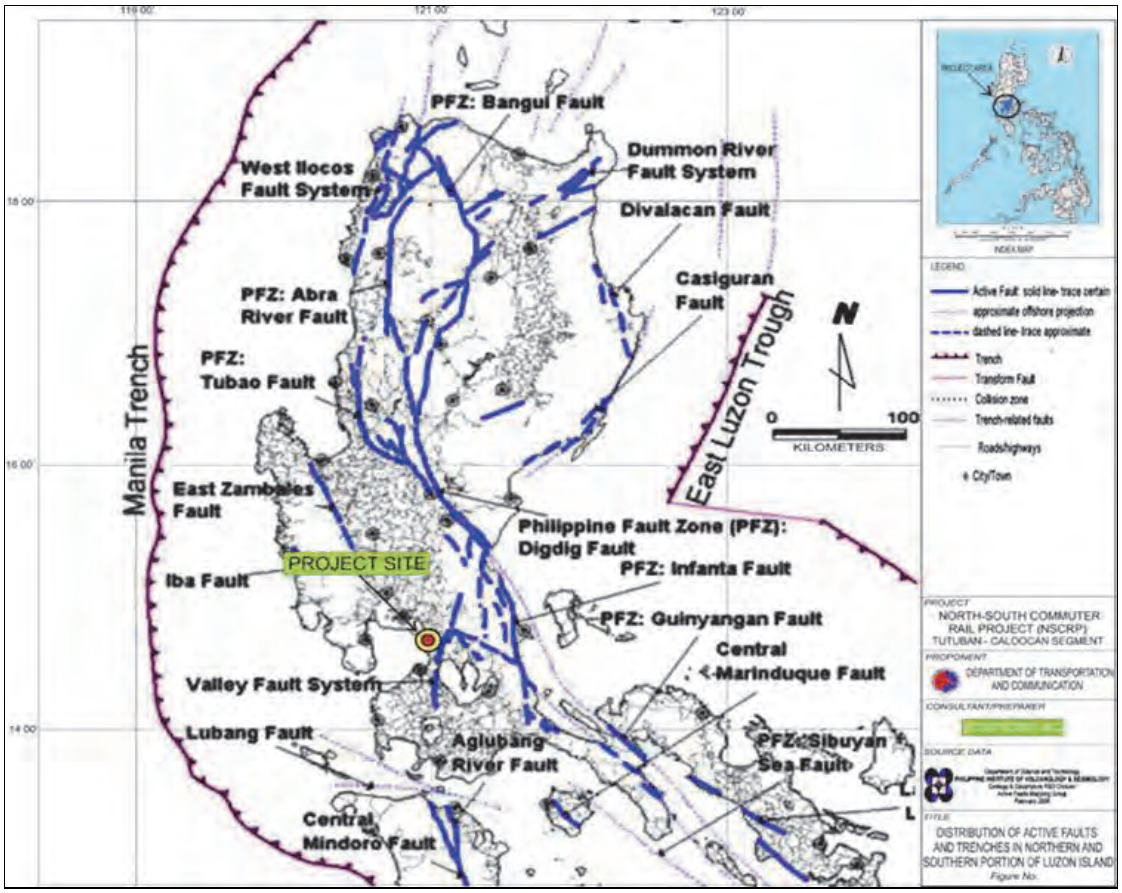
Subsidence due to groundwater extraction has been established based on the strong correlation of sea level rise in Manila Bay and the rate of groundwater withdrawal in Metro Manila. In addition, Siringan's study showed that flood-prone areas are also those with high groundwater extraction rates, where the water table has lowered about 100 meters. The over extraction of groundwater that contributes to ground subsidence is mainly attributed to agriculture (particularly rice production) and fishpond operation.

d) Active Faults

The structural elements around the island of Luzon are presented in Figure 7.1.20. Arranged from the nearest to the farthest, the structures that are likely to exert impacts to the project area and vicinities are shown in the map, and described in the following paragraphs. Faulting is considered only moderate in the study corridor.

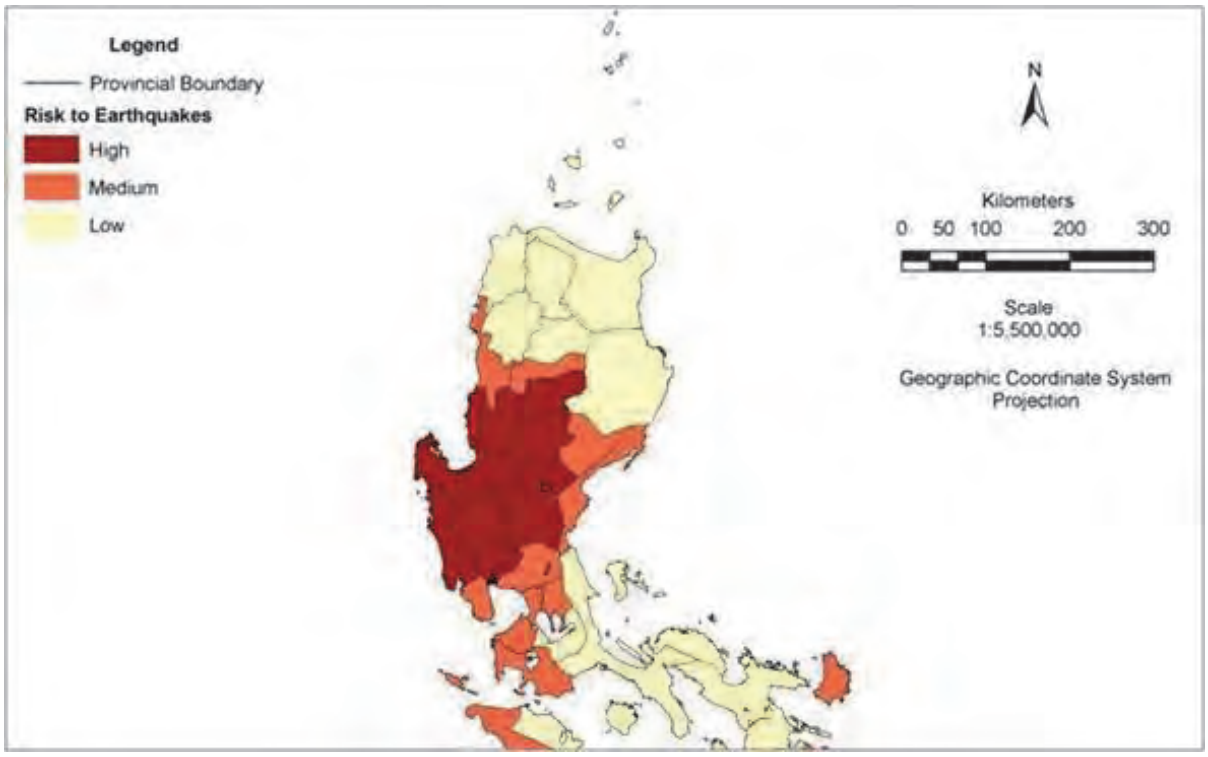
Other active faults within the region are Casiguran Fault located offshore of Casiguran, Aurora; Lubang-Verde Passage Fault System located offshore between Batangas and Mindoro Island; and the East Zambales Fault.

An estimate of the vulnerability to earthquake based on the seismicity data of the Philippines shows that areas along the alignment is rated as medium-risk to earthquake, as mapped in Figure 7.1.21.



Source: PHIVOLCS

Figure 7.1.20 Distribution of Active Faults and Trenches in Northern, Central and Southern Portion of Luzon Island



Source: National Geophysical Data (Earthquake Data); NAMRIA (Base Map)

Figure 7.1.21 Risk to Earthquakes Map

e) Other Natural Hazards for Caloocan to Tutuban Section

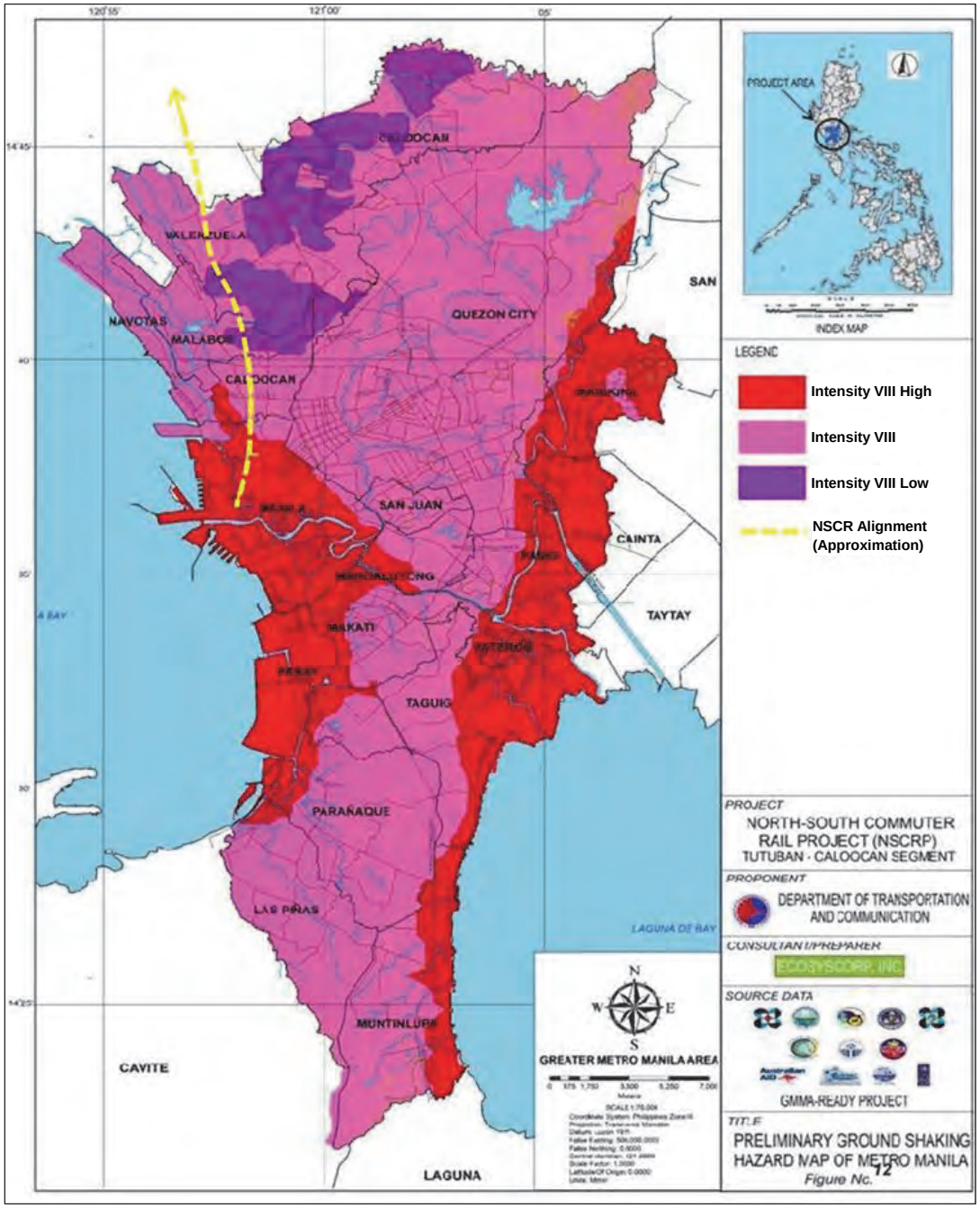
i) Ground-shaking

Figure 7.1.22 presents the ground shaking hazard map of Metropolitan Manila. The major assumption taken into consideration for the map is a magnitude 7.2 earthquake from the West Valley Fault, which is the worst-case scenario that could cause the most damage. The whole metropolis will experience very intense ground shaking.

Owing to the nature of the lithologies underlying the subject area, the intensity of the ground shaking expected will be Intensity VIII, based on the Philippine Earthquake Intensity Scale (PEIS). The intensity is expected to increase from Intensity VIII Low to Intensity VIII High going southwards into the more unconsolidated alluvium underlying Manila.

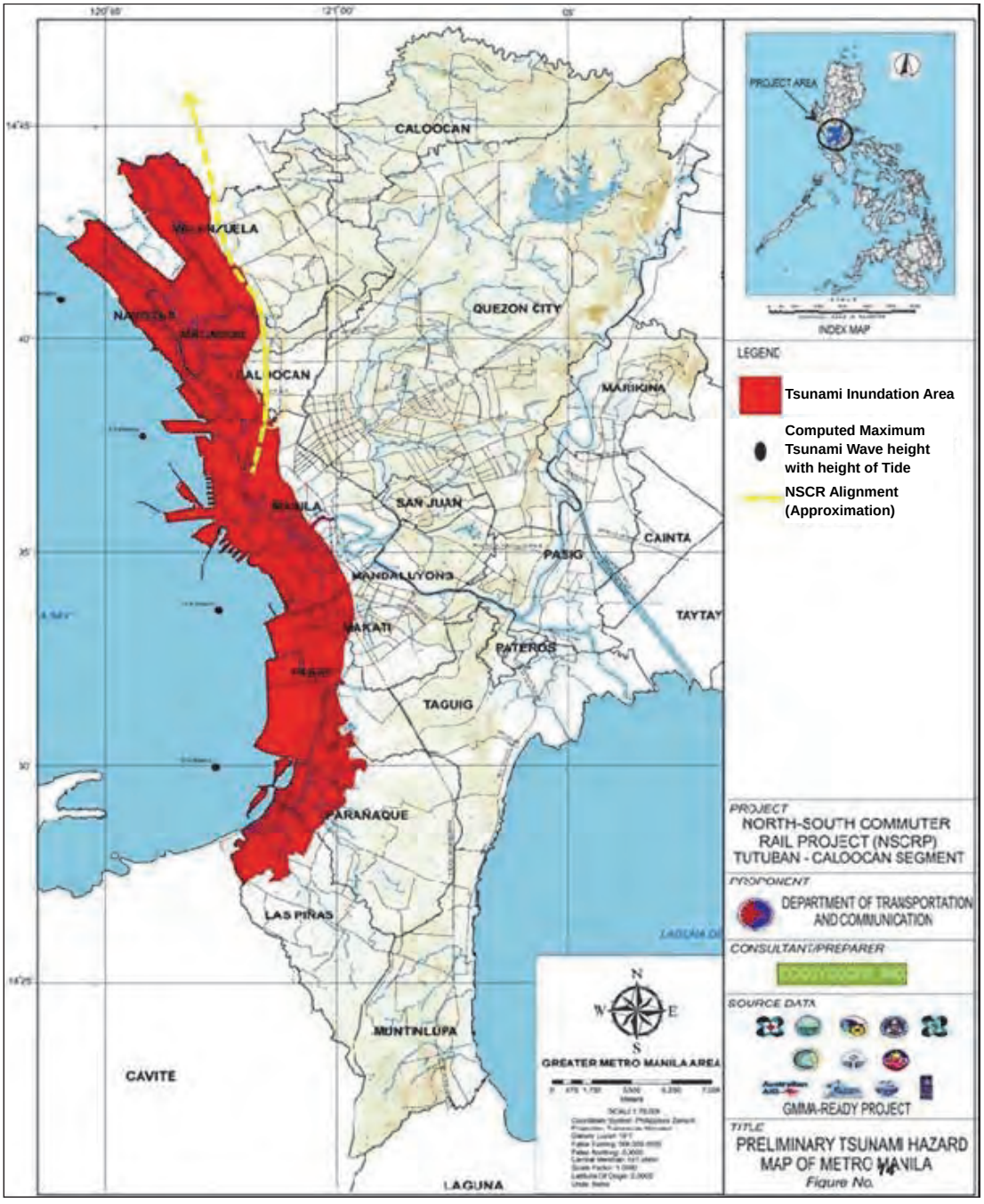
ii) Tsunami

Figure 7.1.23 shows the tsunami inundation hazard map of Metropolitan Manila. The tsunami generator considered for hazard is a segment of the Manila Trench. A projected magnitude 8.2 earthquake will generate a tsunami as high as 5.5 m, assuming the tsunami occurs during high tide, and inundate the southern half of the subject segment.



Source: GMMA-READY Project

Figure 7.1.22 Preliminary Ground Shaking Hazard Map of Metro Manila



Source: GMMA-READY Project

Figure 7.1.23 Preliminary Tsunami Hazard Map of Metro Manila

4) Terrestrial Ecology

a) Vegetation

The proposed NSCR railway traversing through Tutuban, Solis, Caloocan, Valenzuela, Marilao, Meycauayan, Bocaue, Guiguinto and Malolos in Bulacan province is the areas in relatively flat terrain and are heavily built up and populated. Much of the vegetation now established in these areas is planted by residents alongside escaped exotic weeds, which have a pantropic distribution.

Field surveys to assess terrestrial vegetation were undertaken on September 17 - 19, 2013 on four pre-identified sites along the NSCR Project. The sites covered by the study include the NSCR alignment from

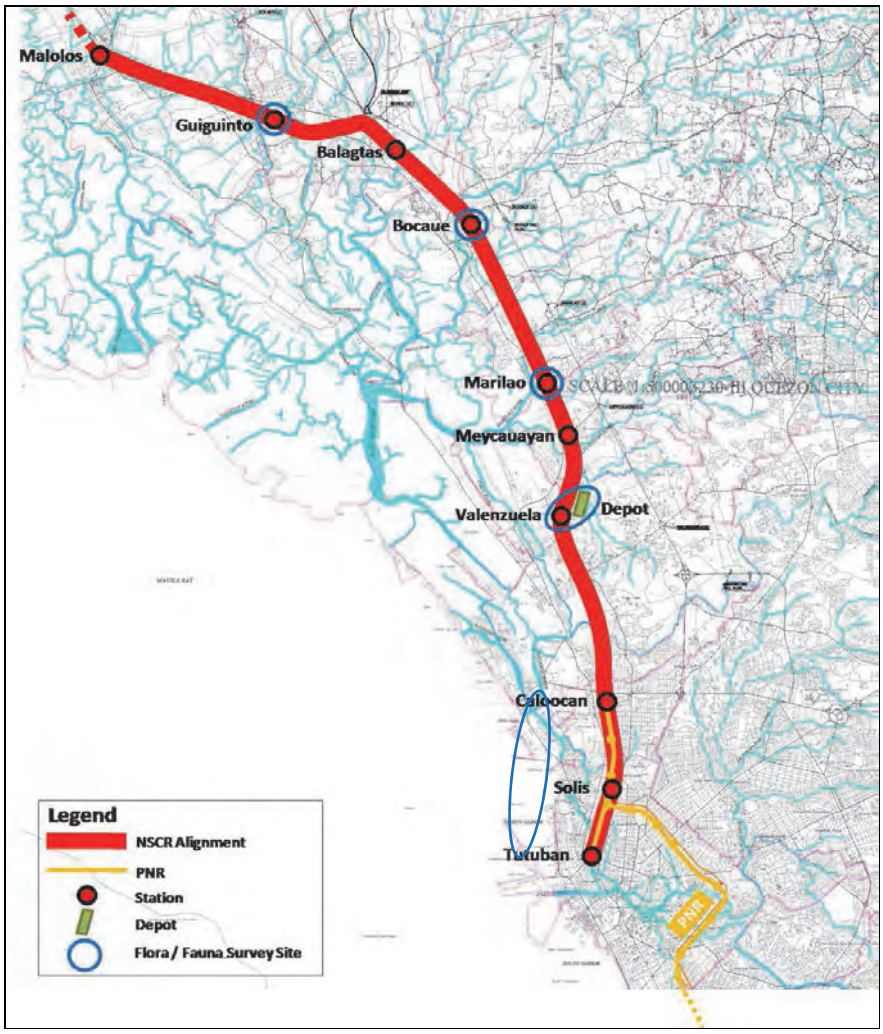
Caloocan to Malolos with more focused on the proposed NSCR stations in Marilao, Bocaue and Guiguinto in Bulacan, and the proposed depot site in Valenzuela City, as shown in Figure 7.1.24. The vegetation assessment for the Caloocan to Tutuban segment was conducted on December 26 - 29, 2014.

The benchmark floristic survey was done to establish baseline information on the vegetation of these sites, identify and locate species of conservation value and enumerate potential impacts and mitigation measures needed to address these impacts.

All vascular plants including trees, herbs, shrubs, grasses, ferns and aquatic plants were enumerated from each site thru direct visual observation. A running checklist was created for each of these sites with special attention given to ascertain the occurrence and exact locations of threatened species. GPS coordinates of all threatened species that are likely to be affected by the proposed development were recorded and their locations plotted on a map.

b) Taxa Counts

A total of 116 morpho-species were enumerated from all six sites belonging to 104 genera and 43 families. The most speciose families include Gramineae/Poaceae with 17 species followed by Fabaceae/Leguminosae with 11 species and Malvaceae with 9 species.



Source: JICA Study Team

Figure 7.1.24 Sites for Flora and Fauna Survey

c) Endemicity

A great majority of the plants (71%) enumerated from the sites are exotics or plants originating from other countries. Only 33 out of 116 plants are indigenous (28%) or native to the country.

d) Threatened Plants

One species designated as threatened under the DAO 2007 - 1 and IUCN 2007 Red Lists, shown in Table 7.1.7, was recorded from the field survey in Valenzuela. The *Pterocarpus indicus*, locally known as *narra*, are located in Valenzuela (28 individuals), as shown in Figure 7.1.25. Occurrence of some juvenile Pterocarpus indicus (narra) was recorded also along the edges of the PNR ROW in the Caloocan to Tutuban segment. So far, no species that falls under the CITES I, II and III threatened species lists were recorded. No threatened species were recorded from Guiguinto, Marilao and Bocaue Stations.

Table 7.1.7 List of Threatened Species under DAO 2007-1 and IUCN 2007

Family	Scientific Name	Common Name	English Name	DAO 2007-1	IUCN 2007
ARECACEAE/ PALMAE	*Adonidia merrillii* (Becc.) Becc.	Bunga de Jolo	Manila palm	EN A1c, B1+2cd	LR/nt ver 2.3 (1994)
FABACEAE/ LEGUMINOSAE	*Pterocarpus indicus* Willd.	Narra	Amboina wood; Burmese rosewood; Red sandalwood	CR A1cd	VU A1d ver 2.3 (1994)
LAMIACEAE	*Vitex parviflora* Juss.	Molawin	Molave	EN A1cd, B2bc	VU A1cd ver 2.3 (1994)
MORACEAE	*Artocarpus blancoi* (Elm.) Merr.	Antipolo		Not assessed	VU A1d ver 2.3 (1994)

Source: JICA Study Team

Legend:
LR=Low risk EN=Endangered DD=Data Deficient
VU=Vulnerable CR=Critically Endangered

Source: JICA Study Team

Figure 7.1.25 Valenzuela Area Showing Locations of Pterocarpus Indicus Willd or Narra

e) Threats to Important Local Species of Fauna

Based on DAO No. 2004 - 15 or the National List of Threatened Fauna, there are four (4) species of mammals, five (5) species of birds and three (3) species of reptiles in and around the Bulacan Region are included in the list, as presented in Table 7.1.8.

Table 7.1.8 National List of Threatened Fauna In and Around Bulacan Region

Taxonomy	Scientific Name	Common Name	Conservation Status	Distribution Area
Mammals	*Macaca fascicularis*	Philippine Monkey	OTS	Throughout the Philippines
	Cervus mariannus	Philippine brown deer	VU	
	Pteropus vampyrus	Giant flying fox	OTS	
	Acerodon jubatus	Golden-crowned fruit bat	EN	
Birds	*Erythrura viridifacies*	Green-faced parrotfinch	VU	Sierra Madre Mountain Range, Norzagaray, Bulacan
	Grus antigone	Sarus crane	CR	Candaba Swamp
	Tringa guttifer	Nordmann's greenshank	EN	Obando, Bulacan
	Sterna bernsteini	Chinese crested tern	CR	Luzon
	Zoothera cinerea	Ashy thrush	VU	Bulacan
Reptile	*Hydrosaurus postulates*	Philippine sailfin lizard	OTS	Throughout the Philippines
	Python reticulates	Reticulated python	OTS	
	Crocodylus mindorensis	Philippine crocodile	CR	

Source: 2004 Statistics of Philippine Protected Areas and Wildlife Resources

Conservation Status: CR - Critically Endangered EN - Endangered VU - Vulnerable OTS - Other Threatened Species OWS - Other Wildlife Species

The threatened species listed in Table 7.1.8 are endemic to the Philippines and are now usually found in the forested areas, more probably in protected areas or landscape.

The project site is located along commercial, industrial or residential areas. Thus, no protected habitat of listed endangered species will be affected. On the contrary, much of the fauna established in the area are domesticated animals, most of which are tended by residents along the area. A listing of the fauna species encountered during the site survey as well as identified through interviews is presented in Table 7.1.9. A listing of the fauna species encountered in the Malolos to Caloocan segment during the site survey as well as identified through interviews is presented in Table 7.1.9.

Table 7.1.9 List of Fauna Encountered during the Site Survey

Common Name	Scientific Name
Domesticated Animals	
Cats	*Felis domesticuc*
Chicken	*Gallus Domestics*
Cow	*Bos sp.*
Dogs	*Canis sp.*
Goat	*Capra sp.*
Pigs	*Sus sp.*
Insects	
black soldier fly	*Hermetia illuscens*
bush brown butterfly	*Mycalesis cf. mineus*
Dragonfly	*Diplacodes trivialis*
	Orthetrum Sabina
	Acisoma panorpoides
flesh fly	*Sarcophaga sp.*
flower fly/ syrphid fly	*cf. Eristalinus*
	Mesembrius
ladybird beetle	*cf. Micraspis sp.*
lynx spider	*cf. Oxyopes*
narrow-winged damselfy	*cf. Pseudagrion cf. pilidorsum*
	cf. Agriocnemis
	cf. Ischnura senegalensis
Grasshopper	*N/A*
Katydid	*N/A*
shield bug	*N/A*
true bugs	*N/A*

Source: JICA Study Team

For the Caloocan to Tutuban segment, a number of domesticated animals were recorded in the study area among others *Columba livia domestica* (city pigeons/kalapati), *Canis lupus familiaris* (dog), *Felis catus domesticus* (cat), *Capra aegagrus hircus* (goat), and *Gallus gallus domesticus* (chicken/game fowl).

C. domestica is usually bred for leisurely purpose, while *G. domesticus* (game fowl) are either for gaming purpose or as food supplement. Backyard growing of *C. hircus* in the area based on local accounts is simply practiced as a small-scale business to augment finances.

f) Avifauna

A bird survey was conducted last October 19, 2013 at the proposed Valenzuela stabling yard and Guiguinto station, where these areas are predominantly covered with grasses with waterlogged sections of land. The survey was done through visual inspection and interviews among local residents around the

NSCR alignment at Valenzuela and Guiguinto area. Table 7.1.10 shows a list of bird species encountered during the survey.

Table 7.1.10 List of Bird Species Encountered in Valenzuela and Guiguinto

Common Name	Scientific Name	Residency Status
VALENZUELA		
Philippine Pygmy Woodpecker	*Dendrocopos maculatus*	E
Cattle Egret	*Bubulcus ibis*	R
Cinnamon Bittern	*Ixobrychus cinnamomeus*	R
Common Moorhen	*Gallinula chloropus*	R
Great Egret	*Egretta alba*	R
Golden-bellied Flyeater	*Gerygone sulphurea*	R
Pied Triller	*Lalage nigra*	R
Pied Fantail	*Rhipidura javanica*	R
Scaly-breasted Munia	*Lonchura punctulata*	R
Striated Grassbird	*Megalurus palustris*	R
Yellow-vented Bulbul	*Pycnonotus goiavier*	R
Blue-tailed Bee-eater	*Merops philippinus*	R
Chestnut Munia	*Lonchura malacca*	R
Eurasian Tree Sparrow	*Passer montanus*	R
Pacific Swallow	*Hirundo tahitica*	R
Red Turtle-Dove	*Streptopelia tranquebarica*	R
White-breasted Waterhen	*Amaurornis phoenicurus*	R
Yellow Bittern	*Ixobrychus sinensis*	R
Zebra Dove	*Geopelia striata*	R
Intermediate Egret	*Egretta intermedia*	M
Little Egret	*Egretta garzetta*	M
Barn Swallow	*Hirundo rustica*	M
Black-crowned Night-heron	*Nycticorax nycticorax*	M
Brown Shrike	*Lanius cristatus lucionensis*	M
Common Kingfisher	*Alcedo atthis*	M
Whiskered Tern	*Chlidonias hybridus*	M
BULACAN		
Blue-tailed Bee-eater	*Merops philippinus*	R
Cattle Egret	*Bubulcus ibis*	R
Chestnut Munia	*Lonchura malacca*	R
Cinnamon Bittern	*Ixobrychus cinnamomeus*	R
Eurasian Tree Sparrow	*Passer montanus*	R
Glossy Swiftlet	*Collocalia esculenta*	R
Greater Painted Snipe	*Rostratula benghalensis*	R
Pacific Swallow	*Hirundo tahitica*	R
Pied Fantail	*Rhipidura javanica*	R
Scaly-breasted Munia	*Lonchura punctulata*	R
Striated Grassbird	*Megalurus palustris*	R
Tawny Grassbird	*Megalurus timoriensis*	R

Common Name	Scientific Name	Residency Status
White-collared Kingfisher	*Halcyon chloris collaris*	R
Yellow-vented Bulbul	*Pycnonotus goiavier*	R
Zebra Dove	*Geopelia striata*	R
Brown Shrike	*Lanius cristatus*	M
Barn Swallow	*Hirundo rustica*	M
Snipe sp.	*Gallinago* sp.	M

Source: JICA Study Team

Residency Status: E = Endemic R = Resident M = Migrant

Based on observation, the birds come to the areas along the NSCR alignment, specifically in waterlogged areas and areas covered with grasses, mainly for feeding. It flies back towards the north direction, where it's roosting is located, after feeding.

The habitat area in the proposed depot area that will be cleared are small and do not constitute important stopover sites for migratory bird species. Only seven migrant species out of 26 birds were recorded at Valenzuela and only three of 18 at Bulacan and none of these migrant species appear in the Convention on Migratory Species (CMS) list.

Some of the migrants are widely distributed terrestrial species able to thrive in disturbed and fragmented habitats e.g. Brown Shrike Lanius cristatus and Barn Swallow Hirundo rustica while others were observed flying very high over the area, e.g. Intermediate Egret Egretta intermedia and Whiskered Tern Chlidonias hybridus. Resident graminivores or seed-eating birds that feed on grass inflorescence and use tall grasses as nesting material i.e. munias and sparrows were the most abundant and occurred in big flocks. Resident insectivores. i.e. Grassbirds which are also widely distributed in grassland and marsh habitats made up the rest of the species observed in the survey. Widely distributed species are those highly tolerant of disturbance and able to take advantage of resources in human-altered landscapes.

The species that would potentially be affected by the proposed habitat clearance/conversion are the resident waterbirds i.e. the bitterns and rails. However, there are similar and larger grassland-marsh habitats in Valenzuela and Bulacan that can support resident and migrant birds passing through the area.

Since 2004, the Protected Areas and Wildlife Bureau of the Department of Environment and Natural Resources in partnership with the Wild Bird Club of the Philippines (www.birdwatch.ph) has conducted regular surveys of waterbirds in Valenzuela and other wetland areas throughout the country. The survey team of the Club covered the adjoining areas of Arkong Bato, Villa Encarnacion, Incuman and St. Elsewhere in Malanday, Valenzuela, which are near the NSCR alignment. Ten species were listed including the resident Barred Rail Gallirallus torquatus and Purple Swamphen Porphyrio porphyria, which were not encountered during the survey for NSCR Project at Valenzuela and Bulacan. An important record from Valenzuela is the presence of a breeding colony of hundreds of Black- crowned Night-heron Nycticorax nycticorax, which used to be entirely migratory. Another frequently surveyed site in proximity to the NSCR alignment is the Tanza, Navotas coast, which is the habitat or stopover site for many migratory waders during winter migration starting in September and spring migration in March-April. Availability of stopover habitat for migratory birds is therefore not limited in the area.

For the Caloocan to Tutuban segment, Table 7.1.11, shows the birds diversity was observed in the study area in the duration of the survey, totaling to only seven (7) species belonging to seven (7) families. The encountered species are those usually found in urban areas, and are generally adapted to lowland and residential areas.

Of the identified individuals, *Passer montanus* (Eurasian tree sparrow), an introduced species from China in the 1930's was the most frequently encountered species in the study site. *Collocalia esculenta* (Glossy swiflet/langay-langayan) was also commonly sighted. These two (2) species are widely distributed in the country, normally inhabiting lowland areas and residential communities.

Based on the International Union for Conservation of Nature (IUCN) Redlist 2014, all the bird species

observed belongs to the least concern category. It was not established whether the significant bird activities such as nesting, roosting, and mating are performed in the area. The low species diversity in the project area is expected as it is located in a highly disturbed environment in terms of habitat availability.

Table 7.1.11 Residency and Conservation Status of Bird Species Encountered in the Caloocan to Tutuban Segment

Family Name	Species Name	Common Name	Residency Status	IUCN Redlist (2014)
Apodidae	*Collocalia esculenta*	Glossy Swiftlet	Resident	Least Concern
Columbidae	*Geopelia striata*	Zebra Dove	Resident	Least Concern
Muscicapidae	*Rhipidura javanica*	Pied Fantail	Resident	Least Concern
Ploceidae	*Passer montanus*	Eurasian Tree Sparrow	Resident	Least Concern
Pycnonotidae	*Pycnonotus goiavier*	Yellow-vented Bulbul	Resident	Least Concern
Sturnidae	*Acridotheres cristatellus*	Crested Myna	Resident	Least Concern
Sylviidae	*Megalurus palustris*	Striated Grassbird	Resident	Least Concern

Source: JICA Study Team

5) Hydrology

a) Drainage morphology/flood history

The hydrological characteristics of the area are defined by two major river basins, the Pampanga River Basin (Figure 7.1.26) and Pasig-Laguna de Bay River Basin (Figure 7.1.27).

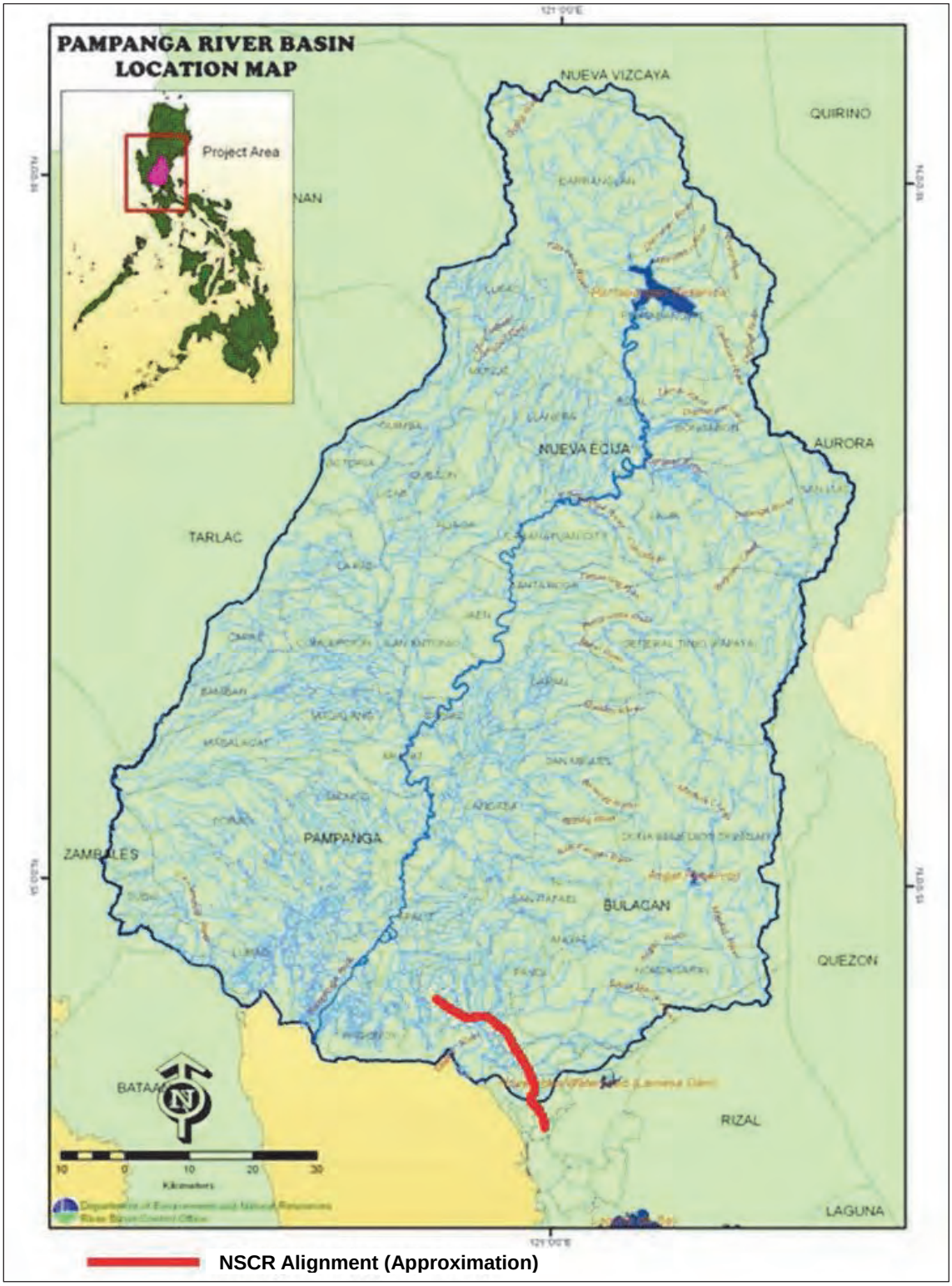
A big portion of the province of Bulacan is covered by the basin of the Pampanga River. The Pampanga River basin system is the 4th largest basin in the Philippines. It is broadly divided into three sub-basins: Pampanga Main River basin, Pasac River basin (or alternatively known as the Pasac-Guagua Allied river basin) and the Angat River basin. The headwaters of these three basins originate from different mountain areas with separate river channels draining into the Manila Bay. These channels are interconnected and their water resources management works are closely related.

The Pasig-Marikina-Laguna de Bay Basin covers the National Capital Region in the west, portions of the Region III province of Bulacan in the northwest, and the Region IV provinces of Rizal in the northeast, Laguna and portions of Cavite and Batangas in the south. This basin is composed of 29 sub-basins of which 22 sub-basins collectively known as Laguna de Bay basin drains to the Laguna Lake, while runoffs from the other seven Metro Manila river sub-basins flow to the Manila Bay. Another important body of water the Pasig River bisects Metro Manila and serves as the outlet of Laguna de Bay to Manila Bay.

The Pasig River is the master drainage system that links Manila Bay with Laguna de Bay. The river has a total length of 25 km and cuts across most cities of Metropolitan Manila.

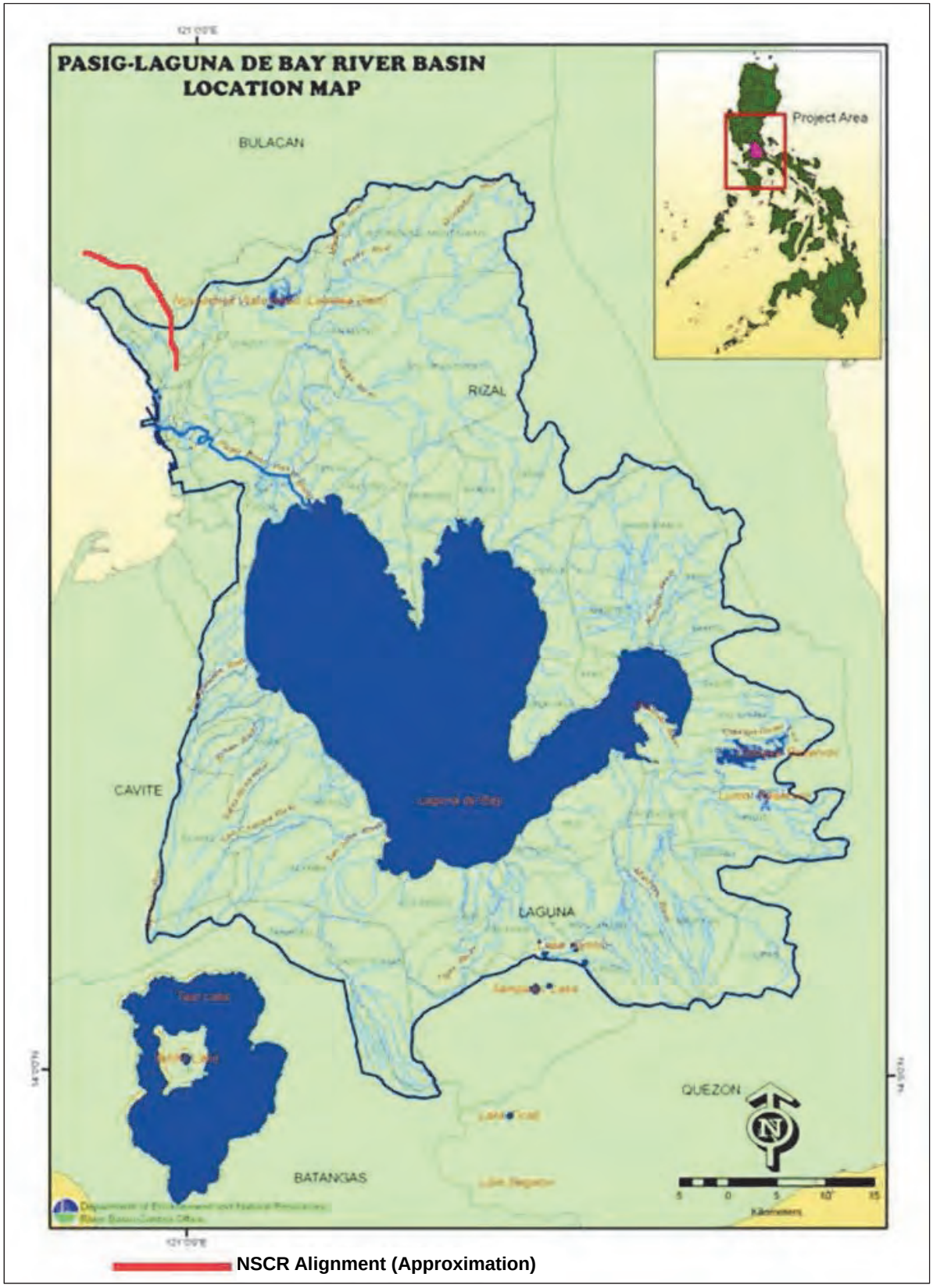
Draining into the Pasig River are creeks/esteros and large storm sewers which collect the run-off water from large areas of the metropolis. Seven creeks/esteros were crossed by the railroad tracks along the subject segment, three in Manila and four in Caloocan City From south to north, these are:

Estero de Kabulusan is listed in the Manila Comprehensive Land Use Plan as a “non-existing” estero. Parts of Makabalo and Casili Creeks, as well as two unnamed creeks, in Caloocan are “missing” and have been covered by concrete.



Source: DENR River Basin Control Office

Figure 7.1.26 Pampanga River Basin Map



Source: DENR River Basin Control Office

Figure 7.1.27 Pasig-Laguna de Bay Basin Map

b) Flood History

The NSCR alignment lies mostly on the southern part of the Pampanga River Basin and portion of which is located northwest part of the Pasig-Laguna de Bay Basin. Geomorphologic setting of this part of the river basins makes the project area highly susceptible to flooding.

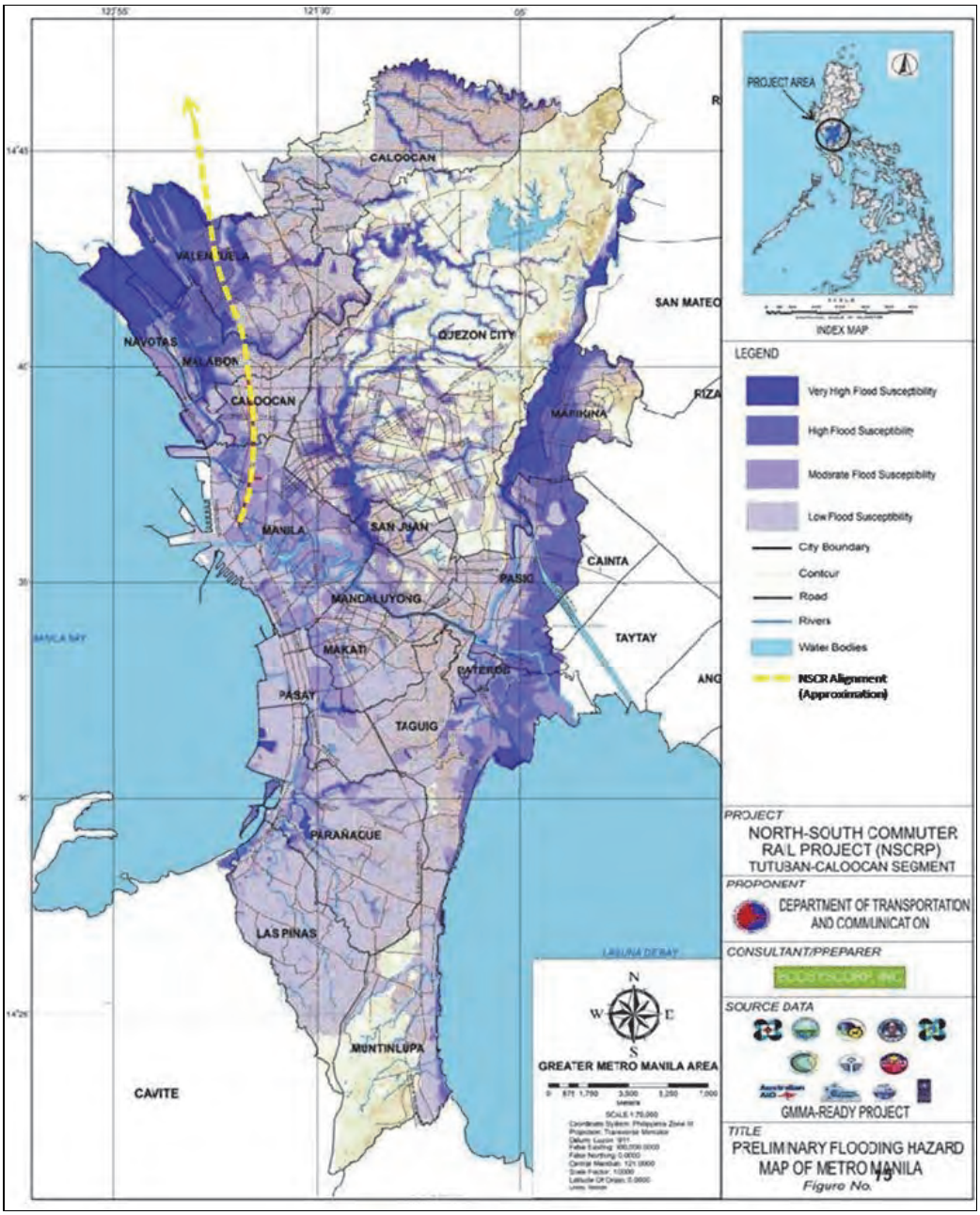
The Pampanga River basin is vulnerable to flooding, due to its relatively low elevation and flat terrain. Its narrow and silted waterways, attributed to the 1991 Mt. Pinatubo eruption, and proximity to Manila Bay, wherein tides impede river and creek flow, further contribute to the basin's flood susceptibility. The basin experiences an average of at least one flooding per year. The dry season generally occurs from December to May. The wettest months are from July to September. The basin could only handle between 100 - 130 millimeters (mm) of 24 hour Rainfall.

Historically, extensive flooding occurred at the Pampanga River Basin numerous times. This occurred in July 1962, May 1966 (during typhoon Irma), May and June 1976 (during typhoon Olga and Ruby), June, July and August 1972 (during typhoon Ora) October 1993, August 2003, August 2004, late September-October 2009 (during typhoon Ondoy), and the most recent southwest monsoon in August 2012. The flooding that occurred in September 2011, associated with typhoon Pedring nearly swallowed the Province of Pampanga and Southern parts of Bulacan. The flooding in the river basin that occurred in July and August 1972, severely affected almost all of the entire Province of Pampanga, Nueva Ecija, Tarlac and Bulacan.

Likewise, the northern part of Metro Manila, which includes Caloocan City, Malabon, Navotas City and Valenzuela City (CAMANAVA), is included among the flood-prone areas. The area has a low and flat topography with an elevation of up to 3 m above the mean sea level. Inundation takes place almost throughout the year and most frequently during May to September when high tide takes place simultaneously with heavy rains. The inundation in these areas was brought about by a combination of factors such as the overflowing of the Malabon - Tullahan River and an inadequate local drainage system.

Figure 7.1.28 shows the flood hazard areas simulated using rainfalls delivered by tropical storm Ondoy on 26 September 2009. The rainfall event is considered as an extreme event that can generate floods with a 100 - 150 year return period. It should be noted that data for Malolos were not yet available during the simulation of the said inundation maps. However, based on the stakeholders meeting conducted for this EIA, Malolos residents along the ROW has expressed that based on experience, some areas along the alignment in Malolos are flood-prone, which was allegedly due in part to the blockage of natural waterways during the Northrail project construction. The high hazard areas include neighboring municipalities of Balagtas, Bocaue, Marilao and Meycauayan in Bulacan. Moderate to high flooding may be experienced in Guiguinto, Valenzuela and Malabon.

A large part of Metropolitan Manila is susceptible to flooding as shown in Figure 7.1.29. Generally, the entire length of the study area is moderately susceptible to flooding, meaning the area is likely to experience flood heights of 0.5 to 1.0m and/or flood duration of 1 to 3 days. However, anecdotal accounts indicate that some portions of the railroad tracks in Manila and Caloocan have low flood susceptibility, experiencing flood heights less than 0.5m and/or flood duration of less than one day.



Source: GMMA-READY Project

Figure 7.1.28 Preliminary Flooding Hazard Map of Metro Manila

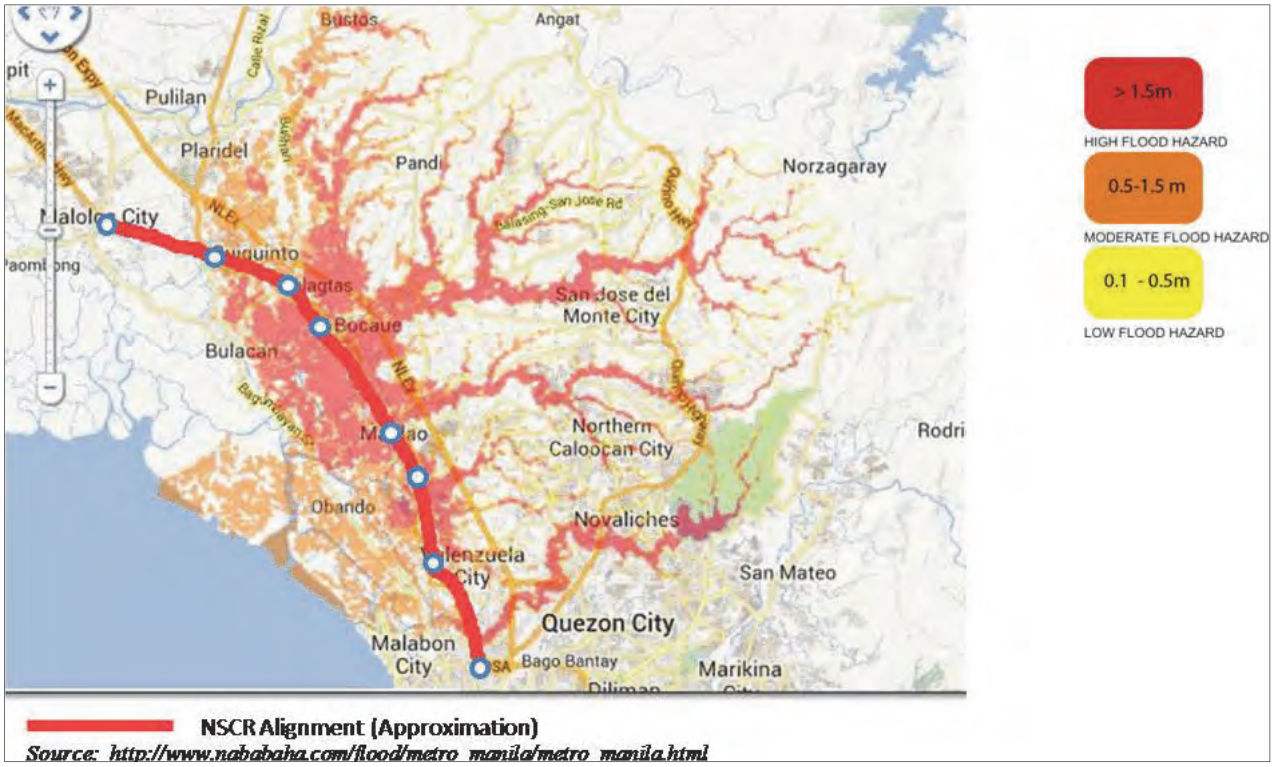


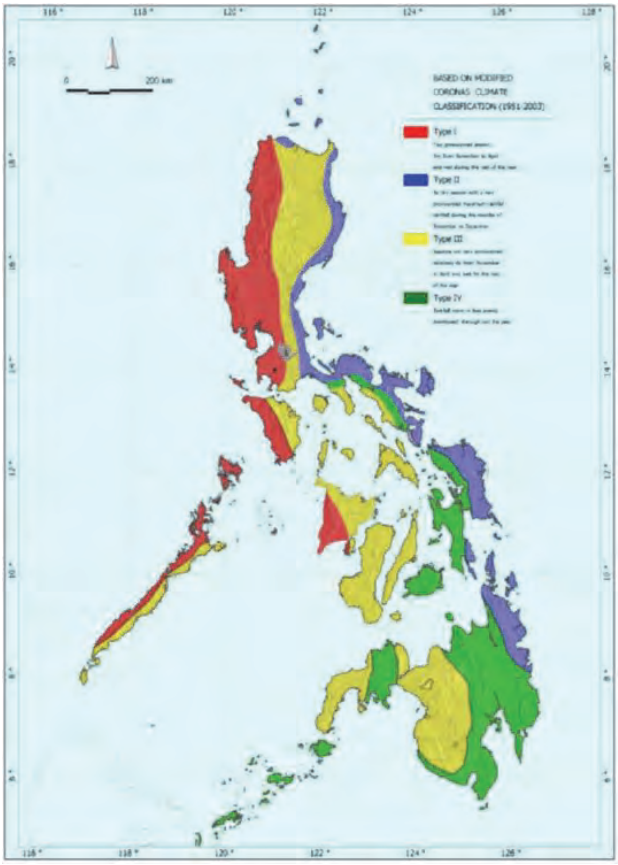
Figure 7.1.29 Flood Hazard Map of the Project Area

6) Meteorology/Climatology

Meteorological and climatological data (normal values) for a period of 1981 - 2010 were obtained from the three nearest PAGASA stations at NAIA (MIA) Pasay City, Port Area Manila and Science Garden Quezon City, which show the normal values of the climatological data.

a) Climate / temperature / rainfall / humidity / wind

The climate of Manila, Caloocan, Malabon, Valenzuela, Meycauayan, Marilao, Bocaue, Balagtas, Guiguinto and Malolos area are classified as Type I under the Coronas Climate Classification used by Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) depending on the rainfall pattern as shown in Figure 7.1.30. It is characterized by two pronounced seasons: dry season from November to April and wet season during the rest of the year.



Source: PAGASA

Figure 7.1.30 Coronas Classification of Climate in the Philippines

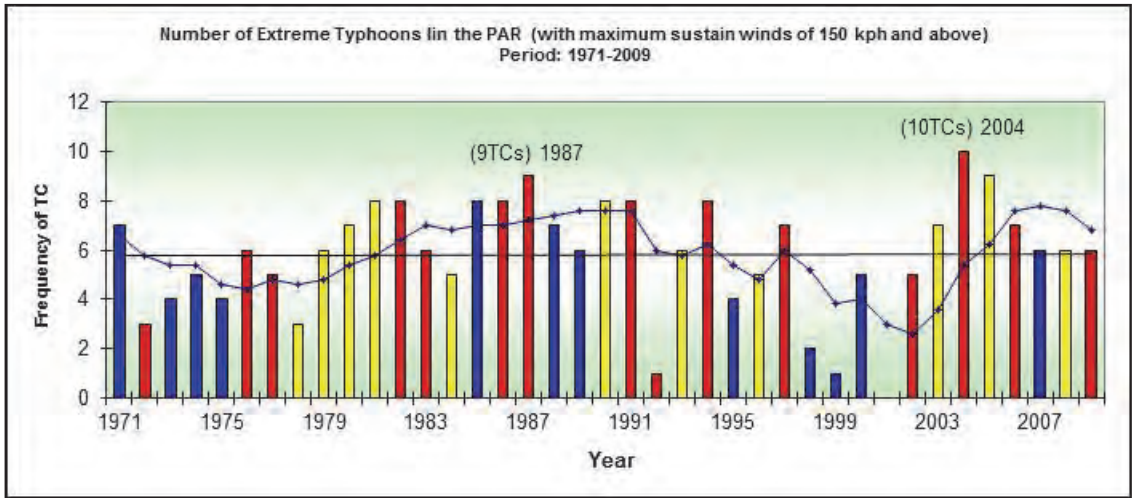
Based on the 2011 Report on Climate Change in the Philippines by PAGASA, trends of tropical cyclone occurrence within the Philippine Area of Responsibility (PAR) show an average of 20 cyclones per year. Although there is still no indication of increase in the number of frequency, a slight increase in the number of tropical cyclones with maximum sustained winds greater than 150 kilometer per hour (kph) is observed. Table 7.1.12 presents a list of recent tropical cyclones with maximum sustained winds above 150 kph while Figure 7.1.31 **s**hows the trend on the number of extreme typhoons that entered the PAR, having a maximum sustained winds of 150 kph and above.

Table 7.1.12 List of Tropical Cyclone with Maximum Sustained Wind of Above 150 kph in the Philippines Area of Responsibility

Local Name of Tropical Cyclone	Period	Maximum Sustained Winds (kph)
Reming (“Durian)	November 2006	193
Frank (“Fengshen”)	June 2008	165
Pablo (“Bopha”)	December 2012	185
Yolanda (“Haiyan)	November 8, 2013	235

Source: PAGASA-DOST/Climate Monitoring and Prediction Center

Note:( ) International Name



Source: PAGASA-DOST/Climate Monitoring and Prediction Center

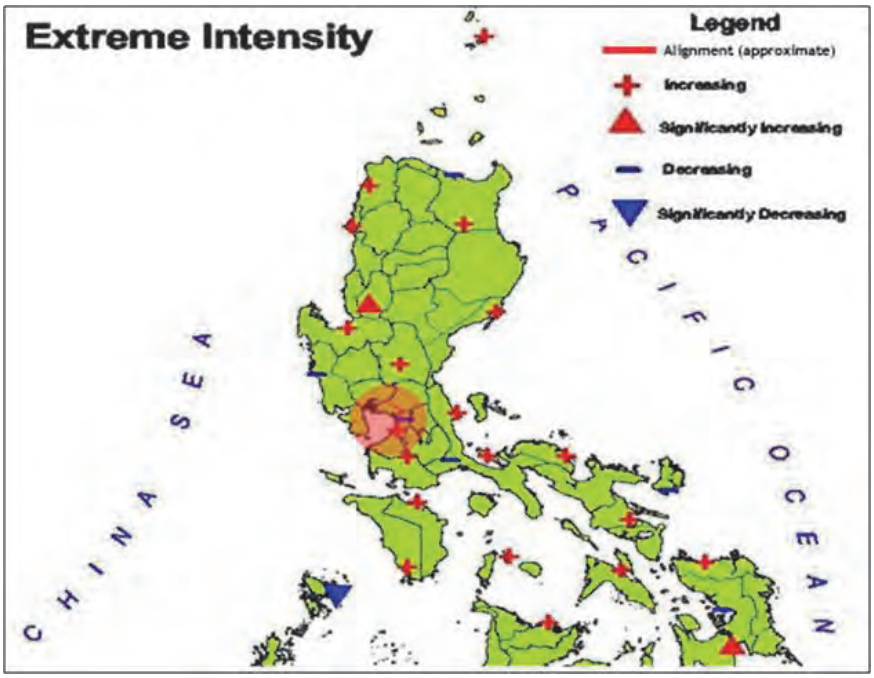
Figure 7.1.31 Number of Extreme Typhoons with Maximum Sustained Winds of above 150 kph in the PAR

b) Rainfall

PAGASA stations in NAIA (MIA) Pasay City, Port Area Manila and Science Garden Quezon City recorded an annual rainfall amount of 1,767.8 millimeter (mm), 2,103.6 mm and 2,574.4 mm with a total of 101, 139 and 153 rainy days, respectively, during the period of 1981 – 2010. The rainy months of May to November indicated that in NAIA Pasay City, Port Area Manila and Science Garden Quezon City, the monthly rainy days range from 6 - 19, 10 - 21 and 12 - 23 days, respectively. For Manila (Port Area Station), the months of July and August have the greatest number of rainy days with 21 days each, and mean monthly rainfall values of 420 mm and 432 mm, respectively.

Increase in rainfall is likely observed during the southwest monsoon (June, July and August) season until the transition month of September, October and November in most areas of Luzon. From the study of PAGASA on the climate projections in the Philippines there were varied trends in magnitude and direction of the rainfall wherein it is clear that performance of southwest and northeast monsoons will increase. Such that the usual wet seasons become wetter and dry seasons becomes drier all over the country.

Based on the trends in the extreme rainfall intensity of the Philippines (1951 - 2008 data from PAGASA), as shown in Figure 7.1.32, the intensity of rainfall along the NSCR alignment is increasing but statistically not significant. However, in the past five years, extreme rainfall events that caused severe flooding in the country there are recorded, as listed in Table 7.1.13. Situational reports provided by the National Disaster Risk Reduction Management Council (NDRRMC) website show available data on the flood level specifically for the city of Malolos. During Habagat 2013, the estimated range of flood depth observed in Malolos City was 0.3 - 1.2 meters.



Source: PAGASA-DOST/Climate Monitoring and Prediction Center

Figure 7.1.32 Trends in the Extreme Rainfall Intensity of the Philippines

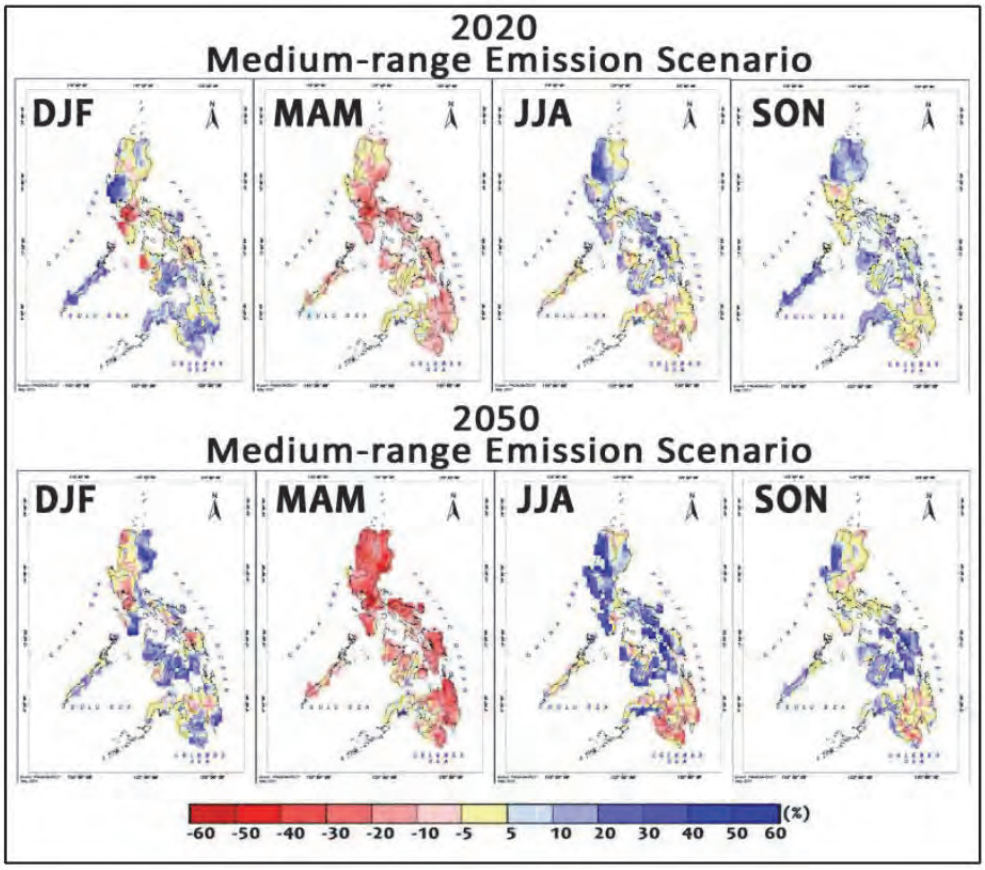
Table 7.1.13 List of Extreme Rainfall Events that Cause Severe Flooding

Event	Period	Highest Measured Accumulated Rainfall
Ondoy ("Ketsana")	Sept. 24-27, 2009	556.1 mm of rain (4-day period)
Habagat 2012 (enhanced by Typhoon Haiku)	August 6-8, 2012	1,0007.4 mm of rain (3-day period)
Habagat 2013 (enhanced by Tropical Storm Maring)	August 17-21, 2013	1,120.2 mm of rain (5-day period)

Source: www.rappler.com/newsbreak/39948-by-the-numbers-ondoy-habagat-2012-2013

Based on the Report of PAGASA on Climate Change in the Philippines (February 2011), the projected seasonal rainfall change will generally show that there is reduction in rainfall in most parts of the country during the summer (March - April - May) season. However, rainfall increase is likely during the southwest monsoon (June-July - August) season until the transition (September – October - November) season in most areas of Luzon and Visayas, and also, during the northeast monsoon (December-January - February) season, particularly, in provinces/areas characterized as Type II climate in 2020 and 2050.

There are varied trends in the magnitude and direction of the rainfall changes, both in 2020 and 2050. What the projections clearly indicate are the likely increase in the performance of the southwest and the northeast monsoons in the provinces exposed to these climate controls when they prevail over the country. Moreover, the usually wet seasons become wetter with the usually dry seasons becoming also drier; and these could lead to more occurrences of floods and dry spells/droughts, respectively.

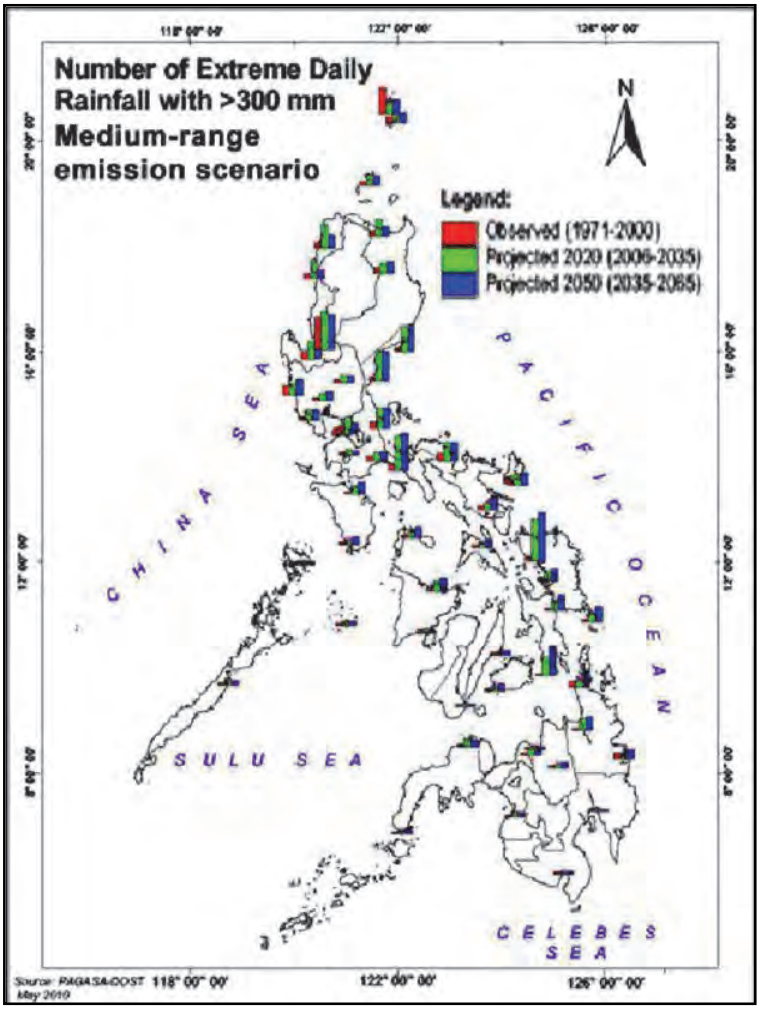


Source: PAGASA

Figure 7.1.33 Maps Showing the Projected Rainfall Change (increase/decrease) in % in 2020 and 2050 in the Philippines.

Extreme rainfall events (heavy daily rainfall) will continue to become more frequent, extreme rainfall is projected to increase in Luzon and Visayas only, in 2020 and 2050.

Figure 7.1.34 shows the projected increase in number of days with extreme rainfall (defined as daily rainfall exceeding 300 mm) compared with the observed (baseline) values.



Source: PAGASA

Figure 7.1.34 Current and Projected Extreme Rainfall in the Philippines in 2020 and 2050 under Midrange Scenario

The projected seasonal temperature increase, seasonal rainfall change in 2020 and 2050 under the medium-range emission scenario in Bulacan and NCR are presented in Table 7.1.14.

Table 7.1.14 Seasonal Rainfall Change (in %) in 2020 and 2050 under Medium-Range Emission Scenario in Provinces in Region 4-A

		Metro Manila	Bulacan
Observed Baseline (1971-2000)	Dec-Jan-Feb	107.5	212.4
	Mar-Apr-May	198.5	288.9
	Jun-Jul-Aug	1170.2	1041.4
	Sep-Oct-Nov	758.7	842.1
CHANGE In 2020 (2006-2035)	Dec-Jan-Feb	-12.8	4.2
	Mar-Apr-May	-33.3	-23.0
	Jun-Jul-Aug	8.5	12.8
	Sep-Oct-Nov	0.0	-2.9
CHANGE in 2050 (2036-2065)	Dec-Jan-Feb	-17.3	-13.2
	Mar-Apr-May	-38.5	-36.4
	Jun-Jul-Aug	21.3	23.6
	Sep-Oct-Nov	3.7	-3.3

Source: PAGASA

c) Temperature

The average normal annual temperature recorded at the stations in NAIA (MIA) Pasay City, Port Area Manila and Science Garden Quezon City were 27.8°C, 28.4°C and 27.7°C, respectively.

For most parts of the country, the frequency of hot days and warm nights are significantly increasing. Extreme temperature are normally expressed in number of days with maximum temperature greater than 35°C. Based on the climate trends analyzed by PAGASA using the observed data during the period of 1951 - 2010, there has been an increase in annual mean temperature by 0.648 °C or an average of 0.0108 °C per year-increase. The warmest months are observed in April, May and June and the coldest months during December, January and February, with the temperature ranging from of 28 - 30°C and 25 - 27°C.

d) Relative Humidity

The monthly relative humidity (percentage of water vapor in the air) values ranged from 66% to 84%. The average values for relative humidity recorded at NAIA (MIA) Pasay City, Port Area Manila and Science Garden Quezon City were 76%, 74% and 78%, respectively. This shows high humidity in the three stations.

e) Wind Speed and Direction

PAGASA weather stations in NAIA (MIA) Pasay City, Port Area Manila and Science Garden Quezon City recorded the prevalent wind direction in the respective area for the period of 1981 - 2010, as shown in Table 7.1.15. The average annual wind speed for NAIA (MIA), Pasay City and Port Area, Manila is 3.0 meters per second (mps), while Science Garden Quezon City has an average annual wind speed of 1.0 mps.

Table 7.1.15 Prevalent Wind Direction Recorded from PAGASA Weather Stations

Month	NAIA (MIA,)Pasay City	Port Area, Manila	Science Garden, Quezon City
January-April	E	N, E and SW	N, NE and SE
May-September	W	SW	SW
October-December	E	SW and N	N
Annual	E	SW	N

Source: PAGASA

Table 7.1.16 shows the prevalent wind direction and average wind velocity at the 3 sampling sites, as measured by CRL Environmental Corporation.

Table 7.1.16 Speed and Direction During Air Quality Sampling (September 24-26, 2013)

Station	Prevailing Wind Direction	Average Wind Velocity	Weather Condition
Guiguinto	SW-NE	0.10- 1.57 m/s	Cloudy to partly cloudy with isolated rain shower
Valenzuela	SW-NE	0.15- 0.39 m/s	Cloudy to partly cloudy
Caloocan	SW-NE	0.13- 2.05 m/s	Cloudy

Source: PAGASA

7) Ambient Environmental Quality

Manila, Caloocan, Valenzuela, Malabon, Meycauayan, Marilao, Bocaue, Balagtas, Guiguinto and Malolos are already experiencing a deterioration of air quality. This may be attributed to the congestion of people, high volume of vehicles plying in the cities/municipalities, improperly maintained vehicles servicing them and the significant number of manufacturing companies and industries, with inadequate air pollution control devices, operating within the area.

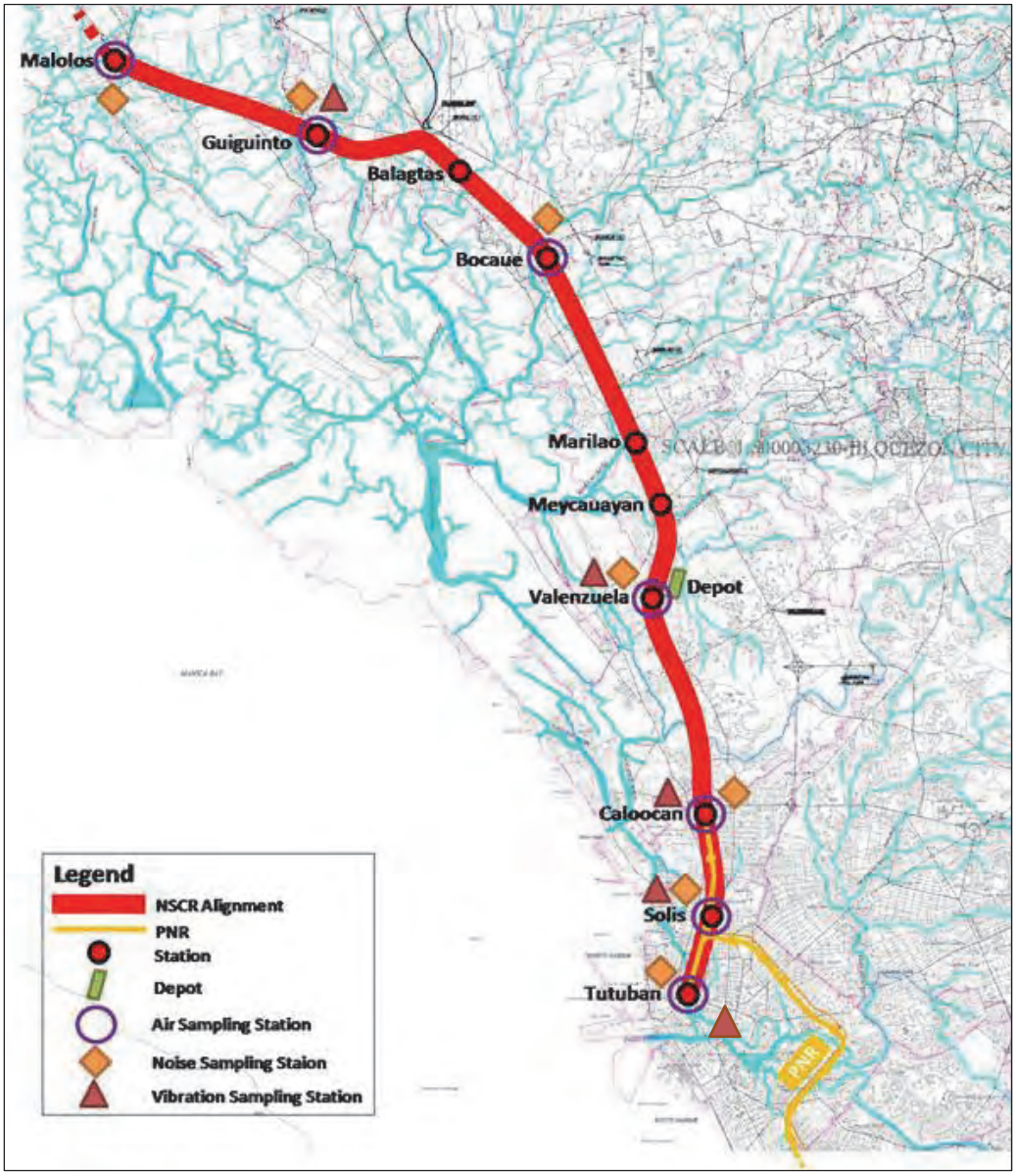
Ambient air quality sampling was conducted at old PNR Malolos and Bocaue stations in October 2012. Sampling was undertaken in the morning and the afternoon. Air quality sampling was also conducted at three Old PNR stations, namely Guiguinto, Valenzuela and Caloocan in September, 2013. In Manila and Caloocan, air quality sampling was conducted at three sites along the proposed NSCR Project alignment in December 2014. Locations of the sampling sites were at Caloocan (near the intersection of Samson Road and existing PNR tracks); Solis (near the existing PNR tracks); and Tutuban (along C.M. Recto Ave. near the old PNR tracks). The sampling sites are shown in Figure 7.1.35.

The measurement results of the following parameters; TSP, PM_{10}, Pb, CO, NO_2, SO_2 and O_3 are shown in Table 7.1.17.

TSP level measured at the Malolos station in the afternoon exceeded the DENR standards, although PM_{10} level did not exceed the DENR standards. Particulate Matter, PM_{10}, measured in all sampling points was within the DENR standards. The O_3 level measured in the morning and in the afternoon at Malolos station exceeded the DENR guideline value.

On the other hand, the detected concentration levels of Pb, CO, NO_2 and SO_2 from all sampling sites were below the DENR standards and guideline values.

The baseline air quality data will be used as reference values in determining the changes of pollutant levels during the monitoring of activities at the pre-construction, construction and operation phases of project.



Source: JICA Study Team

Figure 7.1.35 Sites for Ambient Air Quality, Noise and Vibration Level Measurement

Table 7.1.17 Observed Ambient Air Concentrations

Sampling Station	Coordinates	Ambient Air Quality						
		TSP (µg/NCM)	PM_{10} (µg/NCM)	Pb (µg/NCM)	CO (ppm)	NO_2 (µg/NCM)	SO_2 (µg/NCM)	O_3 (µg/NCM)
Malolos[1]	14°51'8.15"N 120°48'56.70"E	95	61.8	<0.003	1.15	3.093	<0.05	659.56
		585	91.3	<0.003	0.92	2.700	<0.05	546.65
Bocaoue[1]	14°48'1.24"N 120°55'53.49"E	133	67.9	0.14	0.31	2.702	<0.05	21.37
		145	104.4	0.10	0.62	2.059	<0.05	37.60
Guiguinto[2]	14^0 50' 07.1" N 120^0 52' 01.2" E	20.20	26.83	ND	ND	8.67	3.68	ND
Valenzuela[2]	14^0 43' 03.0" N 120^0 57' 44.1" E	37.52	49.68	ND	ND	10.43	3.96	ND
Caloocan[3]	14^0 39' 28.3" N 120^0 58' 26.2" E	97.28	97.60	ND	ND	30.81	15.53	ND
Caloocan[3]	14^0 39' 26.75" N 120^0 58' 25.52" E	86.3	30.6	<0.00005	4.0	10.6	0.4	17.27
Solis[3]	14^0 37' 56" N $120^0$58' 34.6" E	84.6	30.5	<0.00005	8.6	10.9	0.9	29.88
Tutuban[3]	14^0 36' 22" N $120^0$58' 17" E	81.3	46.7	0.06159	2.1	12.7	2.3	12.14
DENR Standard (NAAQS/NAAQGV)		230	150	1.5	30*	150	180	140*

Source: JICA Study Team

Note: *Proposed

[1] Conducted Oct 19-20, 2012, upper row: in the morning, lower row in the afternoon

[2] Conducted Sep 17-23, 2013

[3] Conducted Dec 26-28, 2014

ND: Not Detected

8) Surface Water Quality

Philippine water quality is assessed based on the set beneficial use as defined in the Department of Environment and Natural Resources (DENR) Administrative Order (DAO) 34, Series of 1990. Under this DAO, a water body must meet all the parameters that define the desired water quality 100 percent of the time to maintain its designated water body classification.

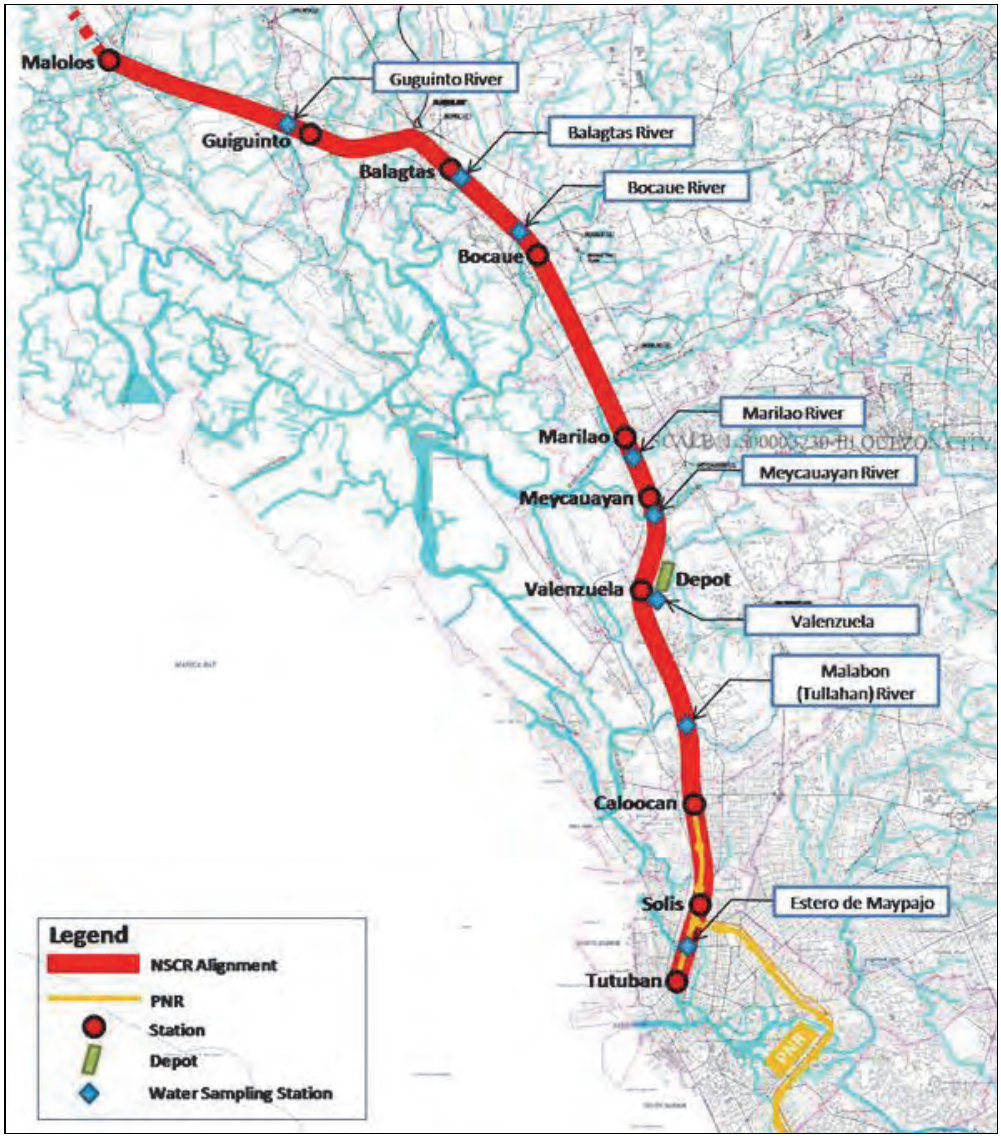
In terms of environmental concerns, Region 3 is one of the most critical regions in terms of environmental concerns primarily because of the sprawling number of industries and settlements without the necessary land use and environmental planning. Based on the Green Framework of Innovative Strategy (GFIS) for Sustainable Consumption and Production Report (March 2008) prepared by the Environmental Management Bureau (EMB) of DENR and International Center for Environmental Technology Transfer (ICETT), of the 40 rivers surveyed in Central Luzon, 5 are biologically dead. These dead rivers are the Balagtas, Bocaue, Guiguinto, Marilao and Meycauayan rivers, all in Bulacan. According to the report, industrial wastes account for about 48% of the total pollution load of rivers and creeks. In terms of biochemical oxygen demand (BOD) loading, 51% is generated by domestic sources, 14% by the industrial sector, and 35% by the agricultural sector.

In the case of Metro Manila, massive population growth, infrastructure development and increased economic activities led to the deterioration of its water bodies. In 1990, the Pasig River was pronounced as dead and incapable of sustaining marine life. As of 2003, the DENR formally declared four more rivers as biologically dead; the Navotas-Malabon-Tenejeros-Tullahan (NMTT) River, Paranaque River, Marikina River and San Juan River.

To validate existing water quality data from secondary sources, actual water sampling was conducted along the NSCR alignment. Surface water samples were taken from Guiguinto River, Santol (Balagtas)

River, Bocaue River, Marilao River, Meycauayan River, a water-logged area in the proposed stabling yard in Valenzuela, and Malabon (Tullahan) River, and the Estero de Maypajo bordering Caloocan and Manila, as seen on Figure 7.1.36.

Results of the laboratory analyses are summarized in Table 7.1.18. At many sampling points, many parameters of the water samples exceeded the DENR Class C Standards. It might be caused by untreated wastewater from industrial zones and untreated domestic wastewater.



Source: JICA Study Team

Figure 7.1.36 Site of (River) Water Sampling Stations

Table 7.1.18 Summary of Test Results for Surface Water Samples

Parameters, units	Guiguinto River[1]	Balagtas River[1]	Bocaue River[1]	Marilao River[1]	Meycauayan River[1]	Valenzuela[1]	Malabon River[1]	Estero de Maypajo	DAO No. 34, Class C Standards
pH	8.8	7.6	7.9	7.8	7.4	6.6	7.0	7.2* 7.0**	6.5-8.5
Temperature	26.7	27.0	27.5	28.2	27.7	26.7	27.7	25* 26.5***	3 °C Maximum rise
Color, PCU	170	170	85	85	50	50	40	75* 30**	(c)
DO, mg/L	2.3	4.5	8.2	7.1	<2.0	<2.0	<2.0	<0.5* 5.0**	5.0 minimum
BOD, mg/L	12	2	4	8	9	55	22	63.2* 33**	7(10)
TSS, mg/L	44	8.8	44	36	17	9.0	12	47.5* 21.2**	(g)
Surfactants, MBAS, mg/L	0.5	<0.02	<0.2	0.1	0.4	1.7	2.2	3.9* 2.7***	0.5
Oil and Grease, mg/L	0.8	0.6	0.7	0.8	0.6	0.7	0.4	3.7* 0.8*	2
Nitrate, mg/L	0.05	0.3	0.9	1.7	0.04	<0.2	0.05	21.8* 0.2***	10 (j)
Phosphate, mg/L	0.3	0.5	0.5	0.6	0.4	0.3	1.6	2.74* 0.5***	0.4 (k)
Phenols, mg/L	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.0006	<0.01* <0.0006***	0.02 (l)
Chloride, mg/L	24	3.6	8.4	14	22	14	27	40.3* 20***	350
Cr+6, mg/L	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.001* <0.003***	0.05
Mercury, mg/L	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.001* <0.0001***	0.002
Dissolved Copper, mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.05* <0.01***	0.05
Free Cyanide, mg/L	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.01* <0.02***	0.05
Arsenic, mg/L	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.0014* <0.01***	0.05
Cadmium, mg/L	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.01* <0.006***	0.01
Lead, mg/L	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.05* <0.05***	0.05
Total Coliforms, MPN/100 ml	>160,000	35,000	54,000	54,000	>160,000	>160,000	>160,000	9,200,000* 7,000,000**	5,000 (m)
Fecal Coliforms, MPN/100 ml	92,000	13,000	35,000	35,000	>160,000	>160,000	>160,000	5,400,000* 1,700,000**	-

Source: JICA Study Team

Note:
[1]Sampling Date – September 24-25, 2013
*Sampling Date – January 14, 2015
**Sampling Date – July 31, 2014
***Sampling Date – September 15, 2014

(c) No abnormal discoloration from unnatural causes
(g) Not more than 30 mg/L increase
(j) Applicable only to lakes or reservoirs and similarly impounded water
(k) When applied to lakes or reservoirs, the Phosphate as P concentration should not exceed an average of 0.05 mg/L nor a maximum of 0.1 mg/L
(l) Not present in concentrations to affect fish flavor/taste
(m) These values refer to the geometric mean of the most probable number of coliform organism during a 3-month period and that the limit indicated shall not exceeded in 20 percent of the samples taken during the same period
nil - Extremely low concentration and not detectable by existing equipment
( ) Values enclosed in parentheses are maximum value

9) Soil Contamination

An old garbage dumpsite for domestic wastes (Figure 7.1.37) is situated close to the Meycauayan River, which is also along the PNR ROW. The area now covered with grasses is currently vacant and is adjacent to a backyard leather tannery.

Source: JICA Study Team

Figure 7.1.37 Satellite Photo of old Meycauayan Dumpsite

In terms of the level of contamination, composite bore samples taken from the site at 1.85 m to 2 m, 4.55 m to 5m and 5.55 m to 5.69 m depths showed concentrations of polychlorinated biphenyls (PCBs), organophosphorus pesticides, organ chlorinated pesticides and volatile organic compounds that are below the method detection limits.

The results of heavy metals analysis (as dry basis) are shown in Table 7.1.19. There are no soil standards in the Philippines. Environmental standards for soil of three countries; Japan, Netherlands and Germany are also presented for reference in Table 7.1.19.

Results of the soil sample analysis show that all heavy metals tested were well below the three countries' standard values. It should be noted that soil samples were taken during the rainy season, which may have an influence on the quality of results.

Table 7.1.19 Summary of Heavy Metals Analysis for Soil Sample in the Former Meycauayan Dumpsite (mg/kg dry matter)

Heavy metals	Results	Environmental Standards for Soil Pollution in Japan[1]	Dutch Standards reference values[2]	German Standards Trigger values[3]
Arsenic	1.3	150	29.0	25
Barium	155	4,000	160	-
Cadmium	<0.1	150	0.8	10
Chromium	2.0	250	100.0	200
Lead	7.1	150	85.0	200
Mercury	<0.05	15	0.3	10
Selenium	<0.02	150	0.7	-
Silver	<0.4	-	-	-

Source: JICA Study Team

Note: 1) Soil Contamination Countermeasures Act, 2002, Hazardous Category: Class 2 Designated Hazardous Substances
2) Dutch Target and Intervention Values, 2000. Reference values for soil are adjusted for the organic matter (humus) content and soil fraction < 0.2 μm (lutum). Values are calculated for a "Standard Soil" with 10% organic matter and 25% lutum.
3) Federal Soil Protection and contaminated Site Ordinance: trigger values pursuant to Article 8 para 1 Sent. 2 no.1 of the Federal Soil Protection Act for the direct intake at the playground.

Also, along the ROW of PNR in Barangay Bangcal, Meycauayan, is an area that has been contaminated with lead but has since been remediated. The area was used by informal settlers as a "leaded material sorting & cleaning" encampment for their recycling of unauthorized extracted materials from the adjacent RAMCAR Battery Manufacturer Facility. RAMCAR was required by DENR EMB Region III to complete a site remediation action in the specified lead contaminated site. Contamination was generally composed of soil materials with residual lead content after extraction of the lead material.

The Leelin Industrial Corporation, which operated the RAMCAR Battery Manufacturer, conducted remediation from July 04 to August 29, 2014 with the following protocols:

a) subject area was surveyed to determine size and technical points of the contaminated area

b) soil samples were gathered from previously identified points in the subject area for independent testing to determine variables

c) grating – complete and thorough topsoil scraping of up to 0.6 meters, to loosen the topsoil for hauling and relocation to a secure temporary holding area

d) Backfilling – after scraping and removal of topsoil, a new 0.6 layer of clean topsoil will be compacted to coat the subject area.

e) Retesting and monitoring – upon completion of remediation works, retesting and periodic monitoring will be performed to verify effectiveness of remediation.

With regard to the area near the abandoned RAMCAR Battery Manufacturing Facilities located in Brgy. Bangkal, Meycauayan, the area needs to be monitored during construction as the land had already been covered and remediated; and might be excavated that traces of lead might again be detected. Hence the following actions should be taken by the proponent before the selection of the contractor in order to ensure that the contaminated site has been completely remediated by the RAMCAR.

1) Confirm that the DENR EMB's evaluation of effectiveness of remediation by the begging of detailed engineering design stage;

2) If the remediation is deemed insufficient, the proponent will request DENR EMB and RAMCAR to conduct further remediation;

3) Even if the remediation is deemed sufficient, the heavy metal (Pb) in excavated soil shall be monitored during construction. If the testing result indicates any contamination, the proponent shall stop excavation/civil work and discuss with DENR EMB and RAMCAR how to remediate contaminated soil.

10) Ambient Noise Level

Ambient noise measurement survey was conducted at 7 sites as shown in Figure 7.1.35. The results compared to the National Pollution Control Commission (NPCC) Memorandum Circular No. 002 Series of 1980, Section 78 - Ambient Noise Quality and Emission Standards for Noise. The results are shown in Table 7.1.20.

In comparison with the maximum allowable noise level set by DENR for Class B, Malolos station slightly exceeded the noise level 65dBA standard during daytime, while Bocaue station exceeded the noise level standard during morning. The rest of the time, noise level was within the DENR standard. The monitored noise levels at Guiguinto station were well below the noise level standard for the fourspecified sampling periods for light industry area Class C. Valenzuela station exceeded the noise level standard for Class A during the evening and the night. During the morning and the daytime, there were some periods the noise levels exceeded the standard noise levels. The monitored noise levels at Caloocan station went beyond the noise level standard for Class AA and even Class A, both in September 2013 and December 2014. The sampling site at Caloocan faces to the commercial area and the Samson road, where vehicular traffic movement is significant.

The results of the noise levels monitoring at Tutuban showed that all values observed exceeded the DENR standards for the four specified sampling periods for commercial area, Class B. As for the night time noise, the observed noise levels lightly exceeded the DENR standards of 55dBA. Sounds generated by the movements and activities of customers and business operators are the main sources noise at the sampling station. Noise generated by the passing vehicles and construction activities on the adjacent area likewise contributed to the intermittent noise recorded at the time of sampling.

The monitoring results at Solis revealed that the recorded morning noise levels were well below the noise level standard for the four specified sampling periods for commercial area Class B.

Table 7.1.20 Observed 24 hour Noise Levels (dB)

Malolos[1]		Bocaue[1]		Guiguinto[2]		Valenzuela[3]		Caloocan[4]		Caloocan[5]		Solis[6]		Tutuban[6]		DENR Standard for Noise Level			
Sampling Time	**dB (A)**	**Sampling Time**	**dB (A)**	**Sampling Time**	**Db (A)**	**Sampling Time**	**dB (A)**	**Sampling Time**	**dB (A)**	**Sampling Time**	**dB (A)**	**Sampling Time**	**dB (A)**	**Sampling Time**	**dB (A)**	**Class AA**	**Class A**	**Class B**	**Class C**
Daytime 09:00 – 18:00	65.1	Daytime 09:00 – 18:00	61.9	09:00 – 11:00	52.8	09:40 – 11:40	51.5	09:00 – 11:00	60.7	09:30 – 09:40	74	13:30-13:40	63	17:20 – 17:30	74	50	55	65	70
				11:00 – 13:00	53.2	11:40 – 13:40	52.5	11:00 – 13:00	60.8							50	55	65	70
				13:00 – 15:00	52.6	13:40 – 15:40	68.1	13:00 – 15:00	61.1							50	55	65	70
				15:00 – 17:00	52.4	15:40 – 17:40	51.7	15:00 – 17:00	55.3							50	55	65	70
Evening 18:00 – 22:00	55.9	Evening 18:00 – 22:00	59.1	17:00 – 19:00	52.9	17:40 – 19:40	52.2	17:00 – 19:00	54.8	21:30 – 21:40	73	21:30-21:40	53	21:00 – 21:10	72	45	50	60	65
				19:00 – 21:00	53.9	19:40 – 21:40	50.9	19:00 – 21:00	60.1							45	50	60	65
Nighttime 22:00 – 05:00	50.8	Nighttime 22:00 – 05:00	53.2	21:00 – 23:00	50.3	21:40 – 23:40	52.1	21:00 – 23:00	54.8	01:00 – 00:10	63	22:40-22:50	53	01:10 – 01:20	57	40	45	55	60
				23:00 – 01:00	49.8	23:40 – 01:40	50.5	23:00 – 01:00	52.8							40	45	55	60
				01:00 – 03:00	49.7	01:40 – 03:40	48.9	01:00 – 03:00	50.8							40	45	55	60
				03:00 – 05:00	49.3	03:40 – 05:40	48.9	03:00 – 05:00	50.8							40	45	55	60
Morning 05:00 – 09:00	56.3	Morning 05:00 – 09:00	63.0	05:00 – 07:00	51.6	05:40 – 07:40	49.2	05:00 – 07:00	52.5	05:30 – 05:40	73	07:00-07:10	58	05:20 – 05:30	75	45	50	60	65
				07:00 – 09:00	52.3	07:40 – 09:40	51.1	07:00 – 09:00	53.6							45	50	60	65

Source: JICA Study Team

Note:

[1] Conducted last October 19-24, 2012,Categorized as Class B;
[2] Conducted last October 19-24, Categorized as Class C;
[3] Conducted last October 19-24, Categorized as Class A;
[4] Conducted Sep 17-23,2013,Categorized as Class AA;
[5] Conducted Dec 28,2014,Categorized as Class AA;
[6] Conducted Dec26-27,2014, Categorized as Class B

11) Ground Vibration Level

Ground vibration survey was conducted at 5 sites to monitor ground movement as shown in Figure 7.1.35.

Vibration Level (VL) is used for the evaluation index and defined as follows;

$$\mathrm{VL} = 20log_{10}\frac{a_w}{a_0}$$

Where,

VL : Vibration level (dB)

a_w : Frequency weighted acceleration reflecting human perception (m/s^2)

a_0 : Standard acceleration = 10^{-5} (m/s^2)

Although there is no acceptable standard on VL, generally the perceptive threshold of vibration is 55dB for human[1]. When a_w is 0.01m/s^2, VL is 60 dB, while a_w is 0.005m/s^2, VL is 54dB. In the Philippines, there is no standard for vibration. According to the above equation, when VL is 55dB, frequency weighted acceleration (a_w) is 0.0056m/s^2.

The results of ground vibration measurements are shown in Table 7.1.21. At Guiguinto station, Samson Road and Solis, the registered vibration peak acceleration was 0.2 cm/s^2. The estimated vibration level VL was 46 dB and below the perceptive threshold of vibration for human 55dB. Peak movements recorded in the site were caused by the vehicles passing near the location and influenced by the loose and unpaved roads. The recorded peak accelerations at the old PNR stations at Valenzuela and Caloocan were not detected.

Table 7.1.21 Observed Vibration Level at Recorded Peak Acceleration

Particulars	**Guiguinto**	**Valenzuela**	**Caloocan** (Old PNR station)	**Caloocan** (Samson Road)	**Solis**	**Perceptive threshold of vibration for human*1**
Sampling Date and Time	9/24/2013 10:00 – 11:00	9/24/2013 13:00 – 14:00	9/24/2013 15:00 – 16:00	1/28/2015 14:00 – 15:00	1/28/2015 16:00 – 17:00	-
Recorded Peak Acceleration (m/s^2)	0.002	ND	ND	0.002	0.002	0.0056

Source: JICA Study Team

Note 1) "Technology and Laws Regulation for Pollution Control, 2000"Japan Environmental Management Association for Industry

[1] "Technology and Laws Regulation for Pollution Control, 2000", Japan Environmental Management Association for Industry

7.1.4 Legal and Institutional Frameworks and Procedures on Environmental and Social Consideration in Philippines

7.1.4.1 Laws and Regulations of Environmental Impact Assessment (EIA)

Any private or public projects or activities which are likely to have foreseen adverse effects on the natural and social environment are subject to the Philippine Environmental Impact Statement System (PEISS). Among some of the most important laws and guidelines related PEISS are shown in Table 7.1.22.

Table 7.1.22 Important Laws and Manuals of PEISS

Laws and manuals	Stipulation
Presidential Decree No. 1152 (1977)	Philippines' Environmental Code. Comprehensive environmental management with mitigation measures were addressed and concept of the environmental impact assessment was introduced for the first time.
Presidential Decree No. 1586 (1978)	PEISS was established to conduct EIA study for the environmentally critical projects and the projects in the environmentally critical areas.
Presidential Proclamation No. 2146 (1981) and No. 803(1996)	Proclaiming certain areas and types of projects as Environmentally Critical and within the scope of PEISS establish under PD No. 1586.
DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2008)	Providing the implementing rules and regulations for the Philippine Environmental Impact Statement (EIS) System of PD No. 1586.

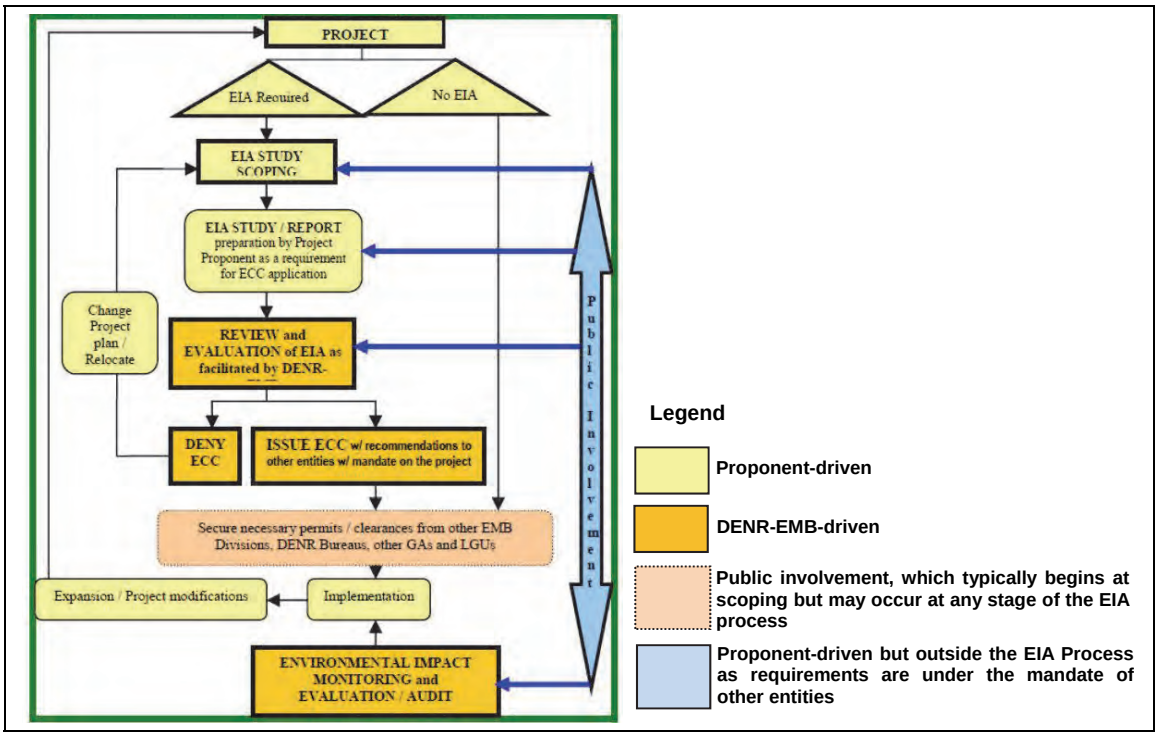
Source: JICA Study Team

7.1.4.2 Responsible Government Authorities

The Department of Environment and Natural Resources (DENR) is the government entity responsible for the environmental administration. Environmental Management Bureau, Department of Environment and Natural Resources (DENR - EMB) is responsible for the issuance of decision making documents such as Environmental Compliance Certificate (ECC) and Certificate of Non-Coverage (CNC) for PEISS. EMB Regional Offices in respective regions are primarily responsible for the consultation and supervision of development projects.

7.1.4.3 Process of PEISS

The Philippine EIA Process has six sequential stages 1) Screening, 2) Scoping, 3) EIA Study and Report Preparation, 4) EIA Review and Evaluation, 5) Decision Making, and 6) Post ECC Monitoring, Validation and Evaluation/Audit stage. A summary flowchart of the complete process is presented in Figure 7.1.38.



Source: DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)

Figure 7.1.38 Flow Chart of EIA Process in the Philippines

7.1.4.4 Projects Covered by PEISS

Projects which have been originally declared as Environmentally Critical Projects (ECPs) or projects in Environmentally Critical Areas (ECAs) presumed to have significant impacts on the quality of the environment are subject to PEISS. The four (4) ECP project types and twelve (12) ECA categories have been declared through Proclamation No. 2146 (1981) and Proclamation No. 803 (1996), as shown in Table 7.1.23 and Table 7.1.24.

Table 7.1.23 Summary of Environmentally Critical Projects (ECPs)

Main Category	Sub-Category
A. Heavy Industries	• Non-Ferrous Metal Industries • Iron and Steel Mills • Petroleum and Petrochemical Industries • Smelting Plants
B. Resource Extractive Industries	• Major Mining and Quarrying Projects • Forestry Projects • Dikes for/and Fishpond Development Projects
C. Infrastructures	• Major Dams • Major Power Plants • Major Reclamation Projects • Major Roads and Bridges
D. Golf Courses	-

Source: DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)

Table 7.1.24 Summary of Environmentally Critical Areas (ECAs)

ECA Categories	Examples
A. Areas declared by law as national parks, watershed reserves, wildlife preserves, and sanctuaries	• Areas of the National Integrated Protected Areas System Act
B. Areas set aside as aesthetic, potential tourist spots	• Areas declared and reserved by the Department of Tourism or other authorities for tourism development
C. Areas which constitute the habitat for any endangered or threatened species of indigenous Philippine wildlife (flora and fauna)	• Areas inhabited by indeterminate species, threatened species, rare species, endangered species
D. Areas of unique historic, archeological, geological, or scientific interests	• National historical landmarks, geological monuments, paleontological and anthropological reservations as designated or determined by the National Historical Institute, National Museum, National Commission for Culture and the Arts, National Commission on Geological Sciences, and other authorities
E. Areas which are traditionally occupied by cultural communities or tribes	• Ancestral lands maintained by the PANAMIN for national minorities • Areas that are occupied or claimed as ancestral lands or ancestral domains by indigenous communities
F. Areas frequently visited and or hard-hit by natural calamities (geologic hazards, floods, typhoons, volcanic activity, etc.	• Areas frequently visited or hard-hit by typhoons • Areas frequently visited or hard-hit by tsunamis • Areas frequently visited or hard hit by earthquakes • Storm surge-prone areas • Flood-prone areas • Areas prone to volcanic activities • Areas located along fault lines or within fault zones • Drought-prone areas
G. Areas with critical slope	• Lands with slope of 50% or more • Alienable and disposable forest lands and unclassified forests
H. Areas classified as prime agricultural lands	• Irrigated and irrigable areas and other areas mapped under the Network of Protected Areas for Agriculture of the Bureau of Soils and Water Management
I. Recharged areas of aquifers	• Areas of sources of water replenishment
J. Water bodies	• Areas that are tapped for domestic purposes • Areas which support wildlife and fishery activities
K. Mangrove Areas	• Tidal areas covered by salt-tolerant, intertidal tree species • Areas declared as mangrove swamp forest reserves
L. Coral Reefs	• Areas characterized by the assemblage of different types of marine plants and organisms • Areas identified by local sources such as the UP-Marine Sciences Institute, DENR-Coastal Environment Program to be rich in corals.

Source: DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)

The EIA-covered projects will require the hereunder listed depending on project type, location, magnitude of potential impacts and project threshold.

- Environmental Impact Statement (EIS),
- Programmatic Environmental Impact Statement (PEIS),
- Initial Environmental Examination Report (IEER),
- Environmental Performance Report and Management Plan (EPRMP),
- IEE Checklist (IEEC), or
- Project Description Report (PDR).

All documents should be prepared by the project proponent to be submitted to EMB Central Office or the Environmental Impact Assessment Division of the respective EMB Regional Offices. The outcome of the EIA Process within PEISS administered by the EMB - DENR is the issuance of decision documents. Decision documents may either be an ECC, CNC or a Denial Letter, described as follows:

- An ECC is issued as a certificate of Environmental Compliance Commitment to which the Proponent conforms with, after DENR - EMB explains the ECC conditions.
- A CNC certifies that, based on the submitted PDR, the project is not covered by the EIS System and is not required to secure an ECC.
- A Denial Letter shall contain an explanation for the disapproval of the application and guidance on how the application can be improved to a level of acceptability in the next EIA process.

For Group I projects, ECC application documents need to be submitted to EMB central office to have decisions by EMB Director or DENR Secretary. While, ECC application for Group II need to be submitted to EMB Regional Office to have decision making by the EMB Regional Director. Table 7.1.25 summarizes Project Groups, EIA Report Types, Decision Documents, Deciding Authorities and Processing Duration.

Table 7.1.25 Summary of Project Groups, EIA Report Types, Decision Documents, Deciding Authorities and Processing Duration

Project Groups	Documents Required For ECC/CNC Application	Decision Document	Deciding Authority	Max Processing Duration
I: Environmentally Critical Projects (ECPs) in either Environmentally Critical Area (ECA) or Non- Environmentally Critical Area (NECA)	Environmental Impact Statement (EIS) / Environmental Performance Report and Management Plan (EPRMP)	ECC	EMB Director / DENR Secretary	40 days (Working Days)
II: Non- Environmentally Critical Projects (NECPs) in Environmentally Critical Area (ECA)	Environmental Impact Statement (EIS) / Environmental Performance Report and Management Plan (EPRMP) /Initial Environmental Examination Report (IEER) / Initial Environmental Examination Checklist (IEEC) / Project Description Report (PDR)	ECC	EMB RO Director	20 days (Working Days)
III: Non-Environmentally Critical Projects (NECPs) in Non-Environmentally Critical Area (NECA)	Project Description Report (PDR)	CNC	EMB Director /EMB RO Director	20 days (Working Days)
IV: Co-located Projects	Programmatic Environmental Impact Statement (PEIS)	ECC	DENR Secretary	40 days (Working Days)
V: Unclassified Projects	Project Description Report (PDR)	CNC or Recommendation on Final Grouping and EIA Report Type	EMB Director / DENR Secretary / EMB RO Director	15 days (Working Days)

Source: DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007)

For the NSCR project, the PEISS requires the following procedure:

- The infrastructure project involving new construction of bridges and viaducts or the railway project at grade (regardless of length and width) is classified as ECP and shall submit the EIS to obtain the ECC from DENR EMB. For the project of existing and to be expanded, modified and/or rehabilitated, the submission of an EPRMP is required to obtain the ECC.
- There are two valid ECCs for the Northrail Project, which is to be applicable to the NSCR project. The first ECC was issued for the Clark to Valenzuela section in 2000 and the second ECC was issued for the Valenzuela to Caloocan section in 2007.
- The NSCR Project has become to have the different project scope, purposes, etc. from those of the Northrail Project, so the DENR EMB has advised DOTC to apply for one integrated ECC from Malolos to Tutuban, entire project scope of the NSCR Project, by conducting an EIA to complete the EPRMP for the entire Malolos to Tutuban section.

7.1.4.5 Public Participation, Public Consultation and Information Disclosure

The PEISS places importance in public participation. According to DENR Administrative Order No. 30 Series of 2003 (DAO 03-30), Revised Procedural Manual (2007), public participation shall be demonstrated through the following activities:

- The Information, Education and Communication (IEC)
- Public Scoping
- Involvement of local stakeholders
- Public Hearing
- EIA recommendations
- Environmental Monitoring and Audit

7.1.4.6 Environmental Monitoring and Management Plan needs to be formulated

Under the Philippine EIS System, the primary purpose of monitoring, validation and evaluation/audit is to ensure the judicious implementation of sound environmental management within a company/corporation and its areas of operation as stipulated in the ECC and other related documents. Specifically, it aims to ensure the following:

- Compliance with the conditions set in the ECC;
- Compliance with the Environmental Management Plan (EMP) commitments;
- Effectiveness of environmental measures on prevention or mitigation of actual project impacts vis-a-vis the predicted impacts used as basis for the EMP design; and
- Continuous updating of the EMP for sustained responsiveness in addressing environmental impacts of undertakings.

a) Project Proponent

The Proponents with issued ECCs are primarily responsible for monitoring their projects. A proponent is required to submit an ECC Compliance Monitoring Report (CMR) to the designated monitoring EMB office on a semiannual frequency. The detailed report on compliance to environmental standards specific to environmental laws shall be submitted through the Self-Monitoring Report (SMR) on a quarterly basis to the concerned EMB office.

b) Multi-partite Monitoring Team (MMT)

The MMT is primarily responsible of validating the proponent's environmental performance and submits findings/recommendations to EMB.

c) EMB

The Environmental Management Bureau shall be primarily responsible for the over-all evaluation/audit of the Proponent's monitoring and the MMT's validation.

7.1.4.7 Comparison of PEISS and JICA Guidelines/World Bank (WB) Safeguard Policies

In comparison to the "JICA Guidelines for Environmental and Social Considerations (2002 April)" (hereafter referred to as JICA Guidelines) and World Bank Operational Policy 4.01 - Environmental Assessment (hereafter referred to as WB OP 4.01), there are no variances in terms of the objectives of the JICA Guidelines/WB OP 4.01 and the Philippines' goal as provided in its constitution, environmental policies, EIS system law, and local government code.

7.1.4.8 Other Environmental Laws and Regulations Concerning the Project

Major environmental laws and regulations, which may be relevant to the interchange projects, must be observed. The PEISS states obligations to strictly comply with the environmental laws, regulations and standards, which have been established by the Philippine government.

Table 7.1.26 Philippines' Envieronmetal Laws, Regurations and Environmental Quality Standards

Items	Laws, Regulations and Environmental Quality Standards
Basic environmental code	Environment Code, Presidential Decree No. 1152 (Presidential Decree No.1152, 1977)
EIA	Refer to Table 12.1-1
Protection of natural environment	National Integrated Protected Areas System Act, Republic Act No.7586 (1992)
Water resources management	Water Code, Presidential Decree No. 1067 (1976)
Forest resources management	Forestry Reform Code/ Presidential Decree No. 705 (1975)
Conservation of biodiversity	Wildlife Resources Conservation and Protection Act Republic Act No.9147 (2001)
Water pollution control	Clean Water Act, Republic Act No. 9275 (2004)
Air pollution control	Clean Air Act of 1999, Republic Act No. 8749 (1999)
Waste management	Ecological Solid Waste Management Act, Republic Act No. 9003 (2001)
Hazardous management	Toxic Substances, Hazard and Nuclear Wastes Control Act, Republic Act No. 6969 (1990)
Environmental water standards	DENR Department Order: DAO No.34, Series of 1990
Wastewater effluent standards	DENR Department Order: DAO No.35, Series of 1990
Potable water quality criteria	DENR Department Order: DAONo.1994-26A (1994)
Ambient air quality and emission standards	DENR Department Order: DAO No.2000-81 (2000)
Noise environment standards	National Pollution Control Committee (NPCC) Memorandum Circular No.002 Series of 1980, Section 78 (1980)

Source: JICA Study Team

7.1.5 Scoping

In accordance with the JICA Guidelines, scoping for the NSCR project was conducted based on the information on the proposed route. The results are shown in the following table.

Table 7.1.27 Scoping for NSCR Project

No	Items	Rating		Brief Description
		Pre-Con/ Construction phase	Operation Phase	
Social Environment				
1	Involuntary Resettlement	A-	D	【Pre-construction】 (-) Involuntary resettlement is unavoidable due to additional land acquisition of for the narrow PNR ROW sections and for all station areas. (-) Small scale involuntary resettlement of informal setters is unavoidable at the proposed Valenzuela depot.
2	The poverty group	A-	B-	【Pre-construction】 (-) Some of informal settlers might be considered as being in the poverty group. 【Operation】 (-) Involuntary resettlement might worsen the situation of the poverty group.
3	Indigenous and ethnic people	D	D	• There are no indigenous or ethnic people in or around the project site.
4	Local economy such as employment and livelihood, etc.	B±	B±	【Construction】 (+) Employment of skilled and unskilled labor will be expected. (-) Land acquisition will force some small businesses to move out and might cause income loss and unemployment. 【Operation】 (+) Commuter trains may ease traffic congestion and boost regional economic activities along the route. (-) Resettlement and livelihood rehabilitation at the relocation site might take a longer period of time.
5	Land use and utilization of local resources	B-	B+	【Construction】 (-) Land use will be changed at the proposed depot site in Valenzuela because of reclamation of wetland. 【Operation】 (+) Effective utilization of present unused land is anticipated due to new development in the surrounding area.
6	Social institutions such as social infrastructure and local decision-making institutions	B-	B-	【Pre-construction】【Construction】 (-) The impacts to barangay's/ residents' societies might be occurred because of resettlement. (-) Conflict resolution between existing residents and new settlers might take longer in newly resettled barangays. 【Operation】 (-) The impacts to barangay's/ residents' societies might continue. (-) Development of new community of existing residents and new settlers might take longer.
7	Existing social infrastructures and services	B-	D	【Construction】 (-) Utility service interruption may inconvenience the communities.
8	Misdistribution of benefits and damage	B-	B-	【Construction】【Operation】 (-) Involuntary resettlement might cause the misdistribution of benefits and damage.
9	Local conflict of interests	B-	B-	【Construction】【Operation】 (-) Involuntary resettlement might cause the local conflict of interest.

No	Items	Rating		Brief Description
		Pre-Con/ Construction phase	Operation Phase	
10	Water Usage or Water Rights and Rights of Common	B-	D	【Construction】 (-) Alignment will pass some rivers, canals, and irrigation channels, therefore those might be blocked by installing the piers and temporary access roads. 【Operation】 • Water usage or water rights, rights of common may not be changed since the routes of the alternative options will be planned along the existing PNR route.
11	Historical/ Cultural heritage	B-	D	【Pre-construction】 (-) The old PNR Stations are recognized as historical heritage sites and are considered for preservation, such as Malolos, Meycauayan, Valenzuela/Polo, Tutuban.
12	Landscape	B-	B-	【Construction】 (-) The railway will employ mostly viaducts and bridges. Local aesthetic views might be disturbed temporarily during construction. 【Operation】 (-) Aesthetic value of the town scape might be affected due to viaducts.
13	Gender, Children's right	B-	B-	【Construction】【Operation】 (-) Involuntary resettlement might affect "Gender" and "Children's Rights".
14	Work environment (occupational health/ safety)	B-	D	【Construction】 (-) Health of workers and surrounding community might be threatened due to working in areas with contaminated soils and excavation of such soils (former domestic waste dumpsite and old battery factory site in Meycauayan). (-) Sanitary conditions will become unfavorable if enough portable toilets and litter bins are not provided at the construction site. (-) Noise & vibration at construction works might affect workers' health conditions.
15	Hazards (Risk) Infectious diseases such as HIV/ AIDS	B-	D	【Construction】 (-) Most construction workers will be hired locally. However, infectious diseases such as HIV/ AIDS might be spread due to workers from outside and poor sanitary conditions.
Natural Environment				
16	Topography and Geological features	B-	B-	【Construction】 (-) In the event of an earthquake, liquefaction, ground shaking and ground rupture might damage components of the construction work. (-) Filling during construction will be needed for access roads to the construction sites. Temporary land alteration may be unavoidable. (-) Reclaiming of small wetland will be needed to construct the depot at Valenzuela. Land alteration may be unavoidable. 【Operation】 (-) In the event of an earthquake, liquefaction, ground shaking and ground rupture might damage the railway facilities.
17	Soil Erosion	B-	D	【Construction】 (-) Construction activities that could lead to soil erosion brought about by rainfall and runoff include clearing vegetation, placing fill, soil removal and stockpiling spoils.
18	Groundwater	D	D	• Underground structure is not constructed for NSCR project.

No	Items	Rating		Brief Description
		Pre-Con/ Construction phase	Operation Phase	
19	Hydrological Situation (flooding)	B-	B-	【Pre-Construction】【Operation】 • The route goes through the flood prone zone. Confirm that the railway structures such as viaduct and embankment will not increase the risk of flooding and inundation. • Hydraulic effects on the river flow due to installation of piers should be checked. (Guiguinto River, Santol (Balagtas) River, Bocaue River, Marilao River, Meycauayan River, Tulahan (Malabon) River)
20	Flora, Fauna and Biodiversity	B-	B-	【Construction】 (-) There will be fewer access roads to the construction sites, land alteration will be unavoidable. (-) Trees and vegetation within the construction limit might be removed. (One species designated as threatened, "Narra" was found in Valenzuela and between Caloocan and Tutuban.) 【Operation】 • No protected area is located in the vicinity of the railway route. (-) Loss of habitat is likely to occur in small wetland in the proposed Valenzuela depot site because of reclamation.
21	Meteorology	D	D	• No impacts are expected through the project activities.
22	Global Warming	B-	C	【Construction】 (-) The operation of construction machines and vehicles will emit CO_2 temporarily but the impact on global warming will be slight. (-) Trees removal and land alteration might have impacts to global warming. 【Operation】 • The project may contribute to the ease of traffic congestion and decrease of CO_2 emission. On the other hand, CO_2 emission might increase around the stations caused by increase of traffic volume. Increase or decrease in CO_2 emission should be predicted.
Pollution Control				
23	Air Pollution	B-	B±	【Construction】 (-) Emission of pollutants due to the operation of construction machines and vehicles might slightly deteriorate the ambient air quality. 【Operation】 (+) The project may contribute to the ease of traffic congestion and decrease of air polluting emissions. (-) Air pollutants might increase around the stations caused by increase of traffic volume. (-) Operation of standby generator set might emit air pollutants.
24	Water Pollution	B-	B-	【Construction】 (-) Surface water will be likely to be deteriorated by suspended solids discharged from construction sites. (-) Discharge of oil and grease emitted from ill-serviced construction machines, heavy vehicles and wastewater from the site might degrade river and creek water quality. (-) Domestic wastewater generation of workers might deteriorate water quality of existing water bodies. 【Operation】 (-) Untreated wastewater from stations and maintenance facilities in the Valenzuela depot might deteriorate the surface water quality.

No	Items	Rating		Brief Description
		Pre-Con/ Construction phase	Operation Phase	
25	Soil Contamination	B-	B-	【Construction】 (-) Oil and grease emitted from ill-serviced construction machines and heavy vehicles might contaminate soil at the construction site. (-) If the acquired land becomes contaminated with hazardous chemicals, remediation will be needed before commencing construction (former domestic waste dumpsite and old battery factory site in Meycauayan) 【Operation】 (-) Soil contamination resulting from leaks of lubricants agents and used oil at the maintenance facilities in the Depot.
26	Waste	B-	B-	【Construction】 (-) Demolition of existing railway structures of PNR and Northrail Phase 1 Project will generate solid waste. (-) Construction work may generate solid waste such as removed soil and sand of the existing structures. Construction workers may also create additional garbage. 【Operation】 (-) Improper disposal of solid waste from stations and maintenance facilities in the Depot might deteriorate the environmental quality of surrounding communities.
27	Noise and Vibration	B-	B-	【Construction】 (-) Noise and vibration due to construction activities and vehicles will be likely to affect the nearby communities. (-) Along detour routes, noise from increased vehicles may also affect the sound environment in the vicinity. 【Operation】 (-) Noise and vibration will cause a nuisance along the route, especially for residential and noise sensitive areas.
28	Ground Subsidence	C	C	【Construction】【Operation】 • Since the depot facilities will be constructed on the reclaimed wetland in Valenzuela, appropriate filling method should be selected to avoid ground subsidence.
29	Offensive Odors	D	D	• No impacts are expected through the NSCR project activities.
30	Bottom sediment	B-	D	【Construction】 (-) Suspended solids discharged from construction sites might settle on bottom sediment on the nearby rivers and creeks. (-) Discharge of oil and grease emitted from ill-serviced construction machines, heavy vehicles and water from the site might degrade bottom sediment quality.
Others				
31	Accidents	B-	B+	【Construction】 (-) Traffic accidents are likely to occur due to the increase of construction vehicles. 【Operation】 (+) No accidents are anticipated since tracks will be installed on viaducts. There will be no level crossing.

Source: JICA Study Team

Rating:
A±: Significant positive/ negative impact is expected.
B±: Some positive/ negative impact is expected.
C: Extent of positive/ negative impact is unknown. (A further examination is needed, and the impact could be clarified as the study progresses.)
D: No impact is expected. IEE/ EIA is not necessary.

7.1.6 Prediction and Assessment of Noise and Vibration

The noise and vibration could be major impact through the project phases. The quantitative assessment on those impacts is described below.

7.1.6.1 Prediction and Assessment of Noise Level

1) Pre-Construction and Construction Phase

Noise level will definitely increase because of construction activities. Most of the noise will be contributed by operation of heavy equipment and machineries, the generator set, and vehicles coming in and out of the Project site.

Some areas along the NSCR alignment would have institutions that will most definitely be affected by the noise level generated during the pre - construction and construction phase of the Project. It is important to identify these institutions to be able to provide appropriate mitigating measures during the Detailed Design Phase of the Project.

a) Prediction method

The prediction model developed in the Technical Handbook for Environmental Impact Assessment of Roads (2007) is applied.

b) Prediction model

The noise level at receiving points is calculated by the following formula of sound propagation.

$$L_p = L_w + 10log\left\{\frac{Q}{4\pi r^2}\right\} = L_w - 20logr - 8$$

Where, L_p: Noise level at Receiving Point (dB)
L_w: Power level of noise source (dB)
r: Distance between noise source and receiving point (m)
Q: Constant on sound radiation (in case of hemisphere radiation: =2)

c) Power level of construction machinery

The power levels of main construction machinery are shown in Table 7.1.28.

Table 7.1.28 Weighted Power Level of Construction Type

Construction Type	A weighted power level (dB)
Pile drivers (hydraulic pile hammer)	135
Rock drilling (soft rock)	119
Slope surface splay	108
Asphalt pavement	108

Source: Technical Handbook for Environmental Impact Assessment of Roads (2007)

In the case of combined impacts of some typical construction machinery, the predicted noise level can be calculated based on the combined power level as follows.

$$L_{w,\Sigma} = 10 * \log(10^{\frac{L_{w,1}}{10}} + 10^{\frac{L_{w,2}}{10}} + \cdots + 10^{\frac{L_{w,n}}{10}})$$

Where, $L_{w,\Sigma}$: Combine power level of noise source (dB)
$L_{w,i}$: Power level of individual noise source i (dB)

For instance, when pile driver and rock drilling are simultaneously operated at the center of the track, the

combined power level is approximately 135.1dB. In general, the combined power level is almost the same as the largest level of machinery if the difference of power levels between sources is more than 10dB.

d) Location of noise source and receiving point

The construction machinery, i.e., noise emission source is assumed to be set on the center of the track. During the construction temporary wall (3.0m) will be set at the edge of the ROW (construction limit). The height of the receiving point is 1.2m.

e) Results of the prediction and evaluation

The results of the prediction of the construction noise are shown in Table 7.1.29. Without the temporary wall, the noise levels of pile driver will exceed the maximum allowable level 90 dB. The predicted noise levels of individual operation of rock drilling will exceed maximum allowable level 85 dB up to 10 m from the edge of the ROW. In case of the slop surface spray and asphalt pavement, the predicted noise level of individual operation will exceed just at the edge of the ROW.

The total noise levels of combined operation of pile driver and any other machinery will be almost same as the individual operation of pile driver and exceed maximum allowable level up to 10 m from the edge of the ROW, as shown in Table 7.1.29.

With the 3 m high temporary wall, the predicted noise levels of all types of construction work will below the maximum allowable noise levels during the construction. In the case of combined operation of pile driver and other machinery, the total noise levels will also below the maximum allowable noise levels.

Table 7.1.29 Results of Prediction of Construction Noise

Construction Work		Distance from the Edge of the ROW to Receiving Point (m)					Maximum Allowable Noise Level[2] (dBA)	
Type[1]	Power Level (dB)	0	5	10	15	20		
Without temporary wall								
Pile drivers	135	112.2	106.6	103.2	100.8	98.9	90	Class 1
Rock drilling (soft rock)	119	96.2	90.6	87.2	84.8	82.9	85	Class 2
Slope surface splay	108	85.2	79.6	76.2	73.8	71.9	75	Class 3
Asphalt pavement	108	85.2	79.6	76.2	73.8	71.9	75	Class 4
Pile drivers with other machinery	135.1	112.3	106.7	103.3	100.9	99.0	90	Class 1
With temporary wall (3.0m)								
Pile drivers	135	89.9	88.2	85.4	83.2	81.4	90	Class 1
Rock drilling (soft rock)	119	73.9	72.2	69.4	67.2	65.4	85	Class 2
Slope surface splay	108	62.9	61.2	58.4	56.2	54.4	75	Class 3
Asphalt pavement	108	62.9	61.2	58.4	56.2	54.4	75	Class 4
Pile drivers with other machinery	135.1	90.0	88.3	85.5	83.3	81.5	90	Class 1

Source: JICA Study Team

Note 1): Technical Handbook for Environmental Impact Assessment of Roads, 2007
2): NPCC Memorandum Circular No. 002, May 12, 1980

Class 1 Work which requires pile drivers (excluding manual type), file extractors, riveting hammers or combination thereof. This classification does not include work in which pile drivers are used in combination with earth augers.
Class 2 Work which requires rock drills or similar equipment like jack hammers or pavement breakers
Class 3 Work which requires air compressor (limited to those compressors which use power other than electric motors with a rated output of 15 KW or more in excludes air compressors powering rock drills, jack hammers and pavement breakers)
Class 4 Operation involving batching plant (limited to those with a mixer capacity of 0.5 or more cubic meters) and/or asphalt plants (limited to those with mixer capacity of 200 KG or more). Batching plants for the making or mortar are excluded.

The identified impacts will have moderate to high adverse effect, with the effect more pronounced along the alignment where schools, hospitals and residential areas are closely nearby. However, mitigating measures that is described below are anticipated to address almost all identified impacts.

To reduce noise disturbance that will have direct effects to workers and nearby community, the following measures need to be implemented:

- Installation of control devices such as mufflers and noise suppressors to all construction equipment to help minimize noise generated. Regular maintenance of heavy equipment, construction machinery, and other support vehicles is also recommended.
- Provision of temporary noise barriers such as galvanized iron shields, particularly in noise-sensitive areas such as churches, schools, and hospitals in the immediate vicinity of the construction area.
- Construction workers must be provided with personal protective equipment (PPE), e.g. earmuffs.
- Scheduling of high noise generating activities during daytime to reduce disturbances to nearby community
- Construction sites must be fenced for safety and security reasons

2) Operation Phase

The noise by train operation was examined with reference to “Proposal of a Prediction Model for Noise of Conventional Railway, Noise Control Engineering 20(3), 1996, Institute of Noise Control Engineering, Japan” and “EIA report for Osaka Outer Ring for East-Osaka Urban Rapid Transit, 1999, Osaka Prefecture”.

a) Prediction method

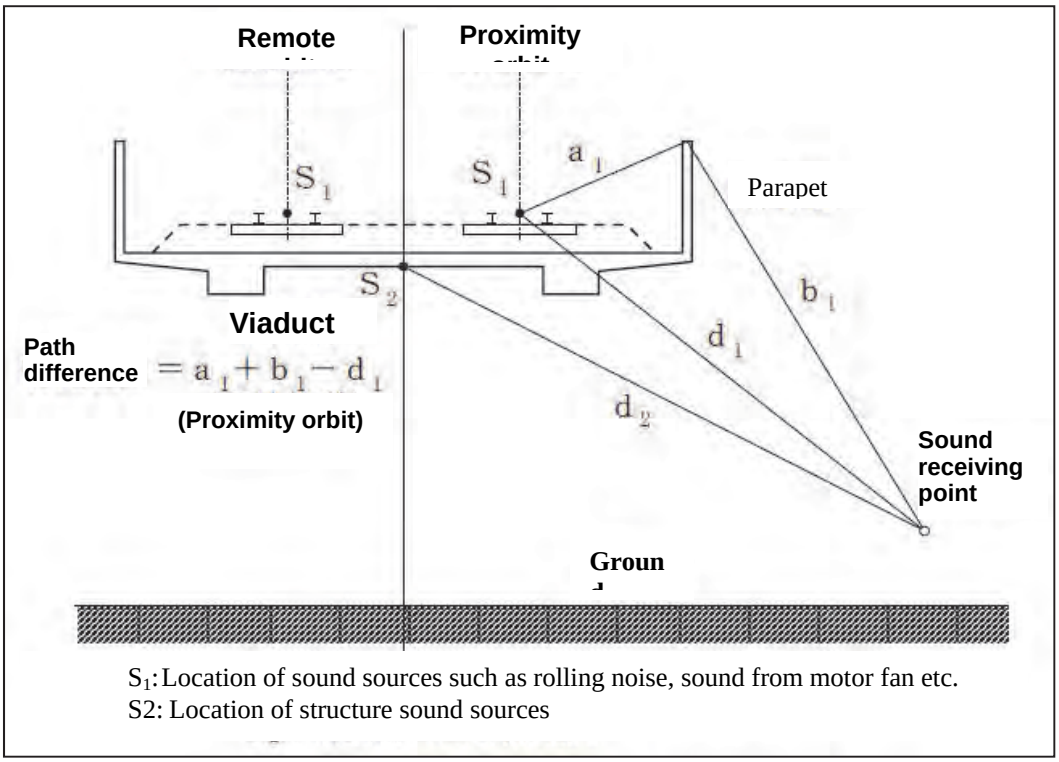
Based on section structure and train velocity, the maximum of the noise level at the time of the run of 1 train (L_{Amax}) is estimated firstly. Moreover single event sound exposure level (L_{AE}) is estimated from train transit time. Finally equivalent continuous sound pressure level (L_{Aeq}) by train number every train type of time zone is calculated.

b) Prediction model

The prediction model by Japanese formula is applied. The noise by train operation compounds 3 main sound sources such as rolling noise of running train, structure sound from vibration of slab on concrete viaduct, and railway vehicle sound. The formula is calculated by combining these sound sources.

c) Estimation of maximum value of noise level (L_{Amax})

The prediction formula for train length I m and train velocity V km/h indicates Formula 1 - 4 by definition of each variable shown in Figure 7.1.39.



Source: Proposal of a Prediction Model for Noise of Conventional Railway, Noise Control Engineering 20(3), 1996, Institute of Noise Control Engineering, Japan

Figure 7.1.39 Arrangement of Sound Source, Sound Receiving Point and Explanation of Path Difference

(a.1) Rolling noise

$$L_{Amax}(R) = PWL_R - 5 - 10log_{10}d_1 + 10log_{10}\left(\frac{\left(\frac{l}{2d_1}\right)}{1+\left(\frac{l}{2d_1}\right)^2} + \tan^{-1}\left(\frac{l}{2d_1}\right)\right) + \alpha_1 \quad \text{---Fomula 1}$$

Where, $L_{Amax}(R)$: maximum value of noise level (decibel)
PWL_R: Sound source power level (decibel)
$PWL_R = 30.0 \log_{10}(V) + 42.6$
D_1: Distance between center of run orbit and sound receiving point (m)
L: Train length (m)
V: Train velocity (km/h)
α_1 : damping effect by balustrade (decibel)

(a.2) Structure sound

$$L_{Amax}(C) = PWL_C - 5 - 10\log_{10}d_2 + 10\log_{10}\left(\frac{\left(\frac{l}{2d_2}\right)}{1+\left(\frac{l}{2d_2}\right)^2} + \tan^{-1}\left(\frac{l}{2d_2}\right)\right) + \Delta L_C \quad \text{--Formula 2}$$

Where $L_{Amax}(C)$: Maximum value of noise level (decibel)
PWL_C: Sound power level of structure sound (decibel) ,$PWL_C = 72$
d_2: Distance between center of structure underside and sound receiving point (m)
ΔL_C: Correction value
$r < 4h$: $\Delta L_C = 0$
$r > 4h$: $\Delta L_C = -10 \log_{10}(r/4h)$

r: Horizontal distance between center of viaduct and sound receiving point (m)
h: Height of viaduct underside from ground (m)

(a.3)Maximum value of noise level (L_{Amax})

The maximum value of noise level for one (1) train formation is calculated by combining noise levels calculated by Formula 1 - 2.

$$L_{Amax} = 10log_{10}\left(10^{\frac{L_{Amax}(R)}{10}} + 10^{\frac{L_{Amax}(C)}{10}}\right) - - - \text{Formula 3}$$

a. Relation between estimation of maximum value of noise level (L_{Amax}) and single event sound exposure level (L_{AE})

The relation between estimation of maximum value of noise level (L_{Amax}) and single event sound exposure level (L_{AE}) is calculated by using Formula 4.

$$L_{AE} = L_{Amax} + 10log_{10}(l/(1000V/3600)) - - - \text{Formula 4}$$

b. Calculation of equivalent con6 pttinuous sound pressure level (L_{Aeq})

$$L_{Aeq} = 10log_{10}\left(\frac{1}{T}\sum_{i=1}^{n} 10^{L_{AEi}/10}\right) - - - \text{Formula 5}$$

Where, L_{AEi}: Single event sound exposure level by direction and train type (decibel)
N: Number of trains
T: Time for L_{Aeq} (second)

d) Prediction condition

i) Prediction points

The prediction points are 1.2 m height at 0, 10, 20, 30, 40, 50 m from the edge of railway.

ii) Structural condition

The structural conditions are as follows:

- Railway structure: Viaduct
- Truck structure: Slab track
- Rail type: Long rail
- Train length: 120 m (20 m x 6 cars) from 2020 to 2025, 160 m (20 m x 8 cars) from 2025 to 2040.

iii) Operation condition

The number of operated trains is shown in Table 7.1.30 based on the train operation condition. The train velocity is maximum 120 km/h.

Table 7.1.30 Total Number of Operated Trains (one-way)

Day Time (7:00 ~ 22:00)	Night Time (22:00 ~ 24:00 & 6:00 ~ 7:00)	Total
110	13	123

Source: JICA Study Team

iv) Prediction results

The results of prediction on railway noise of the equivalent continuous sound pressure level (LAeq) (dBA) are shown for year 2020 and 2040 in the following tables.

Table 7.1.31 presents the predicted noise level without noise barrier case. Table 7.1.31 also shows the noise guideline values for the new project and large-scale modification of the conventional railway in Japan (Environmental Agency, 1995). The guideline values are set at the distance of 12.5 m from the center of the nearest track. That is, in case of NSCR, the noise level at 7m from the edge of ROW should be below guideline values. The predicted noise levels are caused by the train operation and therefore cannot be directly compared to the DENR environmental standards for noise.

Table 7.1.31 Prediction of Noise Level during Train Operation from 2020 to 2040 (Without noise barrier)

Year	Day/ Night	Distance from ROW						Guideline values[1] (LAeq)
		0 m	10 m	20 m	30 m	40m	50m	
2020	Day	52.8	52.9	51.7	50.5	49.3	48.2	60
	Night	50.5	50.6	49.5	48.2	47.0	45.9	55
2025	Day	54.0	54.1	53.0	51.7	50.5	49.5	60
	Night	51.7	51.9	50.7	49.4	48.3	47.2	55
2030	Day	54.0	54.1	53.0	51.7	50.5	49.5	60
	Night	51.7	51.9	50.7	49.4	48.3	47.2	55
2040	Day	54.0	54.1	53.0	51.7	50.5	49.5	60
	Night	51.7	51.9	50.7	49.4	48.3	47.2	55

Source: JICA Study Team

Note 1) noise guideline values for the new project and large-scale modification of the conventional railway in Japan (Environmental Agency, 1995)

The outline of results is as follows:

- The predicted noise level will not exceed the guideline values for all day and night even at the edge of the ROW.

e) Mitigation Measures

The predicted noise levels satisfy the noise guideline values for the areas directly facing the railway. However, according to the guidelines, noise level should be further reduced in the noise sensitive areas. The adequate measurements are recommended for noise sensitive receptors of Class AA within 50 m of the alignment.

The noise barrier is one of the abatement measures to reduce the noise level. Table 7.1.32 shows the predicted noise level with noise barrier.

Table 7.1.32 Prediction of Noise Level during Train Operation from 2020 to 2040 (With noise barrier)

Year	Day/ Night	Distance from ROW						Guideline Values *[1] (LAEq)
		0 m	10 m	20 m	30 m	40m	50m	
Case 1: Noise barrier 1m								
2020	Day	51.8	51.6	51.0	49.8	48.8	48.0	60
	Night	49.6	49.3	48.7	47.5	46.5	45.7	55
2025	Day	53.1	52.9	52.2	51.0	50.1	49.2	60
	Night	50.8	50.6	50.0	48.7	47.8	46.9	55
2030	Day	53.1	52.9	52.2	51.0	50.1	49.2	60
	Night	50.8	50.6	50.0	48.7	47.8	46.9	55
2040	Day	53.1	52.9	52.2	51.0	50.1	49.2	60
	Night	50.8	50.6	50.0	48.7	47.8	46.9	55
Case 2: Noise barrier 2 m								
2020	Day	49.9	49.4	49.3	48.2	47.2	46.5	60
	Night	47.6	47.1	47.0	45.9	45.0	49.2	55
2025	Day	51.1	50.7	50.6	49.5	48.5	47.7	60
	Night	48.8	48.4	48.3	47.2	46.2	45.5	55
2030	Day	51.1	50.7	50.6	49.5	48.5	47.7	60
	Night	48.8	48.4	48.3	47.2	46.2	45.5	55
2040	Day	51.1	50.7	50.6	49.5	48.5	47.7	60
	Night	48.8	48.4	48.3	47.2	46.2	45.5	55

Source: JICA Study Team

Note 1) noise guideline values for the new project and large-scale modification of the conventional railway in Japan (Environmental Agency, 1995)

The following findings are drawn from the resulting data shown in Table 7.1.32:

- In order to decrease the noise level below 50 dBA during the night, (5dBA less than the guideline value of 55dBA during the night because the allowable level of noise sensitive area is often set at 5dBA below), the effective height of noise barrier is considered.
- With a 1 m height noise barrier or parapet installed, the noise level during the night is under 50 dBA for the year 2020. Noise level generated by the train operation for years 2025 to 2040 still exceeds 50 dBA during the night operation, at distances from 0m to 30 m, due to the increase of trains.
- With a 2 m height noise barrier installed, the noise level for years 2020 to 2040 is way below 50 dBA.

The impact of the train operations to the generated noise has a moderate adverse effect to the receiving environment, especially in areas where the alignment would be near schools, churches and hospitals.

Table 7.1.33 lists up the noise sensitive receptors in Class AA within the 50 m distance from the alignment.

Table 7.1.33 Noise Sensitive Receptors

Institution	Approximate Distance from Alignment (m)	Indicative Location
MALOLOS CITY		
1. AMA Computer College	46	NE
2. Tikay Elementary School	40	NE
MARILAO		
1. Tabing Ilog Elementary School	32	SW
MEYCAUAYAN		
1. Sheperd's College	50	NE
VALENZUELA CITY		
1. Iglesia ni Cristo locale Valenzuela City	50	SW
2. Parish Church of San Isidro Labrador	34	E
3. Malinta Elementary School	32	NE
CALOOCAN CITY		
1. Caloocan Seventh Day Adventist Center Church	50	E
2. Marulas Elem. School	35	E
3. Christ the Good Shepherd Church	50	E
MANILA CITY		
1. Sta. Monica Church	50	W
2. Light of the World Chistian Church	23	W
3. Gregoria De Jesas Elem. School	40	W
4. Iglesia ni Jesukristo Bagong Jerusalem	50	W
5. Antipolo Chapel	20	E

Source: JICA Study Team

There are two sensitive receptors (churches) within 30 m from the alignment in Manila. For these churches, noise barriers or parapet with at least 2 m height should be installed as mitigating measure. The detailed survey in measuring the distance from the guideway to the receptors in the above should be undertaken during the detailed design stage.

7.1.6.2 Ground Vibration Level

1) Pre-Construction and Construction Phase

a) Construction before and during construction

Operation of construction machinery, such as pile driver and rock drilling, causes ground vibrations that spread through the ground and diminishes in strength with distance. Ground vibrations from construction activities do not often reach the levels that can damage structures, but can achieve the audible and feelable ranges for human very near the construction site.

a. Prediction method

i) Prediction model

The prediction model developed in Technical Handbook for Environmental Impact Assessment of Roads (2007) is applied. Vibration transmits from a source to a receiving point according to the following formula.

$$L_{(r)} = L_{r_0} - 15log_{10}\frac{r}{r_0} - 8.68\alpha(r - r_0)$$

Where, $L_{(r)}$: Vibration level (VL) at receiving point (dB)

$L_{(r_0)}$: Vibration level at reference point (dB)

r : Distance from a source (construction machinery) to receiving point (m)

r_0: Distance of reference point (= 5m)

α: Internal damping ratio

ii) Vibration level on reference point

The power levels of main construction machinery are shown in Table 7.1.34.

Table 7.1.34 Vibration Level of Construction Machinery and Damping Ratio

Construction machinery	Vibration Level at Reference Point (dB)	Internal Damping Ratio
Pile drivers (hydraulic pile hammer)	81	0.01
Rock drilling (soft rock)	64	0.001
Slope surface splay	48	0.01
Asphalt pavement	59	0.01

Source: Technical Handbook for Environmental Impact Assessment of Roads (2007)

In the case of combined impacts of some typical construction machinery, the predicted vibration level can be calculated based on the combined power level as follows.

$$L_{r_0,\Sigma} = 10 * \log(10^{\frac{L_{r_0,1}}{10}} + 10^{\frac{L_{r_0,2}}{10}} + \cdots + 10^{\frac{L_{r_0,n}}{10}})$$

Where, $L_{r_0,\Sigma}$: Combine vibration level at reference level (dB)

$L_{r_0,i}$: Vibration level of individual source i (dB)

For instance, when pile driver and rock drilling are simultaneously operated at the center of the track, the combined power level is approximately 81.1dB. In general, the combined power level is almost the same as the largest level of machinery if the difference of power levels between sources is more than 10dB. The combined operations of slope surface splay and asphalt pavement will increase the vibration level by only 0.3dB as shown in Table 7.1.35.

iii) Location of vibration source and receiving point

The construction machinery, i.e., noise emission source is assumed to be set on the center of the track.

b. Results of the prediction and evaluation

The VL on receiving points was calculated based on the said prediction model. The results of the prediction of the construction noise are shown in Table 7.1.35.

Table 7.1.35 Results of Prediction of Construction Vibration

Construction Work		Distance from the Edge of the ROW to Receiving Point (m)					Perceptive threshold of vibration for human (dB)[2]
Type[1]	Vibration Level (dB)	0	5	10	15	20	
Pile drivers	81	77.6	75.0	72.3	70.1	68.3	55
Rock drilling (soft rock)	64	60.9	58.5	56.2	54.4	53.0	
Slope surface splay	48	44.6	42.0	39.3	37.1	35.3	
Asphalt pavement	59	55.6	53.0	50.3	48.1	46.3	
Pile drivers with other machinery	81.1	77.7	75.1	72.4	70.2	68.4	
Slope surface splay and Asphalt pavement	59.3	55.9	53.3	50.6	48.4	46.6	

Source: JICA Study Team

Note 1): Technical Handbook for Environmental Impact Assessment of Roads, 2007

2): Technology and Laws Regulation for Pollution Control, 2000"Japan Environmental Management Association for Industry

The individual operations of pile driver and rock drilling will affect the area around the project site since the vibration is beyond the human perceptive threshold. Asphalt pavement will also affect the area within 10m distance from the edge of the construction limit. Only the vibration of slope surface splay is below the human perceptive threshold.

The total vibration levels of combined operation of pile driver and any other machinery will be almost same as the individual operation of pile driver and exceed the human perceptive threshold, as shown in Table 7.1.29. The combined operation of slope surface splay and asphalt pavement will cause the vibration impacts in the area within 10 m distance from the edge of the construction limit.

The identified impacts will have high adverse effect to human, thus, mitigating measures is must still be implemented to alleviate all identified impacts.

To reduce generation of vibration and its impact to direct recipients, such as the workers and nearby residents, and structures along the NSCR alignment, the following measures need to be implemented:

- Use of construction machinery with minimal vibration generation, e.g.,
  - Careful operation of construction machinery. Avoid high - load operation
  - Minimize the movement of heavy machinery
- Adopt the less vibration pile driving methods such as cast-in place pile method
- Shorten the operation time of construction machinery
  - Limit the operation during weekdays and during the day
  - Obey the work time schedule and set the rest time
- Keep construction machinery away from the residence and sensitive receptors
- Identify nearby sensitive receptors likely to be affected and monitor vibration levels
- Explain to the community about the construction work and respond to complaints properly

b) Operation Phase

Structural vibration of buildings and houses near the NSCR alignment due to train operation may affect people in many ways, such as deterioration of quality of life or decrease of working efficiency.

There are no established prediction methods for vibration due to train operation sincethe mechanism of occurrence and transmission of train vibration is very complicated. Therefore, the vibration levels are often predicted by using the regression equations based on the actual measurements of the similar cases of train operation and structures for reference. The model below is developed for the East - Osaka Urban Rapid Transit by using the vibration data of the similar type of trains and structures at the existing railways. The NSCR will use the similar type of trains and structures as the existing railways in Japan, therefore, the following model is used for the estimate of vibration level.

a. Prediction method

The prediction model is proposed for several types of trains and structures as shown in Table 7.1.36.

Table 7.1.36 Prediction Model of Vibration Levels

Type	Structure	Model Equations
Train	At-grade (Ballast)	VL= 21.3 log_{10}V - 13.9 log_{10}R + 30.9
	Embankment (Ballast)	VL=42.4 log_{10}V -15.4 log_{10}R - 13.0
	Viaduct (Slab)	VL=12.9log_{10}V -13.2log_{10}R+ 39.3
	Viaduct (Ballast)	VL=18.5 log_{10}V -21.0 log_{10}R+ 44.0

Type	Structure	Model Equations
Freight	At-grade (Ballast)	VL=15.3 log_{10}V -20.7log_{10}R+ 54.7
	Embankment (Ballast)	VL=18.6 log_{10}V - 8.2log_{10}R+ 31.4
	Viaduct (Ballast)	VL=10.4 log_{10}V -20.8 log_{10}R+ 66.7

Source: EIA report for Osaka Outer Ring for East-Osaka Urban Rapid Transit, 2006, Osaka Prefecture

Note: VL: Vibration Level (dB), V: Velocity (km/h), R: Distance from the center of railway track (m)

i) Structures

The types of structure of the NSCR are viaduct (slab) and embankment (ballast).

ii) Parameter

According to the operation plan, the train velocity is 120km/h.

b. Prediction

The vibration level VL is estimated in Table 7.1.37. In the case of the viaduct (slab), VL at the edge of the ROW is estimated 54.6dB and below the perceptible threshold of human (55dB). However, in the case of embankment (ballast), the estimated VL at distance from 0 m to 10 m will be over the perceptible threshold of human (55dB).

Table 7.1.37 Estimated Vibration Level VL (dB)

Type of Structure	Distance from ROW					Threshold VL (dB)
	0	5	10	15	20	
Viaduct (slab)	54.6	51.6	49.7	48.3	47.1	55
Embankment (ballast)	61.7	58.3	56.0	54.3	53.0	

Source: JICA Study Team

c. Mitigation Measures

In the case of the viaduct (slab), mitigation measures will not be needed to be implemented. On the other hand, the embankment will be used for the section where the alignment goes through the rural areas and no flood-prone area. However, the following measures should be taken to abate the vibration level where the residences are located within 15m distance from the ROW.

- Design of rail tracks must incorporate measures to reduce level of vibration generated by the railway during train operations, such as use of long rail, resilient rail fastenings, rail dampers, sleeper with the anti-vibration mat.
- Increase ballast bed height for the embankment section especially near the residential area and sensitive receptors. Install ballast mats.
- Proper maintenance of structures and tracks, such as maintaining smooth rail running surface, elimination of the rail running surface discontinuities, must be conducted.
- Regular reconditioning of train and its components, such as, suspension system, brakes, wheels (re - profiling) and slip-slide detectors.
- Identify nearby sensitive receptors likely to be affected and monitor vibration levels.

7.1.7 Impact Assessment

In addition to the noise and vibration impacts mentioned above, the assessment on other concerned

impacts is carried out based on the results of the survey. The summary of assessment is shown in Table 7.1.38 below.

Table 7.1.38 Impact Assessment Based on the Survey

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
Social Environment				
1	Involuntary Resettlement	A-	D	[Pre-construction] (-) Involuntary resettlement of residents and commercial establishments is unavoidable along the proposed railway alignment and at some station areas and in Valenzuela depot. The total number of Project Affected Families (PAFs) is 1,160 households and 2,045 in population. The total of 300 PAFs are required to be displaced due to the loss of their dwellings: 100 legal residential structure owners and renters, and 200 informal settler families (ISFs). (Refer to Draft Resettlement Action Plan (RAP)).
2	The poverty group	A-	B±	[Pre-construction] [Construction] (-) Most of the affected ISFs are regarded as the poor. The resettlement of ISFs might worsen their livelihood. [Operation] (+) The affected ISFs may eventually be provided serviced houses. The project will also lead to improvement of living condition because the relocation areas are provided for with basic utilities such as power and water and health and educational facilities. Vulnerable Persons such as women-headed households, elderly, persons with disabilities, the poor will benefit the Livelihood and Income Restoration Program. (-) However, improvement of their economic situation might take a longer time period.
3	Indigenous and ethnic people	D	D	There are no indigenous or ethnic people in or around the project site.
4	Local economy such as employment and livelihood, etc.	B±	B±	[Pre-construction] [Construction] (+) The construction of the NSCR Project will require both skilled and unskilled laborers, thus, will provide temporary employment opportunities. To boost economic activity of the local community and affected LGUs, the project proponent will mandate contractor to give priority to the local residents. (-) Land acquisition will force business establishments to move out and might cause income loss and unemployment. Livelihood of the local community, such as that from commercial establishments, vendors and tenants, may experience temporary disturbance during construction. For instance, Vendors at 10th Avenue along the PNR railway track in Caloocan are likely to be displaced to alternative market site. In order to construct a new terminal station in Tutuban Mall, commercial stall tenants may also transfer to other commercial buildings. [Operation] (+) The NSCR Project will also boost regional economic activities along the route through provision of an efficient mass transit system that enhances workforce mobility between the industrial zones in Bulacan and the CAMANAVA area. This fast and continuous means of transportation gives the labor force in NCR and parts of Region 3 more chances of getting available jobs without having to consider the distance between their home and their place of work. Shorter and more comfortable travel time will also bring workers better physical and psychological state resulting to work productivity. (-) Restoration of livelihood of PAPs might take a longer period of time. Alternative livelihood programs in coordination with the LGUs and other government agencies will also be taken in to consideration. For business establishments that will be permanently removed, the draft RAP details compensation for the loss of income.

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
5	Land use and utilization of local resources	B-	B+	[Construction] (-) Land use will be changed at the proposed depot site in Valenzuela because of reclamation of small wetland. [Operation] (+) In the long-term, beneficial land use impacts are expected to occur as a result of railway operation. The project is anticipated to provide a more efficient and safer transportation facility due to reduced travel time, reduced traffic congestion, improved traveler safety and reduced energy consumption. As a result of this improvement, land development would be expected to increase along or near the corridor through conversion of low density residential areas to higher density residential and commercial uses.
6	Social institutions such as social infrastructure and local decision-making institutions	B-	B-	[Pre-construction] [Construction] (-) The total of 201 ISFs will be displaced. Most of them are likely to be relocated to the existing relocation sites. The impacts to barangay's/ residents' societies might be occurred because of resettlement. (-) Conflict resolution between existing residents and new settlers might take longer at the relocation sites. [Operation] (-) The impacts to barangay's/ residents' societies might continue. (-) Development of new community of existing residents and new settlers might take longer at the relocation sites.
7	Existing social infrastructures and services	B-	D	[Construction] (-) Temporarily interruption of utility services such as electricity and water may inconvenience the communities.
8	Misdistribution of benefits and damage	B-	B-	[Pre-construction] [Construction] (-) The total of 300 PAFs are required to be displaced due to the loss of their dwellings. (-) Given that the project will pass through congested areas like Valenzuela, Caloocan, and Manila, residential communities and some commercial and business establishment along the proposed alignment will be displaced. For instance, Vendors at 10th Avenue along the PNR railway track in Caloocan are likely to be displaced to alternative market site. In order to construct a new terminal station in Tutuban Mall, commercial stall tenants may also transfer to other commercial buildings. [Operation] (-) Restoration of livelihood of PAFs might take a longer period of time. Alternative livelihood programs in coordination with the LGUs and other government agencies will also be taken in to consideration. For business establishments that will be permanently removed, the draft RAP details compensation for the loss of income.
9	Local conflict of interests	B-	B±	[Pre-construction] [Construction] (-) The total of 201 ISFs will be displaced. Most of them are likely to be relocated to the existing relocation sites. There might be a conflict between existing residents and new settlers at the relocation sites. [Operation] (-) Conflict resolution between existing residents and new settlers might take longer at the relocation sites.
10	Water Usage or Water Rights and Rights of Common	B-	D	[Construction] No piers of bridges will be built in the rivers and river beds. Therefore there will be no blockage of river flow. However, (-) There are small creeks in agricultural area in Bagtas, Bocaue and Marilao. These creeks might be temporary blocked due to civil works.

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
11	Historical/ Cultural heritage	B-	D	[Construction] (-) The old PNR Stations are recognized as the historical heritage and are considered for preservation. The National Historical Commission of the Philippines (NHCP) has recommended the restoration/preservation of the Malolos Station, Meycauayan Station and Polo/Valenzuela Station. The other stations (Bocaue, Guiguinto and Balagtas) may be demolished, if design requires it to be removed. At the Tutuban Station, there is a current study being done (Transit Oriented Development for Urban Railway) for the concept design of the Tutuban PNR Property which includes the Tutuban Center Mall. The Tutuban Center Mall has a historic marker from NHCP because it is the old central terminal for the PNR Railway, and it has preserved its original façade as well as columns, beams and roof trusses. The preservation of these structures is included in the Concept Design. The Concept Design will preserve the historic structures and integrate it into the development design called "Old and New Heart of Manila."
12	Landscape	B-	B-	[Construction] (-) The railway will employ mostly viaducts in town area. Aesthetic views might be disturbed during construction, but temporary. [Operation] (-) While the entire NSCR will be different from the occurring landscape along the alignment, the structures (viaducts and stations) will be well designed. The architecture of the structures will be complimentary to the urban landscape and will not be unpleasing to the visual aesthetics of the natural rural landscape. Placement of commercial billboards will be discouraged. The impact may not be so significant.
13	Gender, Children's right	B-	B-	[Pre-construction] [Construction] (-) Involuntary resettlement might affect "Gender" and "Children's Rights". Potential risks of displacement and loss of livelihood may increase threats of increased poverty to households already living below poverty threshold. Loss of income will cause them potential exclusion and difficulty in their access to basic social services compromising the well-being of the household members specially children and women. [Operation] (-) Improvement of their economic situation might take a longer time period.

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
14	Work environment (occupational health/ safety) Community health and safety	B-	B-	[Construction] • According to land use history, the site along the PNR ROW in Barangay Tugatog, Meycauayan, used to be a dumpsite for domestic wastes. Results of soil sampling analyses in the old dumpsite showed no significant land contamination. However, further site investigation is needed to confirm these initial findings. (-) Disturbance of soil in the former dumpsite due to excavation work can provide an exposure pathway for contaminants to workers and the surrounding community. Exact locations of land areas to be excavated during construction must be identified so that soil quality from these sites can be investigated in more detail. • Along the ROW of PNR in Barangay Bangcal, Meycauayan, is an area that has been contaminated with lead but has since been remediated. However the result of remediation is under evaluation by DENR EMB to determine its effectiveness. (-) In order to ensure that the contaminated site has been completely remediated by the RAMCAR, the area needs to be monitored during construction. (-) There may be increased risk of construction-related accidents due to improper work ethics, which may threat health and safety of workers and local residents. Sanitary conditions will become unfavorable if enough portable toilets and litter bins are not provided at the construction site. Air pollutants/ noise & vibration at construction works might have workers' health problem. Waste might have deterioration of work condition. [Operation] (-) The health of employees working at the stations and depot may be affected from exposure to unsanitary conditions. Sanitary facilities or utilities to maintain sanitary and healthy conditions will be made available in all stations and depot.
15	Hazards (Risk) Infectious diseases such as HIV/ AIDS	B-	D	[Construction] (-) Most construction workers will be hired locally. However, infectious diseases such as HIV/AIDS might be spread due to workers from outside and poor sanitary conditions. The Workers and the local community also run the risk of exposure and spread of contagious/ infectious diseases due to unsanitary condition at the project site. Stringent observance of high standards of cleanliness and sanitation will minimize the risk of disease transmission.
Natural Environment				
16	Topography and Geological features	B-	B-	[Construction] (-) Because of the relatively flat terrain along the alignment, the amount of fill or cut during railway construction will have minimal impact on topography. Should there be cuts or fills, such areas must be re-graded to match the original topography after they are no longer needed to avoid permanent impacts. (-) Liquefaction: The alignment will pass through many liquefiable areas. The foundation of railway track and must be designed such that liquefaction hazards must be considered. (-) The alignment can be affected by earthquakes. Foundations, embankments and structures will be subjected to strong seismic loading in case of a major earthquake along the West Valley Fault. A seismic hazard assessment should be conducted during the detailed design. [Operation] (-) Small swampy area will be reclaimed at the proposed Valenzuela depot site. Therefore, alteration of topography will be unavoidable. (-) Liquefaction: Loss of soil strength, settlement of soil, lateral spreading, bearing failures, floatation of embedded structures, damage to overlying structures, in the event of an earthquake, might be foreseen. (-) Ground shaking/ground rupture might damage infrastructure in the event of an earthquake.

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
17	Soil Erosion	B-	D	[Construction] (-) Construction activities that could lead to soil erosion brought about by rainfall and runoff include clearing vegetation, placing fill, soil removal and stockpiling spoils. Most of the construction works will take place on a relatively flat terrain. Therefore, it is anticipated that there is no significant risk of erosion, particularly during rainy days. Still, uncontrolled runoff from the site can potentially lead to soil erosion. [Operation] There will be no risk of soil erosion.
18	Groundwater	D	D	Underground structure is not constructed for NSCR project.
19	Hydrological Situation (Flooding)	B-	B-	[Construction] [Operation] The NSCR alignment goes through the flood prone zone of Pampanga River Delta and the CAMANAVA area. No piers of bridges will be built in the rivers and river beds. Therefore there will be no blockage of river flow. However, (-) Elevated structure (viaduct) will not block runoff flowing downstream. On the other hand, embankment may act as a dam to cause flooding and inundation in upstream areas. 1) Malolos to Meycauayan The elevated structure (viaduct) will be selected for the section where the alignment goes through the high flood susceptible areas. The embankment will be used for the section where there are no crossings of the main roads. To avoid blockage of runoff flow, box culverts should be installed at regular intervals with the drainage system. 2) Meycauayan to Tutuban The elevated structure will be selected for the section where the alignment goes through the build-up areas and crosses many main roads. (-) Improper handling, storage, and hauling of demolition debris/excavated materials may clog existing drainage systems and block creeks, canals and other waterways.
20	Flora, Fauna and Biodiversity	B-	B-	[Construction] (-) Narra trees, designated as threatened species, were found along the alignment from Caloocan to Tutuban and the Valenzuela depot site will be affected and removed during the clearing operation. These narra trees may be relocated through balling and transplantation. (-) Other trees, such as fruit bearing trees, along the alignment will be removed, and these will be subject to compensation if they belong to PAPs. [Operation] (-) In the proposed depot areas, wetland area is small and do not constitute important stopover sites for migratory bird species. Seven migrant species were recorded at Valenzuela and none of these migrant species appear in the list of the Convention on Migratory Species. However, even if small and unimportant, reclaiming the swampy area will permanent loss of habitat.
21	Meteorology	D	D	No impacts are expected through the project activities.
22	Global Warming	B-	B+	[Construction] (-) The operation of construction machines and vehicles will emit CO_2 temporarily but the impact on global warming will be slight. (-) Trees and vegetation removal and land alteration might have impacts to global warming. [Operation] (+) Prediction result shows that the emission of GHG will decrease due to the modal shift and increase of vehicle travel speeds (see Chapter 8).

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
Pollution Control				
23	Air Pollution	B-	B±	[Construction] (-) Generation of dusts and particulate matter, and gas emissions due to earthmoving, demolition and earth-balling, and operation of equipment, machineries and service vehicles. The effect of the identified impacts is low and short-term, limited only during the pre-construction and construction phase. [Operation] (+) Reduction of air pollution is expected because the railway contributes to the ease of traffic congestion and decrease of air polluting emissions. (-) Increase of traffic around the stations might increase the exhausted gas. (-) Sources of air emissions will be limited to service vehicles and from the standby generators that will be operated in case of power outage in stations and in the depot. However, the adverse impact is low and only limited area.
24	Water Pollution	B-	B-	[Construction] (-) There may be short-term adverse impact on water quality due to excavation activities especially during rainy season. There may be slight increase in sediments and turbidity of rivers, creeks and other watercourses along the proposed alignment. (-) Wastewater generated by the increased number of workers will cause aggravation of the existing water quality if enough portable toilets are not provided at the construction site. (-) Fuel, lubricant and hydraulic oil discharges from poorly maintained construction equipment, machineries and heavy vehicles will also impact water quality. [Operation] (-) Pollution of receiving waters bodies due to domestic wastewater generation as well as maintenance activities in depot will be foreseen. Therefore wastewater treatment facilities with the oil separator shall be installed. (-) Domestic wastewater from comfort rooms in the stations may be also be source of pollution of nearby water bodies. Thus septic tanks will be installed at all stations.
25	Soil Contamination	B-	B-	[Construction] (-) Soils may become contaminated during construction works due to leaks and accidental spills of fuels and lubricants from construction vehicles and machineries. [Operation] (-) Soil contamination could result from leaks of lubricants agents and used oil. Releases of such contaminants will be of more concern in the proposed Valenzuela Depot stockyard, where train maintenance activities will take place.
26	Waste	B-	B-	[Construction] (-) Solid waste generation includes the demolition of existing railway structures and rail tracks that were constructed during the Northrail Phase 1 Project. (-) Excess soil from earthwork activities such as excavation, backfilling and embankment may be generated. The estimated volume of surplus soil is about 616,000m^3 after reduction of soil required to build 3 meter high embankment. If not managed properly, soil wastes may be discharged to water bodies through run-off and could cause increased sedimentation in nearby rivers. (-) The construction workforce will generate solid wastes such as industrial waste packaging materials from construction materials and general wastes from workers such as food scraps, putrescible wastes, toiletries and recyclable and non-recyclable packaging materials. If such wastes will not be handled properly, these would cause land and potential surface water contamination and negative impacts to aesthetics. [Operation] (-) Improper disposal of solid waste from stations and maintenance facilities in the Depot may result to land contamination as well as aesthetic impacts.

No	Items	Rating based on Impact Assessment		Assessment of Impacts
		Pre- & Construction Phase	Operation Phase	
27	Noise	A-	B-	[Construction] (-) Occurrence of higher noise level due to earthmoving, demolition and earth-balling, and operation of equipment, machineries and service vehicles. The noise levels of pile driver and rock drilling will exceed the maximum allowable noise levels of construction work. The temporary wall to reduce the noise levels will be needed. [Operation] (-) The predicted noise level will not exceed the guideline values for all day (60dBA) and night (55dBA) even at the edge of the ROW. In order to decrease the noise level below 50 dBA during the night, (5dBA less than the guideline value of 55dBA during the night because the allowable level of noise sensitive area is often set at 5dBA below), the noise barrier will be needed to install especially in areas where the alignment would be near schools, churches and hospitals.
	Vibration	A-	A-	[Construction] (-) The operations of pile driver and rock drilling will affect the area around the project site since the vibration level (VL) is beyond the human perceptive threshold (55 dB). The appropriate mitigation measures are required to reduce the vibration level. [Operation] (-) According to the prediction results, in the case of the viaduct (slab), the estimated VL at the edge of the ROW is below the perceptible threshold of human (55dB). However, in the case of embankment (ballast), the estimated VL at distance from 0 m to 10 m will be over the perceptible threshold of human (55dB). Thus the appropriate mitigation measures are required to reduce the vibration level.
28	Ground Subsidence	B-	B-	[Construction] (-) The project is not expected to extract large amounts of ground water during construction and operation. Rather, settlement could result more from the soft soil particularly in the Valenzuela Depot area including swampy area. Hence the depot facilities must be designed based on the result of geotechnical survey. Earth-filling method will be used for the foundation at the depot. [Operation] (-) The level of settling of soil should be measured regularly to determine settlement.
29	Offensive Odors	D	D	No impacts are expected through the NSCR project activities.
30	Bottom sediment	B-	D	[Construction] (-) No piers of bridges will be built in the rivers. However, there may be short-term adverse impact on bottom sediment quality due to excavation activities near the rivers, especially during rainy season. (-) Fuel, lubricant and hydraulic oil discharges from poorly maintained construction equipment, machineries and heavy vehicles will also impact bottom sediment quality.
Others				
31	Accidents	B-	B+	[Construction] (-) Traffic accidents are likely to occur due to the increase of construction vehicles. [Operation] (+) No accidents are anticipated since tracks will be installed on viaducts and/or underground tunnels. There will be no level crossing.

Source: JICA Study Team

Rating:

A±: Significant (severe) positive/ negative impact is expected.
B±: Some (slight to moderate) positive/ negative impact is expected.
D: No impact is expected.

7.1.8 Environmental Management Plan

The Environmental Management Plan (EMP) in Table 7.1.39 presents the mitigation/enhance measures for the impacts that may arise during the Pre-Construction, Construction, and Operational Phases of the proposed North South Commuter Rail Project. Also discussed in the matrices are the responsible entities who will manage the identified impacts.

Table 7.1.39 Environmental Management Plan

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
I. PRECONSTRUCTION AND CONSTRUCTION PHASE				
Social Environment				
Involuntary Resettlement	• Displacement of residents and few commercial establishments along the proposed alignment	• Implementation of Resettlement Action Plan (RAP) to ensure that affected households and establishments are provided a proper relocation area and/or justly compensated.	DOTC PMO, NHA, LIAC	To be included in the Final RAP Budget
The poverty Group	• Displacement of the ISFs	• Implementation of RAP to ensure that affected ISFs are provided a proper relocation site and/or justly compensated. • Income restoration and livelihood development program for PAPs of ISF and Vulnerable Persons (Women-headed households, Elderly, Persons with disabilities, Poor).	DOTC PMO, NHA, LIAC	To be included in the Final RAP Budget
Local economy such as employment and livelihood etc.	• Commercial establishments and small vendors may experience temporary disturbance during construction due to land acquisition for ROW • Decline or eventual loss of business in affected areas due to land acquisition for ROW	• Implementation of RAP to ensure that affected PAFs including vendors and tenants are provided a proper relocation area and/or to ensure that replacement cost for the losses of affected business establishments and income loss. • Income restoration and livelihood development program for PAPs whose present mean of livelihood is now longer viable and will have to engage in a new income activity.	DOTC PMO LIAC	To be included in the Final RAP Budget
	• Generation of temporary employment by land acquisition for ROW	• The project proponent will mandate contractor to give priority to the local residents.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Land use and utilization of local resources	• Loss of wetland	Offset the lost wetland (see EMP of "Flora, Fauna, and Biodiversity")	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Social institutions such as social infrastructure and local decision-making institutions	• Conflict between existing residents and new settlers	• Implementation of Resettlement Action Plan (RAP) to ensure the integration of the host community with the resettled PAFs at the relocation sites.	DOTC PMO, NHA, LIAC	To be included in the Final RAP Budget
Existing social Infrastructures and services	• Interruption of utility services	• Social service utilities such as power, water, drainage and communication line will be diverted before starting the construction activity.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
Misdistribution of benefits and damage	• Displacement of residents and few commercial establishments along the proposed alignment	• Implementation of RAP to ensure that affected PAFs including vendors and tenants are provided a proper relocation area and/or to ensure that replacement cost for the losses of affected business establishments and income loss. • Income restoration and livelihood development program for PAPs whose present mean of livelihood is now longer viable and will have to engage in a new income activity.	DOTC PMO LIAC	To be included in the Final RAP Budget
Local conflict of interests	• Conflict between existing residents and new settlers	• Implementation of Resettlement Action Plan (RAP) to ensure the integration of the host community with the resettled PAFs at the relocation sites.	DOTC PMO, NHA, LIAC	To be included in the Final RAP Budget
Water Usage or Water Rights and Rights of Common	• Temporary block of small creeks due to civil works	• Small creeks shall be diverted before starting civil works so as not to block the flow. • Restore the creeks to the original conditions.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Historical/cultural heritage	• Loss of old PNR stations by land acquisition for ROW	• Implement recommendations of NHCP in the detailed design to preserve and integrate the old PNR stations • Implement the concept design of Tutuban Station to preserve the historical structures and integrate it into the development design	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Landscape	• Deterioration of aesthetic views	• Design on facilities will be harmonized with the surrounding landscape.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Gender, Children's right	• Displacement of PAFs	• Implementation of RAP to ensure that affected ISFs are provided a proper relocation site and/or justly compensated. • Income restoration and livelihood development program for Women-headed households. • Secure the accessibility to go to school at the relocation sites. • Relocation shall conducted during school holidays	DOTC PMO, NHA, LIAC	To be included in the Final RAP Budget
Work Environment	• Increased risk of accidents due to improper work ethics, which may threat health and safety of workers and local residents	• Provide appropriate personal protective equipment (PPE) to all construction workers • Strict use of PPE by construction workers • Implement Occupational Health and Safety Management Plan • Put up fences / enclosures around the project site to keep away unauthorized persons • Provide access points for residents in selected areas only • Provide First Aid Stations at construction sites with resident doctors and nurses	DOTC PMO Contractor	Php 7, 000.00 per person (for PPE) Included in the contractor's service fee

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
	• Worker and community exposure to health and safety hazards due to working in areas with contaminated soils and/or excavation of such soils (Meycauayan dumpsite and RAMCAR battery site)	• Establish and implement specifications for worker safety, and proper disposal of excavated materials • Further study of soil to verify extent of contamination based on evaluation by DENR EMB (RAMCAR battery site) • Disposal of excavated soil (from Meycauayan dumpsite and RAMCAR battery site) in a registered landfill operator	DOTC PMO, Contractor, DENR EMB	To be included in the project cost to be finalized during the DED
Hazard (Risk)Infectious disease such as HIV/AIDS	• Increased risk to communicable and infectious diseases	• Construction workers submit Medical certificates for fitness to work. • Construct sanitary facilities (toilets, bathrooms, kitchens) at all construction sites. • Implement Occupational Health and Safety Management Plan prior to commencement of work.	DOTC PMO Contractor	Included in the contractor's service fee on health, safety and environmental management
Natural Environments				
Topography and Geological features	• Alteration of topography by Earthworks (excavations for foundations; cut and fill; land grading, etc.)	• Depot area must be re-graded to match the original topography	DOTC PMO Contractor	To be included in the project cost to be finalized during the Detailed Engineering Design (DED)
	• Increased risk of liquefaction due to loss of soil strength, settlement of soil, lateral spreading, bearing failures, floatation of embedded structures, damage to overlying structures, in the event of an earthquake	• In the final detailed design stage, liquefaction hazards are carefully analyzed based on the result of geotechnical survey. In the area judged to have the high liquefaction hazard, necessary measures for each structure type will be considered.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
	• Damage to components of the construction work due to ground shaking/ground rupture	• Undertake site-specific seismic risk characterization and estimates of how the ground beneath the structure will move • Design and construct structures that will address seismic hazards (adopt 0.4 g value of acceleration speed of peak value for seismic force)	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Soil Erosion	• Soil erosion by Earthworks (excavations for foundations; cut and fill; land grading, etc.)	• Use of silt fences and sediment traps, cover exposed earth especially before heavy rains are expected, benching of cuts, use of sediment basins • Provision of surface water runoff drainage systems • Limit stockpile height up to 2 m high only • Minimize removal of vegetation cover as much as possible	DOTC PMO Contractor	Included in the contractor's service fee

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
		• Plan earthwork activities (e.g. excavation, cutting and filling) while considering weather conditions (rainy season)		
Hydrological Situation	• Aggravation of existing flooding problems due to land development, earthworks and civil works	• Sufficient and effective drainage systems shall be incorporated in the designs. The proponent shall coordinate with DPWH and LGUs how to integrate the drainage systems into the existing canals/culverts. • Install box culvert at regular intervals with the drainage system in the embankment section. • NSCR structures will be designed to have a clearance of above established flood level and discharges which will be established and included in the detailed design.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Flora, Fauna, and Biodiversity	• Narra trees along the alignment form Caloocan to Tutuban and at the Valenzuela depot site may be affected and removed during the clearing operation • Other trees, such as fruit bearing trees, along the alignment will be removed	• Coordination with concerned agencies or groups for relocation sites of earth-balled trees. • For every tree removed, an equivalent 100 seedlings will be planted (DENR DAO 58 Series of 1993). Provision of tree seedlings will be provided by the proponent in replacement of trees to be cut. • Monitoring of survival of trees planted • Provision of compensation to owners of non-timber species such as fruit trees that are removed (to be included in the RAP)	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED Tree seedling and monitoring cost Php 20,000/ha
	• Loss of small swampy area used for a few migratory and resident birds due to development of Depot site	• To offset the lost wetland, the proponent will seek assistance from the Society for the Conservation of Philippine Wetlands (SCPW) to identify an adjacent wetland area that the proponent will conserve and enhance so that this area will attract the birds and stay here instead. • Conduct seasonal bird count to monitor the bird population in the surrogate wetland area established.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Global Warming	• GHG emission from operating construction machines and vehicles	• Regular wetting of ground soil in the construction site • Regular preventive maintenance of heavy equipment and service vehicle	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Pollution Control				
Air Pollution	• Generation of dusts and particulate matter, and gas emissions due to earthmoving, demolition and earth-balling , and operation of equipment, machineries and service vehicles	• Regular wetting of ground soil in the construction site • Regular preventive maintenance of heavy equipment and service vehicle	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Water Pollution	• Increase in suspended sediments in the receiving water	• Implementation of appropriate erosion control measures particularly during high precipitation periods.	DOTC PMO Contractor	To be included in the project cost to

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
		• Soil/sediments/debris and other excavated materials shall be hauled out from the site immediately and disposed by accredited waste handlers		be finalized during the DED
	• Increase in pollution of receiving water bodies due to domestic wastewater generation	• Portable sanitary facilities (portalets) will be installed to collect wastewater, which will be collected and disposed by accredited waste handles	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
	• Increase in pollution of receiving water bodies due to fuel and oil leaks from vehicles and other equipment	• Equipment and machinery shall be regularly checked for fuel and oil leaks. • During repair of equipment and machinery, containers/drip trays shall be used to collect leakage. • Any spilled or spent oil will be collected, stored properly and disposed by accredited waste haulers.	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Soil Contamination	• Soil contamination due to oil or lubricant spills by Earthworks (excavations for foundations; cut and fill; land grading, etc.)	• Provide proper construction machines and heavy vehicles and maintain them properly • Oil and grease traps in the drainage system • Establish and implement health and safety management plan and emergency and contingency plan in case of spills	DOTC PMO Contractor	To be included in the contractor's service fee on health, safety and environmental management
	• Remediated land might be excavated traces of lead might again be detected.	• Confirm that the DENR EMB's evaluation of effectiveness of remediation by the begging of detailed engineering design stage; • If the remediation is deemed insufficient, the proponent will request DENR EMB and RAMCAR to conduct further remediation; • Even if the remediation is deemed sufficient, the heavy metal (Pb) in excavated soil shall be monitored during construction. If the testing result indicates any contamination, the proponent shall stop excavation/civil work and discuss with DENR EMB and RAMCAR how to remediate contaminated soil.	DOTC PMO	To be included in the project cost to be finalized during the DED
Waste	• Generation of solid waste; Land and water contamination; aesthetic impacts; spread of diseases	• Submission and implementation of Solid Waste Management Plan as part of contractors' engagement • Provision of waste bins to avoid dispersal of litter and regular site maintenance duties • Regular collection, transportation and disposal of wastes to minimize the attraction of vermin, insects and pests	DOTC PMO Contractor	To be included in the contractor's service fee on health, safety and environmental management
	• Generation of solid waste due to excess soil for disposal from earthwork activities, and demolition of existing railway	• Submission and implementation of Solid Waste Management Plan as part of contractors' engagement • Recycling of wastes including soil, as much as possible • Use of leftover concrete and metals for suitable alternative projects	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
	structures	• Proper sorting of waste for disposal and designation of appropriate temporary storage area • Disposal of non-recyclable wastes by a licensed contractor		
Noise and Vibration	• Increase in noise due to earthmoving, demolition and earth-balling , and operation of equipment, machineries and service vehicles	• Installation of control devices such as mufflers and noise suppressors to all construction equipment • Regular maintenance of heavy equipment, construction machinery • Provision of temporary noise barriers such as galvanized iron shields, particularly in noise-sensitive areas such as churches, schools, and hospitals in the immediate vicinity of the construction area. • Construction workers must be provided with personal protective equipment (PPE). • Scheduling of high noise generating activities during daytime • Construction sites must be fenced for safety and security reasons	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
	• Increase in ground vibration level due to operation of heavy equipment and machineries	• Use of construction machinery with minimal vibration generation e.g., careful operation of construction machinery, avoiding of high-load operation, and minimum movement of heavy machinery • Adopt the less vibration pile driving methods such as cast-in place pile method • Shorten the operation time of construction machinery (limit the operation during weekdays and during the day, and obey the work time schedule and set the rest time) • Keep construction machinery away from the residence and sensitive receptors • Identify nearby sensitive receptors likely to be affected and monitor vibration levels • Explain to the community about the construction work and respond to complaints properly	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Ground subsidence	• Subsidence due to soft soil at depot area	• Design of structures and facilities to withstand ground subsidence	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Bottom sediment	• Increase in suspended sediments in the receiving water due to demolition, excavation and bore piling activities	• Implementation of appropriate erosion control measures particularly during high precipitation periods. • Soil/sediments/debris and other excavated materials shall be hauled out from the site immediately and disposed by accredited waste handlers	DOTC PMO Contractor	To be included in the project cost to be finalized during the DED
Others				
Accidents	• Mobilization of workers,	• Strict implementation of Traffic Management Plan (TMP) that details	DOTC PMO	To be included in

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
	equipment and construction materials, and transport of demolition debris and construction materials to and from the construction site.	the activities to adequately manage traffic flow • The TMP will be properly coordinated and approved by the MMDA and/or LGUs concerned prior to implementation of activities in the areas concerned	Contractor	the project cost to be finalized during the DED
II. OPERATION PHASE				
Social Environment				
The Poverty Group	• Livelihood of ISFs	• Implementation of the Internal and External Monitoring of RAP to monitor the livelihood of relocated ISFs.	DOTC, Private entity in charge of O&M, NHA, LIAC	To be included in the Final RAP Budget
Local economy such as employment and livelihood etc.	• Income of PAFs including venders, tenants and small commercial establishments	• Implementation of the Internal and External Monitoring of RAP to monitor the livelihood of relocated PAFs	DOTC, Private entity in charge of O&M NHA, LIAC	To be included in the Final RAP Budget
	• Increased economy along NSCR route due to Railway Operation	• Ensure efficiency of NSCR system in order to attract passengers and increase ridership • Encourage commercial development at Stations	DOTC, Private entity in charge of O&M	N/A
Land use and utilization of local resources	• Land alteration of small wetland	• See EMP of "Flora, Fauna and Biodiversity."	-	-
	• More efficient and safer transportation facility due to reduced travel time, reduced traffic congestion, improved traveler safety and reduced energy consumption by operation of train • Increase in land development along or near the corridor	• Identification of future land use of surrounding areas that will result to a significant increase in commercial activities especially near train stations, to guide urban planners of the LGUs to adapt future development plans accordingly.	LGUs, DOTC, Private entity in charge of O&M	N/A
Social institutions such as social infrastructure and local decision-making institutions	• Conflict between existing residents and new settlers	• Implementation of the Internal and External Monitoring of RAP to monitor the integration of the host community with the resettled PAFs at the relocation sites.	DOTC, Private entity in charge of O&M, NHA, LIAC	To be included in the Final RAP Budget
Misdistribution of benefits and damage	• Displacement of residents and few commercial establishments along the proposed alignment	• Implementation of the Internal and External Monitoring of RAP to monitor the livelihood of relocated PAFs	DOTC, Private entity in charge of O&M, LIAC	To be included in the Final RAP Budget

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
Local conflict of interests	• Conflict between existing residents and new settlers	• Implementation of the Internal and External Monitoring of RAP to monitor the integration of the host community with the resettled PAFs at the relocation sites.	DOTC, Private entity in charge of O&M, NHA, LIAC	To be included in the Final RAP Budget
Gender, Children's right	• Displacement of PAFs	• Implementation of the Internal and External Monitoring of RAP to monitor the situation of women and children.	DOTC, Private entity in charge of O&M, NHA, LIAC	To be included in the Final RAP Budget
Work environment (occupational health/ safety)	• Risk of accidents at the stations and depot	• Strict implementation of precautionary, safety and security measures	DOTC, Private entity in charge of O&M	Included in the health, safety and environmental management plan and budget of the proponent
Hazard (Risk)Infectious disease such as HIV/AIDS	• Risk of communicable and infectious diseases	• Sanitary facilities or utilities to maintain sanitary and healthy conditions at all stations and depot.	DOTC, Private entity in charge of O&M	Included in the health, safety and environmental management plan and budget of the proponent
Natural environment				
Topography and Geological features	• Loss of soil strength, settlement of soil, lateral spreading, bearing failures, floatation of embedded structures, damage to overlying structures, in the event of an earthquake	• Consider liquefaction hazards in the final design of the structures	DOTC, Private entity in charge of O&M	Part of the regular operation and maintenance and budget of the proponent
	• Damage to infrastructure in the event of an earthquake	• Conduct regular check on integrity of structures; reinforce, if necessary	DOTC, Private entity in charge of O&M	Part of the regular operation and maintenance and budget of the proponent
Flora, Fauna, and Biodiversity	• Narra trees	• Monitoring of survival of trees planted	DOTC, Private entity in charge of O&M	P20,000.00
	• Offset wetland	• Conduct seasonal bird count to monitor the bird population in the surrogate wetland area established.	DOTC, Private entity in charge of O&M,	To be detained in preparation of Restoration Plan.

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
			The Society for the Conservation of Philippine Wetlands(SCPW)	
Global Warming	• Accelerated structural fatigue and materials failure • Greater demands on the construction, operation and maintenance of flood control and drainage structures.	• Design in making infrastructure robust or resilient to the effects of climate change should be taken into consideration • Improvement of current drainages along the alignment to be resilient to climate change	DOTC, Private entity in charge of O&M	To be included in the project cost to be finalized during the DED
Pollution Control				
Air Pollution	• Increase in air pollution due to operation of service vehicles and operation of standby generator set	• Proper preventive maintenance of service vehicles and equipment • Use of cleaner fuel for the generator sets	DOTC, Private entity in charge of O&M	N/A
Water Pollution	• Increase in pollution of receiving waters bodies due to maintenance activities in the railway stations and depot	• Wastewater with oil shall be separately collected and disposed for treatment. • A wastewater treatment facility (WTF) with oil removal will be constructed at the Depot. • Draw up a Procedure Manual for Workers at the Depot to prevent oil spills in EMP	DOTC, Private entity in charge of O&M	Construction Cost of WFT will be included in the Project Cost to be finalized during the DED.
	• Increase in pollution of receiving water bodies due to domestic wastewater generation	• Sanitary facilities at the stations will be installed to collect wastewater, which will be collected and disposed by accredited waste handles	DOTC, Private entity in charge of O&M	Part of Maintenance Cost of the Facilities
Soil Contamination	• Soil contamination resulting from leaks of lubricants agents and used oil due to Maintenance Works at the Depot site	• Provide proper machines and equipment and maintain them properly. • Store bulk waste oils and lubricants in impermeable area and with appropriate secondary containment. • Prepare a procedure manual for workers at the depot to prevent oil and chemical spills and also provide regular training to workers to keep working and surrounding environment in good condition. • Emergency and contingency plan in case of spills and health and safety management plan must be in place.	DOTC, Private entity in charge of O&M	Part of the health, safety and environmental management plan and budget of the proponent
Waste	• Generation of solid waste ; Land and water contamination; aesthetic impacts; spread of diseases due to passengers movement, as well as maintenance activities	• Proper segregation of wastes • Provision of waste bins that will allow proper waste segregation • Use of sealable waste bins to avoid attraction of vermin, insects and pests, • Regular collection and transportation of wastes for recycling or disposal at licensed facilities	DOTC, Private entity in charge of O&M	Part of Maintenance Cost of the Facilities

Items	Impact	Proposed EMP/Mitigation Measures	Responsible Organization	Cost
		• Formulation and implementation of policies on solid waste minimization and solid waste management for patrons and staff		
Noise and Vibration	• Noise due to train operation	• 2 m noise barrier will be considered for the class AA area, especially sensitive facilities such as school, hospital, etc. are located within 50 meter distance • Detailed survey in measuring the distance from sensitive area should be carried out at detail design stage. • Proper maintenance of structures and tracks, such as regular rail grinding, must be conducted	DOTC, Private entity in charge of O&M	To be included in the project cost to be finalized during the DED Part of the regular operation and maintenance and budget of the proponent
	• Vibration due to train operation	• Design of rail tracks must incorporate measures to reduce level of vibration generated by the railway during train operations, such as use of long rail, resilient rail fastenings, rail dampers, sleeper with the anti-vibration mat • Increase ballast bed height for the embankment section especially near the residential area and sensitive receptors. Install ballast mats • Proper maintenance of trains structures and tracks, such as maintaining smooth rail running surface, elimination of the rail running surface discontinuities, must be conducted • Regular reconditioning of train and its components, such as suspension system, brakes, wheels (re-profiling) and slip-slide detectors • Identify nearby sensitive receptors likely to be affected and monitor vibration levels	DOTC, Private entity in charge of O&M	To be included in the project cost to be finalized during the DED Part of the regular operation and maintenance and budget of the proponent
Ground subsidence	• Subsidence due to soft soil at depot area due to movement of trains	• Regular monitoring and measurement of level of ground subsidence	DOTC, Private entity in charge of O&M	Part of the regular operation and maintenance and budget of the proponent
Others				
Accidents	• Traffic congestion near railway stations due to railway operation	• Designate / Provide for loading and unloading areas • Fielding of traffic enforcers near the stations • Provision for tricycle / jeepney/bus terminals	DOTC, Private entity in charge of O&M, LGUs	N/A

Source: JICA Study Team

In the long-term, the NSCR project may cause the indirect adverse impacts on natural and social environment surrounding regions. Therefore, some recommendations are provided to alleviate such impacts as follows:

1) As shown in Table 7.1.39, although beneficial land use impacts are expected due to the train operation, the adverse impact on decreasing the agricultural land might be also foreseen especially in Bulacan. Therefore, it is recommended that the municipalities along the NSCR draw up the appropriate land use plan and regional development plan.
2) It is recommended that the EMP of the operation phase be implemented consistently with the land use plan and regional development plan of the municipalities along the NSCR. DOTC should regularly confirm its consistency with such plans.

7.1.9 Environmental Monitoring Plan

7.1.9.1 Self-Monitoring Plan

The Self-Monitoring Plan shows the monitoring that needs to be accomplished with regard to NSCR compliance to the environmental laws (PEISS, Air Quality, Water Quality and Solid Waste Management). The Self-Monitoring Report shall be submitted to EMB as in accordance with DAO No. 2003 - 27, on a quarterly basis. Table 7.1.40 shows the Self-Monitoring Plan for the North South Commuter Rail Project during the Pre - Construction, Construction, and Operational Phases of the project.

7.1.9.2 Third Party Monitoring

As agreed in the Technical Scoping for the NSCR Project, instead of creating the MMT, the proponent may hire a Third Party Monitoring entity to undertake the validation monitoring in accordance with DAO 03-30 Section 2.3 (Monitoring, Validation & Evaluation/Audit Procedures).

In line with this, the specific roles and responsibilities of the Third Party Monitoring entity will be:

- Validate project compliance with the conditions of ECC and the EMP
- Validate the proponent's conduct of self-monitoring
- Prepare validation reports for submission to proponent, EMB and for documentation to stakeholders

Table 7.1.40 Environmental Monitoring Plan (EMoP) for the North South Commuter Rail Project

Items	Parameter to be Monitored	Location	Frequency	Responsible Organization	Annual Estimated Cost
I. PRE-CONSTRUCTION PHASE					
Social Environments					
Involuntary Resettlement & relevant items* (Refer to Section 7.2.12 and draft RAP Chap.12 "Monitoring and Evaluation") *"Poverty group", "Local economy such as employment and livelihood", "Social institutions", "Local conflict of interests", "Gender, Children's right" Misdistribution of benefits and damage"	Compensation for affected land, structures and improvements	Affected barangays	Monthly: RAP Implementation period Semi-annually during construction (but should be extended until the end of livelihood restoration program)	DOTC PMO, NHA LIAC	PhP 20,000/year. To be determined and finalized during the RAP updating in the Detailed Engineering Design Phase.
	Relocation of ISFs to the relocation sites	Affected barangays Relocation sites			
	Relocation of Venders and Tenants	Affected barangays (e.g., 10th Avenue, in Callocan, Cluster Building 2 at Tutuban) Relocation sites			
	Income restoration and livelihood development program	Affected barangays Relocation sites			
	Assistance for vulnerable PAFs	Affected barangays Relocation sites			
	Consultation Meetings (group, community, barangay)	Affected barangays Relocation sites			
II. CONSTRUCTION PHASE					
Social Environment					
Historical/ Cultural heritage	Status of old PNR stations	Malolos Station, Meycauayan Station, Polo/Valenzuela Station and Tutuban Station	Monthly until preservation work of station is completed	PCO of the Contractor and DOTC PMO	N/A
Traffic conditions	Traffic flow (congestion)	Major intersection in the vicinity of constriction sites	Weekly	PCO of the Contractor and DOTC PMO	N/A
Accidents	Accident (with causes)	All constriction sites	Monthly	PCO of the Contractor and DOTC PMO	N/A
Work Environment and community health	Proper removal and disposal of excavated soil (from Meycaucyan dump site and RAMCAR battery site	Meycauayan dumpsite and RAMCAR battery site	N.A.	PCO of the Contractor and DOTC PMO	PhP 200,000

Items	Parameter to be Monitored	Location	Frequency	Responsible Organization	Annual Estimated Cost
Hazards (Risk) Infectious diseases such as HIV/ AIDS	Health conditions of workers	All construction sites	Bimonthly (every two weeks)	PCO of the Contractor and DOTC PMO	N/A
Natural Environment					
Flora, Fauna and Biodiversity	• Number of trees cut • Number of trees replaced • Survival rate of the species (e.g., Nara) introduced. • Provision of corresponding number of tree seedlings.	Designated tree planting site and/or reforestation area designated by the DENR-EMB Region III and NCR	Number of trees cut and replaced, Survival rate of the species introduced: Monthly. Provision of number of tree seedlings: Monthly	PCO of the Contractor and DOTC PMO	To be determined and finalized implementation of the project based on current prices of seedlings (Note: monitoring cost is P20,000.00)
	Seasonal bird count	Adjacent offset wetland of the Valenzuela depot	Annually	DOTC PMO, The Society for the Conservation of Philippine Wetlands (SCPW)	To be detained in preparation of Restoration Plan. (Note: monitoring cost is P20,000.00)
Pollution Control					
Air Pollution	TSP, $PM_{2.5}$, PM_{10}, NO_2, SO_2,	At sampling locations at Malolos, Bocaue, Guiguinto, Valenzuela, Caloocan and Manila, Solis and Tutuban using the same sampling stations of the baseline air quality surveys.	Quarterly. Immediately based on complaints	PCO of the Contractor and DOTC PMO	Total sampling cost shall be determined during implementation of the project (Note: Cost P5,000.00 per monitoring station)
Water Pollution	pH, DO, Oil & Grease, BOD, Total Coliform, and TSS	At sampling locations in Guiguinto River, Santol (Balagtas) River, Bocaue River, Marilao River, Meycauayan River, Valenzuela Depot, Tullahan River, and Estero de Maypajo.(8 points)	Quarterly	PCO of the Contractor and DOTC PMO	Total sampling cost shall be determined during implementation of the project (Note: sampling cost per monitoring station P50,000.00)
Soil Contamination	Oil spill	All construction sites	Weekly Immediately after the spills	PCO of the Contractor and DOTC PMO	To be included in engineering cost
Waste	Proper waste management and disposal	All construction sites	Weekly	PCO of the Contractor and DOTC PMO	To be included in engineering cost

Items	Parameter to be Monitored	Location	Frequency	Responsible Organization	Annual Estimated Cost
Noise and Vibration	Noise level	Residential area including noise sensitive receptors in the vicinity of the construction site	Monthly Immediately based on complaints	PCO of the Contractor and DOTC PMO	Total sampling cost shall be determined during implementation of the project (Note: sampling cost P10,000.00 per monitoring station)
	Vibration level	Residential area including sensitive receptors in the vicinity the construction site	Quarterly Immediately based on complaints	PCO of the Contractor and DOTC PMO	Total sampling cost shall be determined during implementation of the project (Note: Monitoring cost P10,000.00 per sampling station)
Ground Subsidence	Level of ground subsidence	Valenzuela Depot	Monthly	PCO of the Contractor and DOTC PMO	To be included in engineering cost
III. OPERATIONAL PHASE					
Social Environments					
Accidents (stations and the depot)	Accident (with causes)	10 stations and the depot	Monthly	DOTC, Private entity in charge of O&M	Included in the budget of Environmental, Health and Safety Management Plan
Natural Environment					
Flora, Fauna and Biodiversity	Restoration status of replacement site, seasonal bird count	Adjacent offset site of the Valenzuela depot	Quarterly	DOTC, Private entity in charge of O&M, The Society for the Conservation of Philippine Wetlands (SCPW)	To be determined in preparation of Restoration Plan. (Monitoring cost: P20,000.00)
	Number of trees surviving	Tree planting site designated by DENR Region III and NCR	Biannual	DOTC, Private entity in charge of O&M	P20,000.00
Pollution Control					
Water Pollution (at the depot)	Quality of discharged water from depot: pH, COD, BOD, TSS, Surfactants (MBAS), Phenolic Substances as Phenols, and Total Coliform	Effluent of wastewater treatment plant in Valenzuela Depot	Monthly	DOTC, Private entity in charge of O&M	Total sampling cost shall be determined during implementation of the project (Note: P20,000.00 sampling cost per sampling site)
Water Pollution (at the stations)	Quality of discharged water from stations: pH, COD, BOD, TSS, Surfactants (MBAS), Phenolic Substances as Phenols, and Total Coliform	Effluent of sanitary facilities at all 10 stations	Monthly	DOTC, Private entity in charge of O&M	Total sampling cost shall be determined during implementation of the project (Note: P20,000.00 sampling cost per sampling site)
	Appropriate disposal of night soil from stations	All 10 stations	When collecting night soil	DOTC, Private entity in charge of	N/A

Items	Parameter to be Monitored	Location	Frequency	Responsible Organization	Annual Estimated Cost
				O&M	
Waste	Proper waste management and disposal in accordance with LGUs ordinances as well as national regulations	All 10 stations	Weekly	DOTC, Private entity in charge of O&M	N/A
Soil Contamination	Proper waste (used lubricants agents and oil) management and disposal	Depot	Weekly	DOTC, Private entity in charge of O&M	N/A
Noise and Vibration	Noise level (monitor during both day time and night time)	Noise sensitive receptors within 50 m distance from the alignment	Quarterly Immediately based on complaints	DOTC, Private entity in charge of O&M	Total sampling cost shall be determined during implementation of the project (Note: P200,000.00 sampling cost for the seven sampling sites)
	Vibration level	Sensitive receptors (schools, hospitals) within 50 m distance from the alignment	Quarterly Immediately based on complaints	DOTC, Private entity in charge of O&M	Total sampling cost shall be determined during implementation of the project (Note: P200,000.00 sampling cost per sampling site)
Ground Subsidence	Level of ground subsidence	Depot	Quarterly	DOTC, Private entity in charge of O&M	N/A

Source: JICA Study Team

Note: PMO – Project Management Officer

7.1.10 Estimated Cost of Environmental Management Plan and Environmental Monitoring Plan

The estimated cost of Environmental Management Plan (EMP) and Environmental Monitoring Plan (EMoP) is tabulated in Table 7.1.41.

Table 7.1.41 Estimated Cost of EMP and EMoP

Items	Environmental Management Plan (EMP)	Environmental Monitoring Plan (EMoP)
I. PRE-CONSTRUCTION AND CONSTRUCTION PHASE		
Social Environment		
Involuntary Resettlement & Relevant Items (Refer to Section 7.1.12 and draft RAP Chap. 12 "Monitoring and Evaluation"	To be included in the Final RAP Budget	PhP 20,000/year. To be determined and finalized during the RAP updating in the Detailed Engineering Design Phase.
The poverty Group	To be included in the Final RAP Budget	
Local economy such as employment and livelihood etc.	*For the Temporary Disturbance to Establishments and Vendors:* To be included in the Final RAP Budget *Income restoration and livelihood development program:* To be included in the project cost to be finalized during the DED	
Social institutions such as social infrastructure and local decision-making institutions	To be included in the Final RAP Budget	
Local conflict of interests	To be included in the Final RAP Budget	
Gender, Children's right	To be included in the Final RAP Budget	
Misdistribution of benefits and damage	To be included in the Final RAP Budget	
Land use and utilization of local resources	To be included in the project cost to be finalized during the DED	N/A
Existing social Infrastructures and services	To be included in the project cost to be finalized during the DED	N/A
Water Usage or Water Rights and Rights of Common	To be included in the project cost to be finalized during the DED	N/A
Historical/cultural heritage	To be included in the project cost to be finalized during the DED	N/A
Landscape	To be included in the project cost to be finalized during the DED	N/A
Work Environment	Php 7, 000.00 per person (for PPE). Included in the contractor's service fee	N/A
	Exposure to Health and Safety Hazards: To be included in the project cost to be finalized during the DED	N/A
Hazard (Risk)Infectious disease such as HIV/AIDS	Included in the contractor's service fee on health, safety and environmental management	N/A
Natural Environments		
Topography and Geological features	*For the Alteration of Topography by Earthworks:* To be included in the project cost to be finalized during the Detailed Engineering Design (DED)	N/A
	For the Increased Risk of Liquefaction: To be included in the project cost to be finalized during the DED	N/A
	For the Damage to Components of Construction Works due to Ground Shaking: To be included in the project cost to be finalized during the DED	N/A
Soil Erosion	Included in the contractor's service fee	N/A

Items	Environmental Management Plan (EMP)	Environmental Monitoring Plan (EMoP)
Hydrological Situation	To be included in the project cost to be finalized during the DED	N/A
Flora, Fauna, and Biodiversity	*For the Narra Trees along the Aligment:* Tree seedling and monitoring cost Php 20,000/ha To be included in the project cost to be finalized during the DED	To be determined and finalized implementation of the project based on current prices of seedlings
	For the Loss of Small Swampy Areas: To be included in the project cost to be finalized during the DED	To be detained in preparation of Restoration Plan. (Note: monitoring cost is P20,000.00)
Global Warming	To be included in the project cost to be finalized during the DED	N/A
Pollution Control		
Air Pollution	To be included in the project cost to be finalized during the DED	Total sampling cost shall be determined during implementation of the project (Note: Cost P5,000.00 per monitoring station)
Water Pollution	*Increased Pollution due to Domestic Wastewater Generation:* To be included in the project cost to be finalized during the DED	Total sampling cost shall be determined during implementation of the project (Note: sampling cost per monitoring station P50,000.00)
	Increased Pollution due to Fuel and Oil Leaks: To be included in the project cost to be finalized during the DED	
Soil Contamination	*Contamination due to Oil or Lubricant Spills:* To be included in the contractor's service fee on health, safety and environmental management	To be included in engineering cost
	In case remediated land might be excavated traces of lead might again be detected: To be included in the project cost to be finalized during the DED	N/A
Waste	*Aesthetic Impacts; Spread of Diseases due to Land and Water Contamination:* To be included in the contractor's service fee on health, safety and environmental management	To be included in engineering cost
	Generation of Solid Waste due to Earthworks: To be included in the project cost to be finalized during the DED	
Noise and Vibration	*Increased Noise due to Earthworks and Demolition*: To be included in the project cost to be finalized during the DED	*For Noise Level:* Total sampling cost shall be determined during implementation of the project (Note: sampling cost P10,000.00 per monitoring station)
	Increased Ground Vibration: To be included in the project cost to be finalized during the DED	*For Vibration Level:* Total sampling cost shall be determined during implementation of the project (Note: Monitoring cost P10,000.00 per sampling station)
Ground subsidence	To be included in the project cost to be finalized during the DED	PhP 200,000. Other costs shall be included in engineering cost
Bottom sediment	To be included in the project cost to be finalized during the DED	N/A
Others		
Accidents	To be included in the project cost to be finalized during the DED	N/A
II. OPERATION PHASE		
Social Environment		
The poverty Group	To be included in the Final RAP Budget	N/A
Local economy such as employment and livelihood etc.	To be included in the Final RAP Budget	N/A
Land use and utilization of local resources	N/A	N/A

Items	Environmental Management Plan (EMP)	Environmental Monitoring Plan (EMoP)
Social institutions such as social infrastructure and local decision-making institutions	To be included in the Final RAP Budget	N/A
Misdistribution of benefits and damage	To be included in the Final RAP Budget	N/A
Local conflict of interests	To be included in the Final RAP Budget	N/A
Gender, Children's right	To be included in the Final RAP Budget	N/A
Work environment (occupational health/ safety)	Included in the health, safety and environmental management plan and budget of the proponent	N/A
Hazard (Risk)Infectious disease such as HIV/AIDS	Included in the health, safety and environmental management plan and budget of the proponent	N/A
Natural Environment		
Topography and Geological features	Part of the regular operation and maintenance and budget of the proponent	N/A
Flora, Fauna, and Biodiversity	*For the Narra Trees:* P20,000.00	*Monitoring of Planting Sites (Tree Planting):* P20,000.00 for Number of Trees Surviving
	For the Offset wetland: To be detained in preparation of Restoration Plan.	*For the Adjacent Offset Site of the Valenzuela Depot:* To be detained in preparation of Restoration Plan. P20,000.00
Global Warming	To be included in the project cost to be finalized during the DED	N/A
Pollution Control		
Water Pollution	*Increased Pollution due to maintenance Activities:* Construction Cost of WFT will be included in the Project Cost to be finalized during the DED.	Total sampling cost shall be determined during implementation of the project (Note: P20,000.00 sampling cost per sampling site)
	Increased Pollution due to Domestic Wastewater Generation: Part of Maintenance Cost of the Facilities	
Soil Contamination	Part of the health, safety and environmental management plan and budget of the proponent	N/A
Waste	Part of Maintenance Cost of the Facilities	N/A
Noise	*Noise due to train operation(noise barrier)*: To be included in the project cost to be finalized during the DED *Maintenance*: Part of the regular operation and maintenance and budget of the proponent	For Noise Level: Total sampling cost shall be determined during implementation of the project (Note: P200,000.00 sampling cost for the seven sampling sites)
Vibration	*Vibration due to train operation:* To be included in the project cost to be finalized during the DED *Maintenance*: Part of the regular operation and maintenance and budget of the proponent	For Vibration Level: Total sampling cost shall be determined during implementation of the project (Note: P200,000.00 sampling cost per sampling site)
Ground subsidence	Part of the regular operation and maintenance and budget of the proponent	N/A

Source: JICA Study Team

7.1.11 Stakeholder Consultations

For the Malolos to Caloocan segment, a total of eighteen (18) stakeholders' consultation meeting was conducted for the cities/municipalities along the alignment. Table 7.1.42 shows the schedules of the conducted stakeholders' consultation meetings for the 8 cities and municipalities along the NSCR alignment for this segment.

Table 7.1.42 Schedule of the Stakeholders Consultations Conducted along the Alignment from Malolos to Caloocan

Date and Time	Venue	Target Affected Cities and Municipalities	Main Participants	No. of Participants
EIA (Public Scoping)				
August 27, 2013, 1:30 pm -4:30pm	Finance Building, City Hall of Valenzuela, Valenzuela City	Malabon and Valenzuela	LGUs (Valenzuela and Malabon, and Barangays), PCUP, DPWH, DOTC, Northrail, PNR, DPWH, Chamber of Commerce and Industry of Valenzuela, NGOs)	29
August 29, 2013, 1:30pm – 4:30pm	3rd Floor Function Room, Bulwagan, Caloocan City	Caloocan	LGUs (City and Barangays), PCUP, DOTC, Northrail, NGOs	38
September 3, 2013, 1:30pm – 4:30pm	Hiyas Convention Center, Malolos, Bulacan	Malolos, Guiguinto and Balagtas	LGUs (Province, City and Barangays), PCUP, DOTC, Northrail, NGOs	34
September 4, 2013, 1:30pm – 4:30pm	3rd Floor Function Room, Bulwagan, Caloocan City	Meycauayan, Marilao and Bocaue	LGUs (Province, City and Barangays), PCUP, DOTC, Northrail, NGOs	38
RAP Survey				
October 7, 2013 1:30pm – 4:30pm	Hiyas Convention Center, Malolos, Bulacan	Malolos, Guiguinto, and Balagtas	PAPs, LGUs (Municipalities and Barangays), PCUP, Northrail, DPWH, Business entities	31
October 8, 2013, 1:30pm – 4:30pm	Marilao Convention Center, Marilao, Bulacan	Bocaue and Marilao	PAPs, LGUs (Municipalities and Barangays), PCUP, Northrail	18
October 9, 2013, 1:30pm – 4:30pm	AVR Legislative Bldg, City Hall of Valenzuela, Valenzuela City	Valenzuela and Meycauyan	PAPs, LGUs (Municipalities and Barangays), Northrail	25
EIA & RAP (Survey Result)				
November 11, 2013 1:30pm – 4:30pm	Marilao Convention Center, Marilao, Bulacan	Bocaue and Marilao	PAPs, LGUs (Bulacan Province, Municipalities and Barangays), NHA, Northrail	56
November 12, 2013 1:30pm – 4:30pm	AVR Legislative Bldg, City Hall of Valenzuela, Valenzuela City	Valenzuela and Meycauyan	PAPs, LGUs (Municipalities and Barangays), PCUP, Northrail	62
November 13, 2013 1:30pm – 4:30pm	Hiyas Convention Center, Malolos, Bulacan	Malolos, Guiguinto, and Balagtas	PAPs, LGUs (Municipalities and Barangays), Northrail, PCUP	55
Draft RAP (Compensation Policy)				
February 5, 2014 1:30 pm -4:00pm	Hiyas ng Bulacan Convention Center, Provincial Capitol Compound, Malolos	Malolos, Guiguinto and Balagtas	PAPs, LGUs (Municipalities and Barangays) , DPWH, DSWD, NHA, Northrail, PNR, PCUP	65
February 6, 2014 1:30pm-4:00pm	Marilao Guillermo Convention Center, Marilao, Bulacan	Marilao	PAPs, LGUs (Municipalities and Barangays), NHA	303
February 7, 2014 1:30 pm 4:30pm	Marilao Guillermo Convention Center, Marilao, Bulacan	Bocaue	PAPs, LGUs (Barangays)	240
March 6, 2014, 1:40-4:00pm	AVR Legislative Bldg, City Hall of Valenzuela, Valenzuela City	Valenzuela and Meycauyan	PAPs, LGUs (City and Barangays), NHA,DPWH, MNTC and DSWD	72
Draft RAP (Relocation Sites)				
March 31, 2014 1:30-pm 4:00pm	AVR Room B, Legislative Building, Valenzuela City Hall	Valenzuela City, Barangay Malhacan, Meycauayan, Bulacan	PAPs, LGUs (Municipalities and Barangays), DOTC PCUP, NHA	170

Date and Time	Venue	Target Affected Cities and Municipalities	Main Participants	No. of Participants
April 1, 2014 1:30pm -5:00pm	Hiyasng Bulacan Convention Center, Provincial Capitol Compound, Malolos	Malolos, Guiguinto and Balagtas	PAPs, LGUs (Municipalities and Barangays), DOTC, NHA, PCUP, Northrail,	42
April 2, 2014 1:30pm -5:00pm	Casa Elum Pavilion and Resort, Barrio Patubig, Marilao	Marilao	PAPs, LGUs (Barangays), Northrail, PCUP, NHA	173
April 3, 2014 1:30pm -5:00pm		Bocaue	PAPs, LGUs (Barangays), PCUP, NHA	75

Source: JICA Study Team

For the Caloocan to Tutuban segment, a total of six (6) IEC (Information, Education and Communication) activities and eight (8) stakeholder consultation meetings were held as shown in Table 7.1.43.

Table 7.1.43 Schedule of the IEC Activities and Stakeholders Consultations Conducted along the Alignment from Caloocan to Tutuban

Date and Time	Venue	Target Affected Cities and Municipalities	Main Participants	No. of Participants
IEC Activities				
November 19, 2014, 2:00pm -4:00pm	City Engineer's Office, Manila City Hall, Manila	Manila	LGUs (Manila Building Officer, Drafting and Survey Division), DOTC	6
December 2, 2014, 1:00pm -4:00 pm	Caloocan City Hall, Caloocan	Caloocan	LGUs (Barangay), DOTC	5
December 4, 2014, 9:00am-12:00nn	EMB, Visayas Avenue, Quezon City	Technical Scoping with EMB	EMB, DOTC, ECOSYSCORP, INC.	13
December 9, 2014, 3:00pm-4:00pm	Mayor's Office, Caloocan City Hall, Caloocan	Caloocan	LGUs (Mayor, City Administrator, City Assessor, Urban Poor Affairs Office Head), DOTC	7
January 14, 2015, 9:00am-11:00am	National Housing Authority, Elliptical Road, Quezon City	Manila and Caloocan	National Housing Authority (National Capital Region)	10
January 20, 2015, 9:00am-11:00am	National Historical Commission of the Philippines, Manila	Manila and Caloocan	National Historical Commission of the Philippines (NHCP)	8
EIA & RAP (Public Scoping)				
November 27, 2014, 1:00pm -4:00 pm	PNR Office, Tutuban, Manila	Manila	LGUs (Barangay officials), DOTC, PNR, PCUP, MNTC	63
December 8, 2014, 9:00am- 11:00am	Barangay 186, Manila	Manila	PAPs (homeowner's association) and LGUs (Barangay 186, Zone 16, Tondo)	5
December 11, 2014, 2:00pm- 4:00pm	Back Conference Room, Caloocan City Hall	Caloocan	LGUs (Barangay Officials), PAPs	43
December 13, 2014, 9:00 am- 11:00am	Barangay 204, Manila	Manila	PAPs (homeowner's association) and LGUs (Barangay 204, Zone 18, Tondo)	12
December 13, 2014, 1:00pm-3:00pm	Barangay 186, Manila	Manila	PAPs (homeowner's association) and LGUs (Barangay 186, Zone 16, Tondo)	37
December 20, 2014, 9:00am-11:00am	Barangay 15, Caloocan	Caloocan	LGUs (Barangay Officials) and PAPs (vendors) along Barangay 15	34
EIA & RAP (Survey Results)				
February 7, 2015, 9:00am-11:00am	Covered Court, Barangay 204, Zone 18, Tondo, Manila	Manila	LGUs (Barangay Officials) and PAPs in Barangay 204 (officials of homeowners associations, residents), DOTC	87

Date and Time	Venue	Target Affected Cities and Municipalities	Main Participants	No. of Participants
February 7, 2015, 2:00pm-4:00pm	Barangay Hall, Barangay 15, Zone 2, Caloocan City	Caloocan	LGUs Barangay Officials) and PAPs in Barangay 15 (vendors), DOTC	54

Source: JICA Study Team

7.1.11.1 Summary of Stakeholder Consultation Meetings (Malolos to Caloocan)

1) Stakeholder Consultation Meeting for Environmental Impact Assessment (EIA)

Four stakeholder consultations were held in (1) Malabon and Valenzuela, (2) Caloocan, (3) Malolos, Guiguinto and Balagtas and (4) Meycauayan, Marilao and Bocaue for the Environmental Impact Assessment. The main opinions and views of participants are summarized in Table 7.1.44**.**

During the four meetings, some issues which emerged include: Most of the issues raised were related to the design and construction, namely: the configuration of the train, construction of roads along the railway, the station locations given PNR's current operations, number of piers and columns. At the same time, PAPs were concerned with the (1) safety of the residents and the availability of service facilities during construction, (2) flooding and railway track elevation, given possible liquefiable areas and (3) land acquisition, compensation and benefits for PAFs.

Table 7.1.44 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for EIA

Major Opinions/Concerns	Reflections/Countermeasures
Project proponent: • Is Northrail the implementing agency?	• DOTC is the project proponent in charge of the NSCR Project.
Site inspection in proposed depot area and location of depot area: • Boundary issues between Valenzuela and Meycauayan. • Location of depot	• The concern will be discussed with DOTC and the concerned LGUs. • The depot will be located in Valenzuela.
Project Affected Families (PAFs) -and Informal Settler Families (ISFs)- along ROW: • How will the project affect the ISFs? • Structures for landowners who were awarded with titles Return of ISFS to PNR ROW and accumulation of garbage	• JST will check whether the ISFs would be affected. If additional right-of-way (ROW) is needed, relocation issues and concerns would be discussed in another meting. • Private structures or properties outside the PNR ROW will not be affected. • LGUs are responsible in preventing ISFs setting up structures under the viaduct and controlling for dumping of garbage.
Width of PNR ROW, land acquisition issues and demolition concerns: • Clearing in Marulas to Malanday and need for MNTC to acquire additional land • Demolition of structures near the track	• Given the issuance of the Environmental Compliance Certificate (ECC) for the MNTC Project, it is assumed that they consulted with the communities regarding this concern. • The PNR ROW has already been cleared. New structures built within the PNR ROW have to be removed.
Relocation: Compensation and Benefits for PAFs • Benefits and compensation for PAFs	• Entitlements would vary and would be discussed in another meeting.
Detailed design phase: Elevated railway • Elevation of Railway from Caloocan to Buendia? • Putting up of fences during construction	• Design is not yet final but JST intends to have the said section elevated. • Area may be fenced during construction.

Major Opinions/Concerns	Reflections/Countermeasures
Detailed design phase: construction of road along the railway	
• Suggestion to construct a road along the direction of the railway to improve accessibility and the traffic condition in Bulacan	• Construction of parallel service roads in some sections is possible and will be put under consideration
• Road repair in case the project will incur damages	• The contractor/s would be responsible for road repair but monitoring will be done during project implementation.
• Utilization of area under viaduct	• National government will decide on this matter.
Detailed design phase: train design	
• Is the project designed for a commuter train or a fast train?	• The NSCR will use commuter trains but the design for the tracks would be for high-speed trains.
Detailed design phase: Skyway 3, Connector Road, Segment 10.3 and Implications to the NSCR Design	
• Implications of the ongoing road projects (Phase 3 of Skyway, Connector Road from Sta. Mesa to C3 and Segment 10 from C3 to Valenzuela) to NSCR Design	• The team coordinates with the other groups regarding their use of the PNR ROW. The design is not yet final and would be discussed with other project proponents.
Construction phase: Station locations and PNR Operations	
• Number of stations in Caloocan	• Only 1 station will be built in Caloocan.
• Station locations and existing PNR operations	• PNR will cease to operate during the construction and operation phase.
• Will there be tri-modal stations – one for Clark, one for Guiguinto and one for Fort Bonifacio?	• The Project did not consider having tri-modal stations. The alignment will not pass through Fort Bonifacio.
• Will there be station locations in every town?	• Stations would be located in the following areas: Malolos, Guiguinto, Balagtas, Bocaue, Marilao, Meycauayan, Valenzuela, Caloocan, Blumentritt, Espana, Sta. Mesa, Paco, Buendia, EDSA, FTI.
• Closing of roads during construction phase	• No access roads will be closed since the alignment will be elevated.
Existence of a central station	• There is no central station.
Construction phase: Number of piers and columns	
• Number of piers or columns in Caloocan	• Not yet determined
• Use of existing columns built by the previous contractor	• No decision yet, but it is likely that these will not be used.
Construction phase: service facilities	
• Interruption of service utilities	• Mitigating plans will be prepared to minimize related impacts.
Construction phase: safety of residents along the area	
• Commotion during construction and safeguards against domestic violence	• This should be addressed by the contractor
Operation phase:	
• Impact on existing vibration level	• An EIA study will be conducted.
Environmental Considerations: Flooding and Railway Track Elevation	
• Plans for flood-prone areas and for upgrading or improving existing roads	• There is a vertical clearance from ground level.
• Presence of drainage canals along the alignment	• Provision of drainage or underground piping will be considered.
• Blocked waterways between McArthur Highway and Malolos	• Construction of drainage (open channel or underground) would be considered in the project • This would be considered in the EIA.
Health and Environmental considerations:	
• Accidental filling from stockpiles may during operation. • Identification of liquefiable areas • Increase in coliform and proximity to bodies of water • Spread of communicable disease among workers	• The following issues and recommendations would be considered in the design of the alignment and for the EIA study.
Employment for PAFs	

Major Opinions/Concerns	Reflections/Countermeasures
• Employment for PAFs	• Skilled laborers from the affected locality would be prioritized and considered for employment.
Conceptualization of Proposed Plan, Coordination with other stakeholders	
• Costs and consequences to PAFs	• Considered in the RAP and EIA
• Consultation with other government agencies	• The project refers to the UDHA and the JICA Guidelines as the basis for coordinating.
• LGU involvement in implementation and monitoring?	• Multi-Partite Monitoring Team to be formed as part of ECC requirements
• Safeguards against corruption	• Results of the bidding process will be published to ensure transparency.
Invitation for Environmental Impact Assessment discussion	
• Invitation to discuss at the barangay level	• A social impact assessment would be held at the community-level.

Source: JICA Study Team

2) Stakeholder Consultation Meeting for RAP Survey

Three consultation meetings were conducted to introduce and explain the NSCR Project, to discuss the conduct of the RAP Survey to the PAPs and stakeholders from Bulacan and Valenzuela. The man issues and concerns are summarized in Table 7.1.45.

During the first public consultation meetings, the participants expressed their concern that the embankment may worsen the flooding problem in the area and may cause access blocking. However, it was explained to them that vertical clearance of viaduct and storm water drainage will be considered in the detailed design. Concerns on land acquisition and compensation for those affected structures were also discussed. Generally, the people have no objection to the project.

Table 7.1.45 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for RAP Survey Results

Major Opinions/Concerns	Reflections/Countermeasures
Structure plan of the NSCR project: • Embankment may worsen flooding and cause access blocking. • Utilization of the open space under the viaduct	• Majority of structures (guide ways and stations) are planned to be elevated. Vertical clearance of viaduct and storm water drainage will be considered in the detailed design. The utilization of open space should be discussed with DOTC and LGUs.
Land Acquisition: • Affected structures	• The width of ROW for the NSCR project is 15m. Affected structures must be compensated at full replacement cost.
Land Acquisition and Resettlement: • Once relocation had been done by the Northrail project. The census survey will be second time.	• The census survey will be conducted for the PAPs of the affected areas due to the additional land acquisition for NSCR projects.
Socio-economic survey: • The procedure how the census survey is carried out.	• The procedures of the socio-economic survey were explained to the PAPs and carried out in coordination with the barangays.
Compensation: • Compensation for affected structures	• In accordance with the JICA Guidelines, compensation must be based on the full replacement cost as much as possible.

Source: JICA Study Team

3) Stakeholder Consultation Meeting for EIA and RAP Survey Results

Three consultation meetings were conducted to discuss survey results to the PAPs and stakeholders from Bulacan and Valenzuela. The main issues and concerns are summarized in Table 7.1.46.

The PAPs raised their concern for those who were not included in the census for different reasons. Concerns on land acquisition and compensation thereof were discussed again. Preferences on relocation sites and questions on employment opportunities were noted. Generally, the people perceive the project to be "good" as this will contribute to the overall progress of the country.

Table 7.1.46 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for EIA and RAP Survey Results

Major Opinions/Concerns	Reflections/Countermeasures
Land Acquisition: • Not censused this time by NSCR project • Not censused by the Northrail project, but censused this time by NSCR project	• The width of ROW for the NSCR project is 15m. The draft RAP was prepared for the PAPs due to the additional land acquisition for NSCR projects.
Compensation: • Compensation for affected lands and structures	• In accordance with the JICA Guidelines, compensation must be based on the full replacement cost as much as possible.
Validation of the census survey: • During the census survey, not censused because of absence.	Based on the result of the detailed design, the detailed measurement survey for validation will be conducted.
Relocation site: • Preference and possible relocation site • Existing relocation sites	• The PAP's preference of the relocation site locations should be considered in a relocation site development plan in the draft RAP. The remaining housing lots in the existing relocation sites shall be also examined. The LIAC will review and discuss the relocation sites.
Employment opportunity: • Employment opportunity for NSCR project	• In accordance with the Philippines laws, skilled and unskilled labor will be preferentially employed from the affected areas.

Source: JICA Study Team

4) Stakeholder Consultation Meeting for Draft RAP

Four consultation meetings were conducted to discuss the draft Resettlement Action Plan (RAP) for the compensation policy for PAPs and stakeholders from Bulacan and Valenzuela. The main issues and concerns are summarized in Table 7.1.47.

The meeting was focused more on the process of land acquisition and the corresponding compensation for the affected structures as well as the options for relocation sites.

Table 7.1.47 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for Draft RAP Compensation Policy

Major Opinions/Concerns	Reflections/Countermeasures
Compensation: • PAPs living on private land	• The private landowners will be compensated but will not be entitled to relocation. Lots and structures are compensated based on the market value. Land for land (land swap) is also considered for entitlement.
Validation of the census survey: • Not censused last October but is a PAP	• Based on the result of the detailed design, the detailed measurement survey will be conducted. Those who were out during the census survey may present evidence that they are structure owners, renters and/or sharers qualifications of beneficiaries will be discussed in the LIAC.

Major Opinions/Concerns	Reflections/Countermeasures
Relocation site: • Preference and possible relocation site • Monthly payment for relocation sites • Concern for access to basic social services in relocation site • Lot size of relocation site • Ownership after relocation • Date of the relocation.	 • While according to NHA there are no existing units available for relocation within the municipality, the PAP's preferences will be considered in the site development plan for the draft RAP. The proposed relocation sites presented in the meeting are not yet final. The LIAC will review and discuss the relocation sites. • The table for the schedule of amortization payments by NHA was presented. • Water and electricity connection will be provided in relocation sites. • An example of relocation sites by NHA was provided– wherein the land is 4 m x 5 m or 20 sq. m. • According to the table of NHA's schedule of amortization payments, the land titles would be given to the PAFs after they have paid. • The schedule will be finalized in the detailed design stage, and that social preparation would take place prior to relocation.
Employment opportunity: • Suggested that DSWD-Region 3 be invited in order to assess the livelihood needs of the PAPs	 • DSWD has a livelihood component and it has been suggested that the DSWD representative in the LIAC would determine and facilitate the livelihood needs of the PAPs.
Structure plan of the NSCR Project: • Embankment may cause the blocking of the waterway	 • Majority of structures are planned to be elevated. There will be no increase of risk of flooding due to construction of the viaduct. Remediation may also be considered during the detailed design stage.
Compensation • Qualified beneficiaries • Transfer of eligibility from senior citizen to daughter • Amount of Compensation	 • Those interviewed last October 2013 are qualified for the relocation package or cash compensation. • Absentee structure owners – those who reside in other areas and rent/lease the structure are not qualified for the relocation or cash compensation package. In cases of co-owners, they are eligible to only one structure. • A Senior Citizen PAP can transfer the eligibility to the son/daughter provided that the person is living with him/her. Such concerns should be raised to the LIAC. • The cash compensation would be based on the replacement cost of the present market value of structures. • DSWD-PDPB mentioned that DSWD offers the Balik-Probinsya Program. A process is in place for applications to the program. Those who would be displaced may choose this option but DSWD should first ensure that they could be accommodated by the receiving LGUs.
Affected area and the number of PAPs • Information on the affected area • Tentative number of project-affected ISFs	 • The affected area may be subject to change depending on the detailed design. This is a feasibility study and that the number may be increased or decreased. • The ISFs would be consulted and would be provided with sufficient information regarding the project. • The information gathered in the F/S stage would be used for planning purposes. The list of affected households and the percent of the structure affected by the project, as well as receive corresponding entitlement will be provided in the draft RAP.
Relocation site • Preference on the Community Mortgage Program (CMP)	 • Only the qualified beneficiaries only those in the affected areas will be relocated. Their proposal has been considered with LGUs and relevant government agencies.

Source: JICA Study Team

5) Stakeholder Consultation Meeting for Draft RAP (Relocation Sites)

Four consultation meetings were conducted for PAPs, LGUs and concerned stakeholders in Valenzuela and Bulacan. The main issues and concerns are summarized in Table 7.1.48.

On the fourth round of public consultation meeting, the discussion was focused on relocation sites, land appraisal, validation of census/survey, compensation and eligibilities/entitlement. No major objection was noted. The people are more interested in knowing the project timeline and other details of the implementation, plans for relocation and the processes on land acquisition.

Table 7.1.48 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for Draft RAP (Relocation Sites)

Major Opinions/Concerns	Reflections/Countermeasures
Project timeline	
• End of F/S and Date of Release of Final Alignment • Date for finalization of NSCR alignment	• The finalized alignment would be conducted in the detailed design stage in 2014. The affected PAPs would be finalized in 2015 and the expected date of operation of the commuter railway is in 2020.
Right of way and tentative affected areas, structures and PAPs	
• Clarification on Socio-Economic Status of affected PAPs	• The project would affect both the ISFs and legal land and structure owners.
• Request for a copy of final affected area to be submitted to the LGUs	• A map of the affected area was presented. A copy and list of the affected area would be provided in the detailed design stage.
• Inquiry on percentage of structure affected by NSCR alignment	• The exact meters and portion of the affected structure will be finalized in the detailed design stage.
• Structure of PAP to collapse if portion would be chopped off by the project	• In such cases, if the structure would not stand or would collapse, 100% (the whole structure) would be compensated.
• Clarification on compensation for legal land and structure owners	• Legal land and structure owners would be entitled to full replacement cost/compensation for the structures.
• Part of structure previously acquired by the government and concern regarding the blocking of the entrance to one's own house	• Access to entrance and improvements would be considered in the detailed design stage.
• Concern regarding door of PAP's house which would be affected by the project	• PAPs would be compensated based on the cost of the materials in the affected area.
• Part of structure was acquired by Northrail	• The NSCR is a new project and is at the Feasibility Study stage. While the Northrail project was suspended, the Philippine government will cover the cash compensation and/or relocation package under the NSCR Project.
Eligibility for relocation, relocation site	
• PAP (renter) asked by structure owner to vacate the structure	• ISFs, regardless of whether they are structure owners, renters and/or sharers, who (1) have been censused in October 2013, (2) have not received previous housing assistance from the government, (3) are included in the masterlist (4) part of the affected area and (5) agree to have their structures dismantled are eligible for relocation. Such concerns can also be raised to and discussed in the LIAC once it has been convened.
• Legal structure and landowner inquiry regarding possibility of acquiring a house in the relocation site	• The legal land and structure owners would be paid in full for their structures. However, they are not qualified for the relocation site.
• Suggested relocation site near their current source of income	• The PAPs may choose a relocation site based on those proposed in the survey. The factors considered for relocation – such as proximity to livelihood and source of income would also be considered.
• Inquiry regarding the proposed relocation site	• The results of the interview survey indicated that the PAPs suggested Lias. This is located in Barangay Lambakin, which was presented earlier as a candidate relocation site. • Candidate relocation sites would be considered and determined by the LIAC.

Major Opinions/Concerns	Reflections/Countermeasures
Compensation	
• Amount of compensation for structure	• Legal land and structure owners will be compensated according to the full replacement cost of the structure.
• Qualified beneficiaries	• As long as the PAPs are in the census list, agree to the dismantling of the structures and have not availed of any previous government housing assistance, they are eligible for compensation - regardless of whether they are structure owners, renters or sharers. However, the renters and sharers will be provided with disturbance fee and/or rental subsidy while the replacement cost will be provided/given to the structure owner.
• Vulnerable household's (female senior citizen and paralyzed male household head) request for eight (8) to ten (10) month notice between relocation and/or provision of cash compensation	• PAPs would be provided with a rental subsidy. PAPs would be paid prior to relocation and construction and that the project would not begin unless all the PAPs are provided with just compensation (or relocation). As a member of the vulnerable sector (senior citizen and elderly), they would also be granted additional allowance.
Validation of Census Survey	
• The PAPs who are refused to be interviewed last October	• It was clarified that those who were invited are those affected by the project. A structure map was also presented. The PAPs who are refused to be interviewed should be interviewed. It was resolved that the R.I.s would stay after the meeting so they may be interviewed.
• Protocol for interview survey	• JST emphasized that there would still be other consultations and validation to ensure that the PAPs would be provided entitlement under fair terms.
• Not censused last October and not in Masterlist but neighbors are PAPs	• The PAP was advised to raise this concern to the LIAC and present evidence that they reside in the said evidence. A grievance redress mechanism would be implemented. The Resettlement Action Plan includes the details for the eligibility for relocation. All those affected would also be asked for necessary requirements proving their residency in the area.
• Clarification on interview survey (first time attendee in Public Consultation Meeting) and request to be re-interviewed	• Based on the survey data, the PAPs were interviewed for clarification.
Land swapping	
• Suggestion on land swapping	• JST clarified that structures with 20% or more of the structures affected would be considered for displacement. The responsible organization for the project is DOTC. The possibility for land swapping should be raised to and discussed at the level of the LIAC.
Land expropriation	
• Suggestion on possibility for land expropriation	• Those who refuse to move out and/or vacate the land may bring the issue to court in accordance with Republic Act 8794.
Land titles	
• Agency and/or organization responsible for the preparation and transfer of land titles	• The transaction cost would be covered and facilitated by the government. Based on the policy, all transaction costs would be covered by the Philippine government.
• Land appraisal	• The appraiser would consider the zoning as indicated in the Comprehensive Land Use Plan, as well as the surrounding structures. The data from the questionnaire would be used to determine the fair market value. The final decision on the appraised value would be decided by the LIAC.

Source: JICA Study Team

7.1.11.2 Stakeholder Consultation Meetings (Caloocan to Tutuban)

1) IEC Meeting

Six IEC meetings were conducted to introduce and explain the NSCR project, to seek the endorsement of

the project for the Regional Development Council (RDC) and to request for the support of Manila in coordinating with the barangays and securing the documents integral to the preparation of the Environmental Impact Assessment (EIA) and Resettlement Action Plan (RAP).

The main participants include DOTC, LGUs (Manila and Caloocan), the Environmental Management Bureau (EMB), National Housing Authority (NHA) and the National Historical Commission of the Philippines.

The main issues and concerns are summarized in Table 7.1.49. Issues raised include the (1) station locations and total distance, (2) NSCR in line with Segment 10, (3) project implementation issues, (4) soil testing in affected areas, as well as the (5) temporary employment and relocation preferences of PAPs and vendors.

Table 7.1.49 Summary of Main Opinions and Concerns during the IEC Meetings

Major Opinions/Concerns	Reflections/Countermeasures
Station Location, Total Distance	• The project would pass by Samson Road in Caloocan. Distance from Malolos to Tutuban is 37.9 meters.
NSCR Project and Segment 10.2 • Would NSCR affect DPWH's Segment 10.2?	• The NSCR Project would utilize the existing PNR ROW – and would be at the second level.
NEDA Board Approval, Endorsement to the Regional Development Council, Project Bidding and Timeline concerns • Has the project been approved by NEDA? • When is the date of bidding for the project? • The Mayor mentioned that they will not reject and/or disagree with the Project and Mayor requested DOTC to provide them a form for the Endorsement to the RDC.	• The project was approved by the NEDA-Investment Coordination Committee Technical Board (NEDA-TB) and is scheduled for discussion in the NEDA Cabinet Committee. JICA is currently waiting for the NEDA approval. In line with this, DOTC is requesting for the mayor's endorsement of the project to the Regional Development Committee (RDC). • The Mayor's comments were noted.
Soil testing in affected area	• To be conducted in detailed design stage
Temporary employment for PAFs	• The law requires that priority be given to hiring the residents from affected barangays.
PAFs • Will the project affect the residents of Caloocan?	• NSCR would utilize the existing PNR ROW, so no PAPs in Caloocan would be directly affected.
Relocation of PAFs: Number of PAFs, Inter-agency Coordination • NHA inquired regarding the need to relocate families since the project intends to set up elevated stations. • According to NHA, it would be easy for them to relocate 26 families (households, but they need time for preparation. • NHA Board Approval is needed for off-city relocation. Would there be an increase in the PAFs? • The medium-rise buildings (MRBs) due to Dagupan Street Extension in Tondo, Manila were LGU-initiated. NHA extended their assistance and coordinated with Manila to relocate 66 families in 3 MRBs.	• The project would be elevated, but it would need additional ROW especially along the Tutuban station. • The comment of NHA was noted. • There was a cut-off for the tagging of affected families. • NHA's comments were noted.
Relocation preferences for vendors: • Vendors requested that they be allowed to continue vending activities even during construction phase.	• A separate meeting was held with the group of vendors along Barangay 15 to determine their relocation preferences and considerations.
Previous RAP and Future Plans for Relocation • NHA is willing to extend their support by providing data on existing and current relocation sites in the affected barangays. • In terms of relocation activities in Caloocan and Manila, NHA mentioned that the cleared areas have been turned over to PNR.	• NHA's comments were noted
Request to meet with barangay representatives	• A separate consultation was conducted

Major Opinions/Concerns	Reflections/Countermeasures
PNR for transporting cargo: • It was suggested that PNR be used to transport cargo for the heavy materials instead of the container van trucks.	• The suggestion in the meeting with Caloocan r has been noted. According to DOTC, they are looking into the possibility of developing Tutuban as a Transit-Oriented Development (TOD).
Northrail and NSCR project • Clarification regarding Northrail and NSCR Project • The mayor expressed reservations regarding the delay of the project - especially its possible delay due to a change in administration.	• Northrail Project was suspended. The NSCR Project was recently the Airport Express Railway (AER) Project – but has been renamed as such (and was intended to run from Malolos to Tutuban). • The Mayor's comments were noted

Source: JICA Study Team

2) Stakeholder Consultation Meeting for EIA and RAP Scoping Meeting

Six stakeholder consultations were held with PAPs in the City of Manila and in Caloocan City. The main opinions and views of participants are summarized in Table 7.1.50.

During the first public consultation meeting with the people in Caloocan and Manila, the study team found out that the common issues in both areas are the project boundary, determination of affected structures and compensation.

In Manila, PAPs do not express objection to the project but are anxious to know the exact alignment, boundary and covered width of the project to determine whether their structures are affected or how much will be affected so they can plan ahead of time.

In Caloocan, on the other hand, the main concern of the people is the possible effect of the project construction to their livelihood. The vendors at 10th Avenue in Caloocan expressed their willingness to be relocated, however, since majority of them are legitimate residents of Caloocan, they prefer to continue vending within Caloocan.

Table 7.1.50 Summary of Main Opinions and Concerns during the EIA and RAP Scoping Meeting

Major Opinions/Concerns	Reflections/Countermeasures
Alignment, project boundary and affected areas • How many meters would be acquired for the project? • Boundary of the project	• The exact number of meters would be provided during the detailed design stage. At present, the project will utilize the existing PNR ROW. • Engineers would be checking the alignment in order to measure or estimate the affected area.
Census concerns • Reason for conducting census • Death of PAP previously included in census • Requirements for those who will be censused	• The census is one of the requirements of JICA as part of the assessment of the economic and social conditions. • Legal heir of the deceased will receive the payment for the structure. • No tax declaration is required from the informal settlers.
Pending formal legal complaints in areas where informal settlers reside in the City of Manila	• Team will coordinate with NHA to determine the previous location of the relocatees and the status of the three (3) MRBs.
Qualified PAPs • Are those whose houses were tagged and/or provided with stickers the houses to be affected by the project? • Some houses were awarded by the government. Would they be considered as a legal PAPs? • A portion of barangay 186 in Manila has an existing court proceeding. • In particular, a PAP from Barangay 204, Manila requested that they be moved to an open area so that they are no longer affected.	• Houses tagged are most likely the ones which will be affected by the project • Awarding of a formal land title or the approval in the form of a Presidential Proclamation or Congress Bill is needed. • The proponent will carefully examine such court cases at the detailed design stage. • The team is open to suggestions on the proposed relocation sites and the existence of a vacant lot within the barangay has been noted.

Major Opinions/Concerns	Reflections/Countermeasures
• There are three options for informal settlers: (1) in/off-city relocation, (2) compensation equivalent to minimum wage for 60 days and (3) trucking assistance. The PAPs hope that the benefits provided would be fair.	• JICA abides by international standards for just compensation and ensures that the needs of the vulnerable sectors are considered.
Possible Relocation Sites: Medium-Rise Buildings in Barangay 186, Manila Temporary vending areas for Caloocan Vendors	
• MRBs were supposed to be constructed in the area where informal settlers now reside.	• The team is coordinating with NHA to check the availability and feasibility of the construction of MRBs to secure relocation sites for the PAPs.
• Permission to continue vending during project construction	• The recommendation was noted and JST met with the Caloocan Mayor to discuss this possibility.
<u>Vending Activity in Caloocan</u>	
• JST inquired regarding the peak time for selling and the duration of the stay of the vendors.	• Peak time for selling is in the morning and evening and during holidays (Christmas, New Year, town fiestas) and the months of December and February. Some of them have been selling in the area for at least six (6) years.
• JST inquired if the vendors receive notices to vacate the place	• The vendors have requested the government to be relocated but there is no place provided. As such, they continue vending in the area.
Compensation for Community-Mortgage Program Beneficiaries, Private Land Owners and Renters, etc.	
• A PAP added improvements to their structure which they acquired through the CMP.	• They cannot yet make decisions or determine how to deal with such cases, but the concern was noted. Under R.A. 8974, however, private property cannot be used for public consumption without just compensation.
• Compensation for private land and lot owners	• Corresponding replacement cost would be provided.
• Compensation for house owners who do not own the lot?	• For those who own lots, quotations for suppliers of construction materials and construction of builders and contractors would be estimated.
• Change in ownership: use of maiden name in CMP	• A valid ID (using the PAF's maiden name) should be presented as proof of ownership.
Detailed Engineering Design	
• Presence of a post in the middle of the train	• To be addressed in detailed engineering design stage
Project Timeline	
• Release of survey results	• A consultation meeting would be held to discuss the results of the survey
• Start of construction	• The target start of the construction stage is the last quarter of 2015.
Consultation with Barangay members	• A separate meeting was held at barangay-level
Existence of historical site within Caloocan	• To be checked with the records of the National Historical Commission of the Philippines (NHCP)
NSCR, PNR and Skyway	
• Leveling of the projects?	• For the time being, the NSCR will occupy the 2nd level and 3rd level for the skyway.
• PNR and NSCR projects would occupy the first and second levels. What about the operators?	• Since PNR is on the 1st level and the NSCR on the 2nd level, it is of necessity to have two operators serving different commuters.
• PNR to be phased out in the future?	• Yes. However, the decision is premature and there is no certainty given the possible change in administration
Construction phase	
• Placing of fences during construction	• The suggestion has been noted
• Construction of stations: simultaneous or by phasing?	• By phase
• Construction of posts and consequences on existing structures (Residential and building)	• Project engineers will make an in depth study on all aspects of the construction process
• Employment of PAPs during construction	• PAPs who are qualified as construction workers would be given priority.
Special services accorded to PWD based on existing law	• PWDs with heavy and bulky baggage are welcome and encouraged to utilize the services of PNR trains.
Environmental concerns: flooding	• There will be measures to mitigate flooding

Source: JICA Study Team

3) Stakeholder Consultation Meeting for EIA and RAP Survey Results

During the meeting conducted in Manila, the people were still anxious to know the exact number of structures that will be affected, the extent of the effect on their structures and whether those structures that are partially affected can still be dwelled in. The government is said to be looking for best possible options so that the PAPs may be relocated within the city or within Metro Manila to minimize the effect of displacement to their families. In Caloocan, the people inquired on the exact date of project construction. They also expressed their need for a public market within Caloocan. During the meetings, compensation, eligibility and entitlement were explained, but no major objection was noted.

Table 7.1.51 Summary of Main Opinions and Concerns during the Stakeholder Consultation Meeting for EIA and RAP Results

Major Opinions/Concerns	Reflections/Countermeasures
PAPs • Families affected in Brgy. 186, Manila? • Entitlements of unemployed senior citizens • Compensation for PAFs not paying local taxes	 • Only 13 structures will be affected for Phase I • Depends on the status of the senior citizen (i.e. as poor, as household head, etc.) • It is advisable that PAPs settle their tax problems
RAP Questionnaire • Reason for asking about work location and transportation cost	 • This is a JICA requirement to assess the impact of relocation on the livelihood of PAFs.
Relocation for PAFs • Informal Setters' preference for in-city relocation • Status of MRBs 1-3	 • JST is coordinating with NHA to request for and to determine available relocation sites • Based on the meeting with NHA, three of the six MRBs were not built due to lack of funds.
Compensation of PAFs based on size of affected structure • Size or percentage of affected area	 • Preliminary measurements will be given next meeting.
Construction phase • Date of construction	 • The project is currently at the F/S stage. The construction could take place in a year of the so
Recommendation: Stakeholder market in Caloocan city	• The team agrees that the City does not have its own public market. As such, they will coordinate with the government of Caloocan. A Masterlist of the vendors affected by the project will also be provided.

Source: JICA Study Team

7.1.11.3 Focus Group Discussion

Two Focus Group Discussions (FGDs) were held as shown in Table 7.1.52. The objective of the FGD was to discuss the basic concept of the North South Commuter Rail and the Social Preparation including the relocation site, and the draft and compensation entitlement.

The main concerns raised by FGDs are summarized in Table 7.1.53, together with how these concerns were reflected in the draft RAP. In particular, their assessment on how the vulnerable groups would be affected was discussed in Table 7.1.54. These issues shall be considered in the livelihood assistance measures.

Table 7.1.52 Focus Group Discussion

Date and Time	Venue	Target Affected Cities and Municipalities	No. of Participants
October 25, 2013 1:30pm – 3:30pm	Tabing Elementary School, Tabing Ilog, Marilao, Bulacan	Vulnerable Groups of Tabing Ilog and Abangan Norte, Marilao,Bulacan	28
April 13, 2014 1:30pm – 3:30pm	Inside the poposed depot site, Venite Reales, Valenzuela	ISFs inside the poposed depot site	20

Source: JICA Stusy Team

Table 7.1.53 Summary of FGD for Vulnerable Groups

Questions/ Suggestions/ Issues	Response
NSCR Project	
• Height of the railway	• Viaduct: 5 meters high. It is the usual height, and trucks can pass through.
Validation of census survey	
• Not censused last October	• The census and tagging was conducted after declaration of the cut-off date last October 2013. The PAP was advised to raise this concern to the LIAC and present evidence that they reside in the said evidence. A grievance redress mechanism would be implemented.
• Renter and sharer	• As well as the structure owners, renter and sharer are also qualified and clarified in the draft RAP.
• Informal settlers who are already relocated/compensated but return to the squatter area.	• Those who have received previous housing assistance from the government are disqualified and clarified in the draft RAP.
• Necessary documents for qualification	• Necessary documents will be specified by the LIAC such as marriage certificate, barangay certificate, voters ID, postal ID, etc.
Relocation site	
• Suggested relocation sites	• The preference of the relocation site should be considered in a relocation site development plan in the draft RAP.
Compensation	
• PAPs who wants to go back to the province	• Cash Compensation option is included in the draft RAP in addition to the relocation option.
• Agrucultural products	• Crops are compensated and also entitled to the disturbance compensation if they are tenant farmers. • Those ISFs who are required to be displaced will be provided livelihood assistance measures.

Source: JICA Stusy Team

Table 7.1.54 Assessment on How NSCR will Affect Vulnerable Groups

Youth Sector	Senior Citizen	Women	Others
• The school will be distant from the house • There will be an issue of schooling • Will be distant from work. • No internet access.	• There will be a limited access to hospital/health center • If relocated in high place, it will be difficult for senior citizens to walk.	• If the relocation is distant from the market, the livelihood and business will be affected and will be a problem • Women will be affected in the issues of 4P's especially if they are subject for relocation. • Will be distant from work. • Women who have a child will have difficulty of access to the Health Center.	• If relocated in a high area, there will be a problem with access to water • Everyone will be affected if the area is prone to flooding. • Will be distant from the barangay (for health purpose, 4P's, security) • Difficult access to transportation for emergency situations. • Emotionally, psychologically affected. Adjustment period.

Source: JICA Stusy Team

Note:1) 4Ps:Pantawid Pamilyang Pilipino Program (Family Subsistence Program for Philipino) by Department of Social Welfare and Development

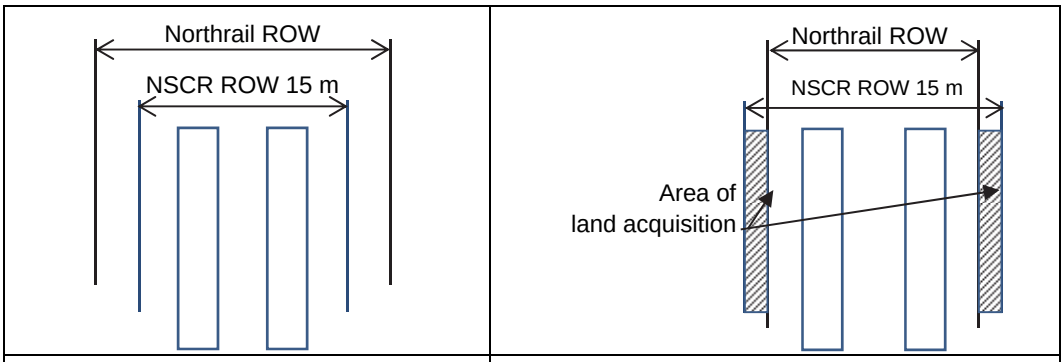
7.2 RAP

7.2.1 Potential Impacts by the Project

7.2.1.1 Project Components with Triggers to Resettlement

1) Additional ROW Acquisition for Railway Track

The required ROW width of the railway track for the NSCR Project is set 15 m all along the alignment (width of viaduct is 11 m plus 2 m easement at both sides). The easement is determined from the viewpoint of fire protection in accordance with the National Building Code of the Philippines. The image of additional ROW acquisition is depicted in Figure 7.2.1.



Source: JICA Study Team

Figure 7.2.1 Additional Railway ROW Requirement

Although the NSCR alignment will utilize the Northrail and ROW from Malolos to Caloocan, additional land acquisition will be needed due to the narrow portions of the existing ROW.

From Caloocan to Tutuban, since the NSCR ROW will be fitted inside the PNR ROW, no additional land acquisition will be needed except at the Solis junction. There is a future plan of the NSCR to extend it to further south of Metro Manila from Solis, up to Calamba, Laguna. This extension is yet determined, however, the minimum required crossover structure will be constructed by the NSCR project. Therefore, additional land acquisition will be needed at the Solis junction.

The additional ROW acquisition will affect not only the structures of residential homes but also commercial and industrial facilities. Displacement of Project Affected Families (PAFs) will be unavoidable when the affected structures are no longer viable for continued use.

Affected areas of the NSCR Project are shown in Figure 7.2.2. Refer to the satellite maps in Annex 1 for details.

2) Additional ROW Acquisition for Stations

Additional land acquisition will be needed to secure the space for the installation of the station facilities. The required ROW width of the station also includes 3 m easement at both sides. The easement of 3 m is determined based on the height of the station building in accordance with the requirement of the National Building Code of the Philippines.

Table 7.2.1 shows the necessity of land acquisition at 10 stations of the NSCR project from Malolos to Tutuban.

3) Depot

The proposed depot site is located in Valenzuela. The Northrail has rented 13.822 hectares of the property

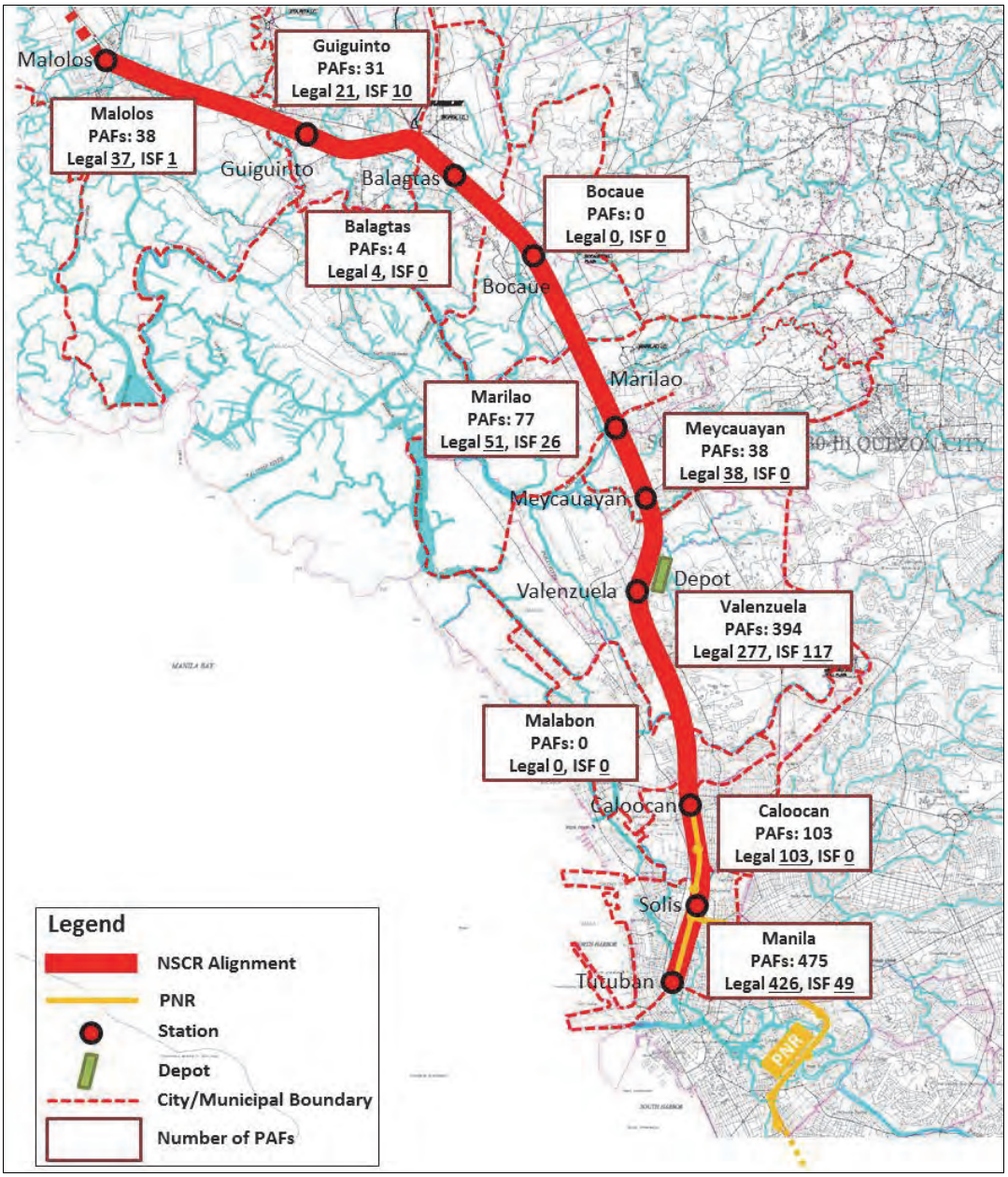
of National Food Authority (NFA) to be used as exclusively for the Depot and Station. According to the Lease Agreement between NFA and Northrail, the term for leasing is 25 years from the date of the signing of the Agreement on the 7th of February 2008. The transfer of the lease agreement from Northrail to DOTC has been discussed with Northrail. The amendment of this lease agreement will be made with NFA during the detailed design stage.

The required facilities for the NSCR operation will be fitted inside this site, no additional land acquisition will not be needed.

Table 7.2.1 Necessity of Land Acquisition at 10 Stations

Station	Description	Necessity of Land Acquisition	Necessity of Displacement of PAPs
Malolos	2 Platforms and 3 Tracks	Yes	Yes
Guiguinto	2 Platforms and 2 Tracks	Yes	Yes
Balagtas	2 Platforms and 4 Tracks	Yes	Yes
Bocaue	2 Platforms and 2 Tracks	No	No
Marilao	2 Platforms and 4 Tracks	Yes	Yes
Meycauayan	2 Platforms and 2 Tracks	Yes	Yes
Valenzuela	2 Platforms and 4 Tracks	Yes	Yes
Caloocan	2 Platforms and 2 Tracks	No	No
Solis	1 Platform and 2 Tracks	No	No
Tutuban	2 Platforms and 2 Tracks	No	Yes

Source: JICA Study Team



Source: JICA Study Team

Figure 7.2.2 Area to be Affected by the NSCR Project

7.2.1.2 Alternative Measures Considered to Avoid or Minimize Adverse Impacts due to Displacement

1) Route Options

The NSCR alignment will utilize the maximum Northrail and PNR ROW in order to minimize the additional land acquisition. Another alternative ROW option has been studied, such as the route along the North Luzon Expressway. However, the area to be acquired by the other option will be larger than the route along the Northrail, resulting in larger scale of resettlement.

2) Structure Type

There are 3 structural types of the railway track for the NSCR Project, i.e., Embankment, Viaduct or Underground as shown in Figure 7.2.3.

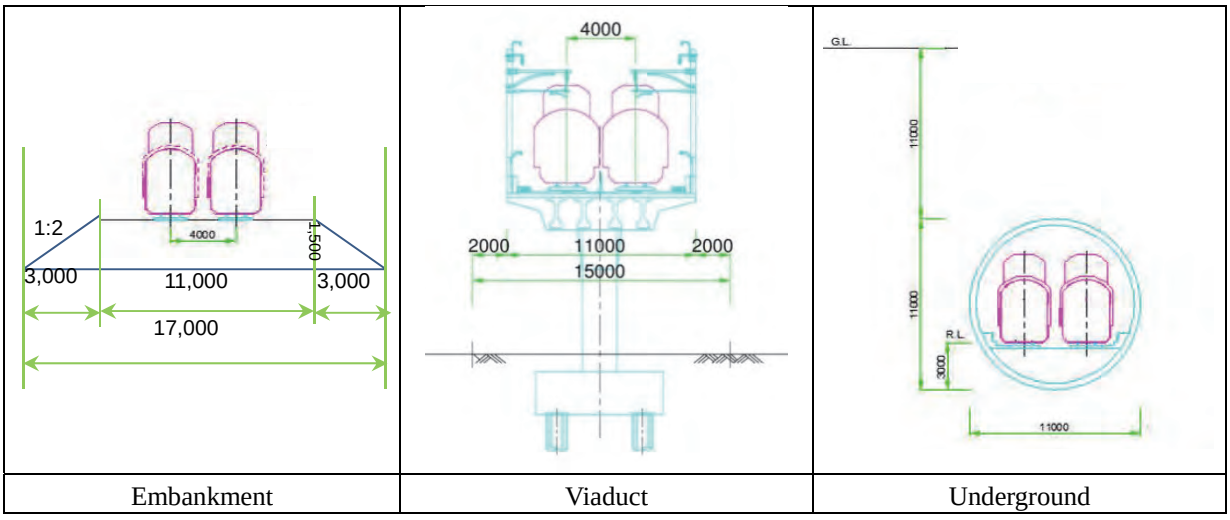
Although the area of land acquisition of the underground option will be smallest among the alternatives, the construction cost will be highest. Furthermore, there are no significant unavoidable obstacles on the ground. Therefore, the underground option will not be chosen for this section.

The embankment is the cheapest option; however, this option may require a wider railway ROW than the viaduct option. The required area of land acquisition will be larger than that of the viaduct option. However, the retaining wall can be used to reduce the land acquisition. Since the NSCR route goes through the flood prone zones, the embankment may increase the risk of flooding.

Therefore, the viaduct option will likely be selected for the NSCR from Malolos to Tutuban.

3) Further Study during Detailed Design Stage

Further study should be done to avoid and minimize the land acquisition and displacement of PAFs. The railway track should be redesigned to fit in the existing railway ROW and to avoid unnecessary land acquisition.



Embankment	Viaduct	Underground

Source: JICA Study Team

Figure 7.2.3 Additional Railway ROW Requirement

7.2.2 Objectives of the Rap

The objectives of this Resettlement Action Plan (RAP) for the North-South Commuter Railway (Phase 1) are to ensure that no affected persons shall be worsened off as a result of the NSCR Project and that:

- Adverse social and physical impacts are avoided, minimized, and mitigated;
- Stakeholders, and more importantly the Project-Affected Persons (PAPs), will benefit from the Project;
- PAPs are provided with sufficient compensation for lost assets and assistance with livelihood programs which will help them improve or at least restore their pre-project standard of living; and
- Resettlement activities are implemented with appropriate disclosure of information, consultation, and the informed participation of those affected.

All the above objectives will be done in accordance with the appropriate and applicable Philippine laws, policies and/or guidelines with consideration of policies and guidelines of the International Financing Institutions, particularly of World Bank and JICA's Guidelines for Environmental and Social Considerations.

7.2.3 Results of Socio Economic Survey

7.2.3.1 Census Survey

The census survey for the Malolos to Caloocan section was conducted for the affected cities and municipalities from October 10 to 17, 2013. The census survey for the Caloocan to Tutuban section was conducted from December 16 to 21, 2014 in Manila and from December 27 to 30, 2014 in Caloocan. In addition, the census survey for the tenants in Cluster Building II at Tutuban Mall was conducted from March 6 to 9, 2015. The cutoff dates were set on the beginning of the census and tagging activities.

The cut - off date has been disclosed to each affected barangays during the consultations prior to the conduct of census and tagging, and the barangays have disclosed to their constituent populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of project entitlements.

The project scope and its impacts will be reviewed during the Detailed Design stage, which is scheduled to be started in 2016. Thus, validation of census and tagging survey should be conducted through the Detailed Measurement Survey (DMS) at the detailed design stage.

In case no resettlement activities are conducted after two years from the said cut-off dates (October 10 - 18, 2013), the census data should be updated according to the World Bank “Involuntary Resettlement Sourcebook - planning and implementation in development projects (2004)”.

1) Affected Cities, Mnicipalities and Barangays

The NSCR Project will pass through ten (10) cities and municipalities from Malolos in the north to Tutuban, in Manila in the south. In two (2) of these cities and municipalities, namely Bocaue and Malabon, there are no project affected persons (PAPs), land and structures. The rest of the eight (8) cities and municipalities have PAPs, land and structures that are to be affected as shown in Table 7.2.2.

Table 7.2.2 Affected Cities and Municipalities and Corresponding Barangays by NSCR Project

	Cities and Municipalities									
	Manila	**Caloocan**	**Malabon**	**Valenzuela**	**Meycauayan**	**Marilao**	**Bocaue**	**Balagtas**	**Guiguinto**	**Malolos**
Barangays	Zone2 (Br.48,49, 50, 51,54)	D1, Zone 1 (Br.1,2,9)	Potrero	Karuhatan	Bancal	Ibayo	Lolomboy	Longos	Tuktukan	Tikay
		D2, Zone 1 (Br.5)	Tinajeros	Malinta	Banga	Saog	Bundukan	Burol First	Sta. Cruz	San Pablo
	Zone14 (Br. 152,155, 156, 159, 160, 161, 162, 163, 164, 165)	D2, Zone2a (Br.15,17)		Dalandanan	Tugatog	Tabing Ilog	Bunlo	San Juan	Tabe	Bagong Bayan
		D2, Zone3 (Br.21)		Malanday	Malhacan	Abangan Sur	Binang First		Poblacion	Mabolo
		D2, Zone3 (Br.25, 29, 32, 33)		Veinte Reales		Abangan Norte	Binang Second		Ilang-Ilang	Cofradia
	Zone16 (Br. 184, 185, 186)						Taal		Malis	Caniogan
		D2, Zone4 (Br.36, 37, 38, 43, 46)					Longos		Tabang	Catmon
	Zone18 (Br.198, 200, 203,204)	D2, Zone5 (Br. 49, 52)								Bulihan
	Zone20 (Br. 213, 214, 217)	D2, Zone6 (Br. 59, 63, 64)								
	Zone21 (Br. 221, 228, 232)	D2, Zone7 (Br. 73)								
	Zone22 (Br. 241)									

Source: JICA Study Team

Note: Gray areas represent unaffected Cities/Municipalities and Barangays by the NSCR Project.

2) Number of Project Affected Persons

The number of Project Affected Families (PAFs) is summarized in Table 7.2.3. The total number of PAFs is 1,160 households and 2,045 in population. The number of PAFs required for displacement is also presented in Table 7.2.3. The total of 300 PAFs are required to be displaced due to the loss of their dwellings. These PAFs consist of 72 legal residential structure owners and 28 legal renters, and 98 informal settler families (ISFs) structure owners and 102 ISF renters.

Table 7.2.3 Number of PAFs

Type of Loss	Number of PAFs			Number of Affected Population		
	Legal[*1]	ISFs[*2]	Total	Legal[*1]	ISFs[*2]	Total
Required for displacement						
Structure owners (Residential)	72	98	170	233	379	612
Structure owners (CIBEs[*3])	55	0	55	55	0	55
Renters (Residential)	28	102	130	145	428	573
Commercial Stall Tenants	79	0	79	79	0	79
Vendors	103	0	103	103	0	103
Subtotal	**337**	**200**	**537**	**615**	**807**	**1,422**
Not required for displacement						
Land owners[*4]	45	-	45	45	-	45
Structure owners (Residential)	30	3	33	30	3	33
Structure owners (CIBEs)	5	-	5	5	-	5
Structure owners (Institutional)	3	-	3	3	-	3
Renters (Residential)	20	-	20	20		20
Absentee structure owners	43	-	43	43	-	43
Workers (Employees of CIBEs)	474	-	474	474	-	474
Subtotal	**620**	**3**	**623**	**620**	**3**	**623**
Grand Total	**957**	**203**	**1,160**	**1,235**	**810**	**2,045**

Source: JICA Study Team

Note: 1) Legal: Land owners who have a full title such as Original Certificate of Title (OCT) or Transfer Certificate of Title (TCT) or other acceptable proof of ownership (e.g., Tax Declaration). (refer to Section 6.4.1)
2) ISFs: Individuals or groups/households who occupy a portion of the public or private lands without the express consent of the landowner, that is, have no recognizable title or other acceptable proof of ownership. (refer to Section 6.4.1)
3) Land owners who are affected only land and not structures due to land acquisition.

3) PAFs by Local Government Units (LGUs)

The total number of legal PAFs in all affected barangays is tabulated in Table 7.2.4.

Table 7.2.4 Legal PAFs by LGUs

Municipalities and Cities	Structure owners (Residential)		Structure owners (CIBEs)		Structure owners (Institutional)		Renters (Residential)		Absentee Structure Owner		Land Owners[*3]		Commercial Stall Tenants		Vendors		Workers (Employees of CIBEs)[*4]		TOTAL	
	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]	Stay[*1]	Move[*2]
Malolos	0	16	0	4	0	0	0	2	4	0	1	0	0	0	0	0	10	0	15	22
Guiguinto	2	6	0	0	1	0	0	0	4	0	2	0	0	0	0	0	6	0	15	6
Balagtas	0	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
Marilao	0	4	0	9	0	0	0	6	7	0	9	0	0	0	0	0	16	0	32	19
Meycauayan	6	0	2	0	0	0	10	9	2	0	1	0	0	0	0	0	8	0	29	9
Valenzuela	21	27	2	41	0	0	9	10	26	0	29	0	0	0	0	0	112	0	199	78
Caloocan	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	103[*5]	0	0	0	103
Manila	1	15	1	1	2	0	1	1	0	0	3	0	0	79[*6]	0	0	322[*7]	0	330	96
Grand Total	**30**	**72**	**5**	**55**	**3**	**0**	**20**	**28**	**43**	**0**	**45**	**0**	**0**	**79**	**0**	**103**	**474**	**0**	**620**	**337**

Source: JICA Study Team

Note: 1) Stay: Not required for displacement.
2) Move: Required for displacement.
3) Land owners who are affected only the land and not structures and improvements due to land acquisition
4) ncluding the number of employees of mixed use (residential cum small stores).
5) There are 103 ambulant vendors in PNR ROW on both sides of the railway tracks, 46 vendors in Barangay 15 and 57 vendors in Barangay 63 at the crossing of 10th Avenue in Caloocan City.
6) There are 79 tenants in the two affected commercial facilities in Tutuban Mall, Barangay 241, Manila due to the construction of Tutuban station.
7) There are 106 employees of commercial stall tenants in Cluster Building 2, 190 employees of Robinson Department and Supermarket Store, 19 employees of Metro Bank Tutuban Branch at Tutuban Mall.

The total number of ISFs is tabulated in Table 7.2.5. There are no ISFs in Balagtas, Bocaue, Meycauayan and Caloocan.

Table 7.2.5 ISFs by LGUs

Municipalities and Cities	Structure owners (Residential)		Structure owners (CIBEs)		Renters (Residential)		Total PAFs	
	Stay[1]	Move[2]	Stay[1]	Move[2]	Stay[1]	Move[2]	Stay[1]	Move[2]
Malolos	0	1	0	0	0	0	0	1
Guiguinto	0	6	0	0	0	4	0	10
Marilao	0	14	0	0	0	12	0	26
Valenzuela	0	52	0	0	0	65	0	117
Manila	2	25	1	0	0	21	3	46
Grand Total	**2**	**98**	**1**	**0**	**0**	**102**	**3**	**200**

Source: JICA Study Team

Note: 1) Stay: Not required for displacement.
2) Move: Required for displacement.

7.2.3.2 Affected Lands and Assets

1) Affected Lands

The total affected lands in 7 affected cities/municipalities is 160.655 square meters (about 1.6 ha) as shown in Table 7.2.6. In addition, the 13.822 hectares of proposed depot site at Valenzuela is also included in the affected lands.

Table 7.2.6 Affected Lands: Area (m^2)

Municipalities and Cities	Residential	Commercial	Industrial	Agricultural	Total
Malolos	3,201	0	241	0	3,441
Guiguinto	144	0	2,062	1,386	3,592
Balagtas	391	0	0	0	391
Marilao	89	3,978	0	312	4,379
Meycauayan	556	0	0	0	556
Valenzuela	2,157	4,230	139,236	87	145,710
Manila	2,405	180	0	0	2,585
Grand Total	**8,943**	**8,388**	**141,539**	**1,785**	**160,655**

Source: JICA Study Team

Note: 1) There is no affected structure in Barangay Ibayo, Marilao. The only land will be affected by the NSCR project.
2) Proposed depot site

2) Affected Structures

The total number of the affected structures is summarized in Table 7.2.7.

Table 7.2.7 Affected Structures

Municipalities and Cities	Residential	CIBEs	Institutional	Total
Malolos	17	3	0	20
Guiguinto	16	0	1	17
Balagtas	4	0	0	4
Marilao	20	8	0	28
Meycauayan	6	1	0	7
Valenzuela	126	42	0	168
Manila	44	3	5	52
Grand Total	**233**	**57**	**6**	**296**

Source: JICA Study Team

3) Affected Improvements

The total number of the affected improvements is summarized in Table 7.2.8. There are no affected improvements in Boacue, Marilao, Caloocan and Manila.

Table 7.2.8 Affected Improvements

Municipalities and Cities	Residential	CIBEs	Institutional	Total
Malolos	25	6	0	31
Guiguinto	1	0	0	1
Balagtas	1	0	0	1
Meycauayan	2	0	0	2
Valenzuela	1	8	0	9
Grand Total	**29**	**14**	**0**	**44**

Source: JICA Study Team

4) Affected Crops and Trees

In Valenzuela depot, there are ISFs who cultivate palay. The cultivated area is about 0.4 ha (4,000 m^2). The total number of the affected trees is summarized in Table 7.2.9. There are no affected trees in Balagtas, Marilao, Bocaue, Meycauayan, Caloocan and Manila.

Table 7.2.9 Affected Trees

Municipalities and Cities	Trees (Fruit Bearing[*1])	Trees (Timber, Non-Fruit Bearing[*2])	Plants/ Cash Trees	Total
Malolos	26	3	4	33
Guiguinto	17	6	3	26
Balagtas	0	0	0	0
Marilao	0	0	0	0
Meycauayan	0	0	0	0
Valenzuela	90	248	19	357
Manila	0	0	0	0
Grand Total	**133**	**257**	**26**	**416**

Source: JICA Study Team

Note: 1) Fruit bearing trees: Mango, Coconut/Buco, Jackfruit/Langka, Santol, Kamatchile, Duhat, Tamarind/Sampaloc, Aratiles/Manzanita, Guava/Bayabas, Macopa, Kaimito, Avocado, Atis, Casoy/Kasuy
2) Timber, Non-fruit bearing trees: Narra, Acacia, Talisay, Bangkal, Balite
3) Plants, Cash crops: Banana, Papaya, Atsuete, Malunggay, Cassava, Cacao

7.2.3.3 Household Livelihood Survey

The household livelihood survey for the PAFs was conducted from October 10 to 17, 2013 for Malolos to Caloocan, from December 16 to 21, 2014 in Manila, and from December 27 to 30, 2014 in Caloocan. The interview survey was conducted together with the census survey using the questionnaire (Annex 3). About 70% of censused PAFs provided the answers to the household livelihood survey from Malolos to Caloocan, while most of PAFs were covered in Manila and Caloocan although the response rates were different in questions ranging from 30% to 90%.

1) Key Profile of Project Affected Households

a) Affected Population by Gender

Of Project Affected Persons (PAPs), 52.1% are male and 47.9% are female.

b) Size of Household

Majority (60%) of the households have equal to or less than 4 members. The average number of household members of residential including mixed use is about 4.0.

c) Age

Total number of PAPs is 1,955. Out of 1,955, 1,268 or 64.8% are belonging to the working age between 17 to 60 years old. Young generation between 0 to 16 is 549 or 28.1 %. The elderly over 61 years old is 138 or 7.1%.

d) Educational Attainment

Out of 1,294 PAPs, 33.1% are elementary graduate, 42.5% are high school graduate, and 22.6% are collage graduate.

e) Length of Stay in Present Place

Of the PAPs, majority (58.7%) live at the current place for less than 10 years, while 41.3% live at the current place for more than 10 years.

f) Reason for Establishing Residence in Present Place

The most common reason for establishing the residence in the present place was “Family Ties” for legal residents (28.0%), legal commercial and business owners (53.8%) and also ISFs (26.7%). “Proximity to Livelihood” was the second common reason to establish the residence in the present area, for PAFs of three categories, legal residents (22.2%), legal commercial and business owners (15.4%) and also ISFs (23.1%). Other reasons include “got married”, “affordable rent fee”, “no other place to go”, and so on.

2) Livelihood of Project Affected Households

a) Employment Status and Source of Income of Household Heads

45.3% of household heads are employed. Out of 45.3%, only 14.3% of the household heads are permanent employed and 31.0% are contractually or temporary employed. 35.0% of household heads are business owner or self-employed. Among 35.0%, 4.9% are engaged in formal business and 30.1% are informal business. 19.6% of household heads are unemployed at the time of the census survey.

b) Primary Occupation

The households are engaged in a variety of occupations. Occupations that do not require much skill such as factory workers (11.4%), driver (7.7%) and carpenter/labor (8.0%) are relatively large number. Also 8.8% are vender and have small business on their own.

c) Monthly Income of Household

34.8% of the households has a monthly income of PhP10,000 and below indicating that many are still below the poverty threshold of the NCR, about PhP 10,084 (Philippine Statistics Authority, 2012). 16.1% of the monthly households income ranges between 10,000 and 15,000. 49.2% of the affected families have a monthly income of more than Php15,000.

d) Monthly Expenditure of Household

Most of the households (68%) spend less than PhP10,000 and below. This means that majority of PAFs live within the monthly income. 26.8% spend PhP10,000 to 30,000. 3.0% spend more than PhP30,000.

e) Location of Employment and Commutation Cost

As to the ratio of location of employment of male households, “within the same barangay”, “within the same municipality or city”, “within the same province” and “other province” are 31.8%, 19.9% 21.2%, and 27.2%, respectively.

On the other hand, that about 44% of female household heads work within the same barangay. About two third of female household head are working in the same municipality/city, including the number of women who work within the same municipality/city (22.9%).

The daily average cost is PhP51.70 for male household heads and PhP42.00 for female household heads. In general, the average commutation costs of female household heads are lower than that of the male household heads. This is because female household heads commute to within the same municipality/city, while male household heads commute to outside the municipality/city.

7.2.3.4 Social Vulnerable Persons

1) Gender of Household Head

Of all the household heads, 406 or 78.3% are men and 113 or 21.7% are women. Caloocan recorded the highest percentage of female headed (46 out of 103, 44.7%) or household.

2) Persons Who Need Special Assistance

93 PAPs were identified as persons who need special assistance. Out of 93, 10 are physical and mental disabilities, 20 need assistance to walk, 27 need special medicare, 26 are seriously ill, and 2 have difficulties in communication.

3) Vulnerable Groups

The total number of vulnerable groups are summarized as below:

- Poor: 164 PAFs who have a total family income below the poverty threshold of Php10,000.
- Elderly: 119 PAPs who are over 60 years old.
- Women-headed household: 113 PAFs who are headed by a woman.
- Persons who need special assistance: 93 PAPs who need special assistance, such as persons with physical and mental disabilities, who needs assistance to walk, who needs special medical care, who have serious illness, who have difficulties in communication.

7.2.3.5 Awareness of the Project and Relocation Preference

The perception survey on the NSCR project for the PAFs was conducted from October 10 to 17, 2013 for Malolos to Caloocan, from December 16 to 21, 2014 for Manila and and from December 27 to 30, 2014 in Caloocan. The interview survey was conducted together with the census survey using the questionnaire. About 50% of censused PAFs provided the answers to the preception survey from Malolos to Caloocan, while most of PAFs were covered in Manila and Caloocan although the response rates were different in questions ranging from 40% to 70%.

Awareness and Acceptance of the NSCR Project

1) Awareness of the NSCR Project

According to the answered 420 PAFs, majority (305 or 72.6%) have an awareness of the NSCR project, while 115 or 27.4 did not aware to the NSCR. This is because this is not new to them. They knew it through the Northrail Project some years ago.

2) Acceptance of the NSCR Project

Most (341 or 81.8%) of the 417 PAFs accept the NSCR project. There is no single city/municipality where the dominant answer is negative. Among the affected cities and municipalities where majority are ISFs, the responses are still positive.

3) Willingness to Relocate

Based on the interview results of both ISFs and non ISFs, most (309 or 82%) of 403 PAFs are willing to be relocated.

a) Preference on Relocation Sites

According to the result of interview with the affected ISFs, 182 or 70.3% of ISFs prefer the relocation package option. On the other hand, 77 or 29.7% preferred to cash compensation.

Majority (62.1%) of PAFs prefer to be relocated within the same barangay, 13.4% of PAFs prefer to be relocated to near the barangay, and 17.7% prefer in the same municipality/city.

Based on the result of the interview with the ISFs, the three most common factors in choosing the relocation site are “Proximity to current job/source of income”, “Proximity to market place”, and “Proximity to basic social services”.

b) Desired Basic Services and Facilities in Relocation Site

Market is the most desired facility (24.5%) in relocation sites followed by school (19.2%) and public hospital (18.2%). However, it must be noted that 32 of the respondents are vendors in Caloocan with affected business structures (stalls) only and not residential structures. If the analysis will be focused on those with affected residential structures only, school will be the most desired service/facility in a relocation site, followed by market and public hospital.

c) Types of Assistance Wished by Affected Households

Of the 404 surveyed households, 382 responded to the questions on the types of assistance they preferred, whether employment (jobs), business capitalization, and or livelihood training. Of the three types of assistance, Business Capital (59.2%) was the most preferred. Second is Employment (24.1%), and last is Livelihood Training (9.9%).

d) Results of Perception Survey

The main opinions and views of respondents are summarized below. These opinions are reflected in the entitlement matrix and selection of the relocation site.

- For the ISFs, in-city relocation sites should be provided if possible;
- For the ISFs, in addition to resettlement package option, provide the cash compensation option to go back to their place of origin; and,
- Assist the PAFs who will have to start or restart their business to access to the business capital loans with low interest rates.

7.2.4 Legal Framework

7.2.4.1 Legal Framework in the Philippines

The main laws and regulations on the land acquisition and involuntary resettlement in the Philippines are summarized in Table 7.2.10.

Table 7.2.10 Relevant Laws on Land Acquisition and Involuntary Resettlement in the Philippines

Laws	Provisions
The Philippine Constitution of 1987	• Private property shall not be taken for public use without just compensation. (Article III, Bill of Rights, Section 9) • Urban or rural poor dwellers shall not be evicted nor their dwelling demolished, except in accordance with law and in a just and humane manner. No resettlement of urban or rural dwellers shall be undertaken without adequate consultation with them and the communities where they are to be relocated. (Article XIII, Urban Land Reform and Hosing, Section 10)
Republic Act No. 7160 *(Local Government Code of 1991)*	• The power of eminent domain by the local government unit may not be exercised unless a valid and definite offer has been previously made to the owner, and such offer was not accepted.
Republic Act No. 7279 *(Urban Development and Housing Act of 1992)*	• The mandate of this Act is to uplift the conditions of the underprivileged and homeless citizens in urban areas and in resettlement areas by making available to them decent housing at affordable cost, basic services, and employment opportunities. • Socialized housing or resettlement areas shall be provided by the LGUs or the National Housing Authority (NHA) in cooperation with the private developers and concerned agencies with the basic services and facilities.
Republic Act No. 8974 *(An Act to Facilitate the Acquisition of Right-of-Way [2000])*	• This Act establishes a uniform basis for determining just compensation for immediate possession of the property involved in eminent domain proceedings. Whenever it is necessary to acquire real property for the ROW or location for any national government infrastructure project through expropriation, the appropriate implementing agency shall conduct mainly monetary compensation for land acquisition from the legitimate owners. • The government through the NHA, in coordination with the LGUs and implementing agencies concerned, shall establish and develop squatter relocation sites, including the provision of adequate utilities and services such as water, electricity, sanitation and transportation.
Indigenous Peoples' Rights Act (IPRA) of 1997	• The IPRA sets conditions, requirements, and safeguards for plans, programs, and projects affecting Indigenous Peoples. It spells out and protects the rights of Indigenous Peoples.
Executive Order (EO) No.1035, 1985	• EO 1035 provides the procedures and guidelines for the expeditious acquisition by the government of private real properties or rights thereon for infrastructure and other government development projects. • Financial assistance to displaced tenants, cultural minorities and settlers equivalent to the average annual gross for the last 3 years and not less than PhP 15,000 per ha.

7.2.4.2 Gaps between Philippines' Legal Framework and JICA Guidelines/WB Safeguard Policies on Involuntary Resettlement

A comparison of the Philippine's legal framework and JICA Guidelines/WB Safeguard Policies on involuntary resettlement and compensation was undertaken. Some gaps are observed as shown in Table 7.2.11. Therefore appropriate project polices to fill in the gaps are also proposed in Table 7.2.11.

Table 7.2.11 Comparison between JICA Guideline and Legal Framework in the Philippines on Involuntary Resettlement

JICA Guidelines	Laws of the Philippines	Comparison/Gaps	Project Policy to bridge the Gaps
1. Involuntary resettlement and loss of means of livelihood are to be avoided when feasible by exploring all viable alternatives.	No person shall be deprived of life, liberty, or property without due process of law, nor shall any person be denied the equal protection of the laws (Constitution of the Republic of the Philippines, Article III, Section 1).	There is no directly corresponding provision in laws of the Philippines, but no significant deviation is observed in the Philippines' policies.	The project shall explore various alternatives and select the most viable option where involuntary resettlement is minimized, while optimizing the railway alignment.
2. When population displacement is unavoidable, effective measures to minimize the impact and to compensate for losses should be taken.	Private property shall not be taken for public use without just compensation. (1987 Constitution of the Republic of the Philippines, Article II. Section 9)	There is no directly corresponding provision in laws of the Philippines, but no significant deviation is observed in the Philippines' policies.	The RAP will be prepared which will evaluate the impacts of the project to the PAPs and formulate the compensation and entitlements for the losses incurred in terms of land, structures, improvements and crops and trees.

JICA Guidelines	Laws of the Philippines	Comparison/Gaps	Project Policy to bridge the Gaps
3. People who must be resettled involuntarily and people whose means of livelihood will be hindered or lost must be sufficiently compensated and supported, so that they can improve or at least restore their standard of living, income opportunities and production levels to pre-project levels.	Monetary compensation is provided for the PAPs who have legal rights to land and structures (RA 8974). For informal settlers, relocation site and socialized housing program is developed by the National Housing Authority (NHA) and LGUs (RA 7279).	In the Philippine laws mentioned, there are no specific laws and guidelines which stipulate compensation for loss of income.	Based on the results of socio-economic surveys, the Income Restoration and Livelihood Development Program are considered in the RAP. For informal settlers, relocation site and socialized housing program is developed (RA 7279).
4. Compensation must be based on the full replacement cost as much as possible.	If the mode of acquisition is through a negotiated sale, the first offer shall be the zonal value of the particular land where the property is located, as determined by the BIR. If the owner rejects the first offer, the implementing agency shall renegotiate within the fair market values (RA 8974). Sec 10 of IRR of RA 8974 provides that the "valuation of improvements and/or structures" shall be determined using the Replacement Cost Method.	The BIR zonal valuation is determined based on the past records of land sales and so differs from the full replacement cost. Replacement cost in IRR of RA 8974 is for improvements and/or structures, but not for land.	The Project Policy on compensation is based on the full replacement cost for land, structures and other improvements in line with JICA guidelines.
5. Compensation and other kinds of assistance must be provided prior to displacement.	EO No.1035, 1985 requires that payments must be made at the time of relocation.	There is no directly corresponding provision in laws of the Philippines, but no significant deviation is observed in the Philippines' policies.	All compensation, entitlements and assistance shall be provided to PAPs before the start of the project, and before displacement.
6. For projects that entail large-scale involuntary resettlement, resettlement action plans must be prepared and made available to the public.	No specific law, but in practice relocation plans are preferred by the government. For instance, NEDA ICC Policy requires that "The proponent agencies should design and submit the right-of-way (ROW) acquisition plan and resettlement action plan.	The NEDA ICC does not require the RAP to be made available to public.	The draft RAP is prepared for this project and shall be accessible to public.
7. In preparing a resettlement action plan, consultations must be held with the affected people and their communities based on sufficient information made available to them in advance.	IRR of RA7279 requires an ample consultation for affected people. Constitution Article XIII Sec. 10: No resettlement of urban or rural dwellers shall be undertaken without adequate consultations with them and the communities where they are to be relocated.	In practice, conducted consultations are not ample enough and not cleared which comes first, is it resettlement plan or the consultation. Also, in practice, PAPs were just informed of the plan.	The consultation meetings are held for stakeholders and PAPs. Their opinions and comments are reflected in the RAP.
8. When consultations are held, explanations must be given in a form, manner, and language that are understandable to the affected people.	DENR Administrative Order No. 96-37 (To Further Strengthen the Implementation of the Environmental Impact Statement System), requires under Section 2 that "All information about the proposed project or undertaking shall be presented by the proponent to the public in a language and manner that are easily understood.	There is no directly corresponding provision in laws of the Philippines, but no significant deviation is observed in the Philippines' policies.	When the consultations are held, explanations and open forum are provided in Filipino, the national language.

JICA Guidelines	Laws of the Philippines	Comparison/Gaps	Project Policy to bridge the Gaps
9. Appropriate participation of affected people must be promoted in planning, implementation, and monitoring of resettlement action plans.	RA 7279 Sec. 23 requires LGUs in coordination with Presidential Commission for the Urban Poor (PCUP) and concerned government agencies, to enable program beneficiaries "to be heard and to participate in the decision-making process over matters involving the protection and promotion of their legitimate collective interests which shall include appropriate documentation and feedback mechanisms."	There is no directly corresponding provision in laws of the Philippines, but no significant deviation is observed in the Philippines' policies.	Consultations with PAPs are held during the preparation of the RAP, and appropriate participation of the PAPs is proposed in the internal and external monitoring mechanism. Increase people's participation in LIAC through their respective people's organizations.
10. Appropriate and accessible grievance mechanisms must be established for the affected people and their communities.	There is neither established law nor procedures requiring the establishment of a grievance mechanism.	There are no specific laws and guidelines which stipulate the grievance redress mechanisms in the Philippines.	The representatives of PAPs and NGOs are to be included in the organization of grievance redress mechanisms in the RAP through a body (LIAC).
11. Affected people are to be identified and recorded as early as possible in order to establish their eligibility through an initial baseline survey (including population census that serves as an eligibility cut-off date, asset inventory, and socioeconomic survey), preferably at the project identification stage, to prevent a subsequent influx of encroachers of others who wish to take advance of such benefits (WB OP 4.12 Para. 6).	There is an established provision under RA 7279 and its IRR where LGUs must conduct inventory of their ISFs. The conduct of survey and tagging are established practice by the Urban Poor Affair Office (UPAO).	No significant deviation is observed in the Philippines' regulations and policies.	The socioeconomic surveys are conducted for the affected areas in this study to prepare the draft RAP. The cut-off date is set on the beginning date of the census and tagging.
12. Eligibility of Benefits include, the PAPs who have formal legal rights to land (including customary and traditional land rights recognized under law), the PAPs who don't have formal legal rights to land at the time of census but have a claim to such land or assets and the PAPs who have no recognizable legal right to the land they are occupying (WB OP 4.12 Para. 6).	Under RA 7279, informal settlers: To qualify for the socialized housing program, a beneficiary: (a) Must be a Filipino citizen; (b) Must be an underprivileged and homeless citizen (c) Must not own any real property whether in the urban or rural areas; and (d) Must not be a professional squatter or a member of squatting syndicates (RA 7279).	There are the eligibility criteria for socialized housing program beneficiaries. Professional squatters and squatting syndicates are not eligible for compensation.	Based on the results of socio-economic surveys, the entitlement matrix is proposed for both legal asset owners and informal settlers.
13. Preference should be given to land-based resettlement strategies for displaced persons whose livelihoods are land-based.	A property needed for exchange with other government property near the project site (RA 8974 IRR Section 6).	Although RA referes to exchange with the government property, there is often no such property near the project site.	Exchange of lands is to be included in the compensation options.
14. Provide support for the transition period (between displacement and livelihood restoration) (WB OP 4.12 Para. 6).	RA 7279 Section 28 says that relocation is not possible within the said period (45 days), financial assistance in the amount equivalent to the prevailing minimum daily wage	There are no specific laws and guidelines which mention the transition period. RA 7279 is not clear on the nature of this	This transitional support will be indicated in the RAP and implemented by a body, such as LIAC.

JICA Guidelines	Laws of the Philippines	Comparison/Gaps	Project Policy to bridge the Gaps
	multiplied by sixty (60) days shall be extended to the affected families by the local government unit concerned.	"transition" support.	
15. Particular attention must be paid to the needs of the vulnerable groups among those displaced, especially those below the poverty line, landless, elderly, women and children, ethnic minorities etc. (WB OP 4.12 Para. 6).	RA 8972 provides benefits and privileges to solo parents and their children (solo parents include unmarried mother/ father, widow/widower, abandoned /separated). Under this law, they are given allocation in housing projects with liberal payment terms (Sec. 10), medical assistance (Sec. 11) and educational scholarship benefits (Sec. 9). RA 7279, for informal settlers below the poverty line and landless, requires preparation of relocation sites. Other related laws of the Philippines address needs of vulnerable groups: • RA 8425 (Social Reform and Poverty Alleviation Program Act) • RA 9710 (Magna Carta of Women) • RA 8371 (Indigenous Peoples Rights Act) • RA 7277 (Magna Carta for Disabled Persons)	There is no gap.	The RAP must identify "vulnerable groups" who will be affected by the project and establish the nature of its support and shall be implemented by a body, such as LIAC.

Source: JICA Study Team

7.2.5 Project Resettlement Policy

7.2.5.1 Fundamental Project Policy

i) The Government of the Philippines will adopt the Project Resettlement Policy (the Project Policy) for the NSCR project specifically because existing national laws and regulations have some gaps with the international practice, including JICA's policy. The Project Policy is aimed at filling-in any gaps in order to help ensure that PAPs are able to rehabilitate themselves to at least their pre-project condition.

This section discusses the principles of the Project Policy and the entitlements of the PAPs based on the type and degree of their losses.

Where there are gaps between the Philippines' legal framework for resettlement and JICA's policy on involuntary resettlement, practicable mutually agreeable approaches will be designed consistent with the Philippine Government practices and JICA's policy.

ii) Land acquisition and involuntary resettlement will be avoided where feasible, or minimized, by identifying possible alternative project designs that have the least adverse impact on the communities in the project area.

iii) Where displacement of households is unavoidable, all PAPs (including communities) losing assets, livelihoods or resources will be fully compensated and assisted so that they can improve, or at least restore, their former economic and social conditions.

iv) Compensation and rehabilitation support will be provided to any PAPs, that is any person or household or business which on account project implementation would have his, her their;

- Standard of living adversely affected;

- Right, title or interest in any house, interest in, right to use, any land (including premises, agricultural and grazing land, commercial properties, tenancy, or right in annual or perennial crops and trees or any other fixed or moveable assets, acquired or possessed, temporarily or permanently;
- Income earning opportunities business, occupation, work or place of residence or habitat adversely affected temporarily or permanently;
- Social and cultural activities and relationships affected or any other losses that may be identified during the process of resettlement planning.

v) All affected people will be eligible for compensation and rehabilitation assistance, irrespective of tenure status, social or economic standing and any such factors that may discriminate against achievement of the objectives outlined above. Lack of legal rights to the assets lost or adversely affected tenure status and social or economic status will not bar the PAPs from entitlements to such compensation and rehabilitation measures or resettlement objectives. All PAPs residing, working, doing business and/or cultivating land within the project impacted areas as of the date of the latest census and inventory of lost assets (IOL), are entitled to compensation for their lost assets (land and/or non-land assets), at replacement cost, if available and restoration of incomes and businesses, and will be provided with rehabilitation measures sufficient to assist them to improve or at least maintain their pre-project living standards, income-earning capacity and production levels.

vi) PAPs that lose only part of their physical assets will not be left with a portion that will be inadequate to sustain their current standard of living. The minimum size of remaining land structures will be agreed during the resettlement planning process.

vii) People temporarily affected are to be considered PAPs and resettlement plans address issue of temporary acquisition.

viii) Where a host community is affected by the development of a resettlement site in that community, the host community shall be involved in any resettlement planning and decision-making. All attempts shall be made to minimize the adverse impacts of resettlement upon host communities.

ix) The resettlement plans will be designed in accordance with Philippines' National Involuntary Resettlement Policy and JICA's policy on involuntary Resettlement.

x) The Resettlement Plan will be translated into the local language and disclosed for the reference of PAPs as well as other interested groups.

xi) Payment for land and/or non-land assets will be based on the principle of replacement cost.

xii) Compensation for PAPs dependent on agricultural activities will be land-based wherever possible. Land-based strategies may include provision of replacement land, ensuring greater security of tenure, and upgrading livelihoods of people without legal titles. If replacement land is not available, other strategies may be built around opportunities for re-training, skill development, wage employment, or self-employment, including access to credit. Solely cash compensation will be avoided as an option if possible, as this may not address losses that are not easily quantified, such as access to services and traditional rights, and may eventually lead to those populations being worse off than without the project.

xiii) Replacement lands, if the preferred option of PAPs, should be within the immediate vicinity of the affected lands wherever possible and be of comparable productive capacity and potential. As a second option, sites should be identified that minimize the social disruption of those affected; such lands should also have access to services and facilities similar to those available in the lands affected.

xiv) Resettlement assistance will be provided not only for immediate loss, but also for a transition period needed to restore livelihood and standards of living of PAPs. Such support could take form of short-term jobs, subsistence support, salary maintenance, or similar to those available in the lands affected.

xv) The resettlement plan must consider the needs of those most vulnerable to the adverse impacts of resettlement (including the poor, those without legal title to land, ethnic minorities, women, children, elderly and disabled) and ensure they are considered in resettlement planning and mitigation measures identified. Assistance should be provided to help them improve their socio-economic status.

xvi) PAPs will be involved in the process of developing and implementing resettlement plans.

xvii) PAPs and their communities will be consulted about the project, the rights and options available to them, and proposed mitigation measures for adverse effects, and to the extent possible be involved in the decisions that are made concerning their resettlement.

xviii) Adequate budgetary support will be fully committed and made available to cover the costs of land acquisition (including compensation, other entitlements and income restoration measures) within the agreed implementation period. The funds for all resettlement activities will come from the government.

xix) Displacement does not occur before provision of compensation and other assistance required for relocation. Sufficient civic infrastructure must be provided in the resettlement site prior to relocation. Acquisition of assets, payment of compensation, and the resettlement and start of the livelihood rehabilitation activities of PAPs, will be completed prior to any construction activities, except when a court of law orders so in expropriation cases. (Livelihood restoration measures must also be in place but not necessarily completed prior to construction activities, as these may be on-going activities.)

xx) Organization and administrative arrangements for the effective preparation and implementation of the resettlement plan will be identified and in place prior to the commencement of the process; this will include the provision of adequate human resources for supervision, consultation, and monitoring of land acquisition and rehabilitation activities.

xxi) Appropriate reporting (including auditing and redress functions,) monitoring and evaluation mechanism, will be identified and set in place as part of the resettlement management system. An external monitoring group will be hired by the project and will evaluate the resettlement process and final outcome. Such groups may include qualified NGOs, research institutions or universities.

7.2.5.2 Cut-off Date of Eligibility

The cut-off date of eligibility refers to the date prior to which the occupation or use of the project area makes residents/users of the same eligible to be categorized as PAPs and be eligible to Project entitlements.

In the Project, the cut-off dates were set as the beginning date of the census and tagging conducted for each municipalities/cities as shown in Table 7.2.12.

Table 7.2.12 Cut-off Date of Eligibility

Cities and Municipalities	Census and Tagging (Cut-off Dates)	First Round Public Consultations*
Malolos	October 10, 2013	Otctober 7, 2013, Hiyas Convention Center, Malolos, Bulacan
Guiguinto	October 11, 2013	
Balagtas	October 13, 2013	
Bocaue	October 14, 2013	October 8, 2013, Marilao Convention Center, Marilao, Bulacan
Marilao	October 15, 2013	
Valenzuela	October 17, 2013	
Meycauayan	October 17, 2013	October 9, 2013

Cities and Municipalities	Census and Tagging (Cut-off Dates)	First Round Public Consultations*
Malabon	NA	AVR B, Legislative Building, Municipality of Valenzuela City
Manila (Brgys 165, 184, 185, 186, 204, 217)	December 16, 2014	December 13, 2014, Barangay Halls of 186 and 204 City of Manila
Caloocan (Brgys 15, 63)	December 22, 2014	December 20, 2014, Barangay Hall, Barangay 15 , Caloocan City
Manila (Tutban Mall & Staion)	March 4, 2015	March 3, 2015, Tutuban Prime Block, City of Manila

Source: JICA Study Team

*****Cut-off Dates were announced during the consultations.
NA – Not Applicable. No affected structures and people in these areas.

This date has been disclosed to each affected barangay by the relevant local governments and the barangays have in turn disclosed to their populations. The establishment of the eligibility cut-off date is intended to prevent the influx of ineligible non-residents who might take advantage of Project entitlements.

7.2.5.3 Principle of Replacement Cost

All compensation for land and non-land assets owned by households/shop owners who meet the cut-off date will be based on the principle of replacement cost. Replacement cost is the amount calculated before displacement which is needed to replace affected asset without depreciation and without deduction for taxes and/or costs of transaction as follows:

i) For agricultural land, it is the pre-project or pre-displacement, whichever is higher, market value of land of equal productive potential or use located in the vicinity of the affected land, plus the cost of preparing the land to levels similar to those of the affected land, plus the cost of any registration and transfer taxes.

ii) For land in urban areas, it is the pre-displacement market value of land of equal size and use, with similar or improved public infrastructure facilities and services and located in the vicinity of the affected land, plus the cost of any registration and transfer taxes.

iii) For houses and other structures, it is the market cost of the materials to build a replacement structure with an area and quality similar or better than those of the affected structure, or to repair a partially affected structure, plus the cost of transporting building materials to the construction site, plus the cost of any labor and contractors' fees, plus the cost of any registration and transfer taxes.

iv) Annual crops equivalent to current market value crops at the time of compensation;

v) For perennial crops, cash compensation at replacement cost that should be in line with local government regulations if available, is equivalent to current market value given the type and age at the time of compensation.

vi) For timber trees, cash compensation at replacement cost that should be in the line with local government regulations, if available, will be equivalent to current market value of each type, age and relevant productive value at the time of compensation based on the diameter at breast height of each tree.

7.2.5.4 Eligibility and Project Impacts

Eligibility defines the PAPs who are covered by compensation and other entitlements / resettlement assistance. The project-related land acquisition will result in the physical displacement of people as well as their economic displacement whether these are based on legitimate or informal occupation of lands

including those who have no land title or tax declaration or other acceptable proof of ownerships and shanty dwellers.

1) Criteria for Eligibility

A Project Affected Person (PAP) is defined as any person or persons, household, firm or private of public institution who, on account of the involuntary acquisition of assets would have their rights, title or interest in all or any part of the house, land (whether residential, agricultural, commercial, industrial or institutional), annual or perennial crops and trees, or any other fixed or movable asset acquired or possessed, in full or in part, permanently or temporarily, and who might suffer income or business loss as a consequence thereof. In particular, a Project Affected Family (PAF) is used when the PAP indicates an affected family/household.

Eligible PAPs may fall under the following categories:

a) Land owners (residential, agricultural, commercial, industrial and institutional):

- Those who have a full title such as Original Certificate of Title (OCT) or Transfer Certificate of Title (TCT) or other acceptable proof of ownership (e.g., Tax Declaration)
- Those who are covered by customary law, e.g., Holders of Certificate of Land Ownership Award (CLOA) granted under the Comprehensive Agrarian Reform Act (RA6657); Holders of free or homestead patents and CLOA under Commonwealth Act (CA141: Public Land Act)

b) Structure owners (residential, mixed use[2], commercial and industrial and institutional):

- Owners of structures who also own the land where the structure is located in;
- Owners of structures who do not own the land where the structure is located in, but have the written permission (lease or rental contract) of the landowner to use the land;

c) Absentee structure owners:

- Owners of structures who also own the land where the structure is located in but do not dwell in the structure and offer it for rent.

d) Renters:

- Renters of residential structures who have the written permission (lease or rental contract) of the structure owners to use them.

e) Informal Settler Families (ISFs):

- Individuals or groups/households who occupy a portion of the public or private lands without the express consent of the landowner, that is, have no recognizable title or other acceptable proof of ownership.
- This shall include those who live in makeshift dwelling units and do not enjoy security of tenure (often referred to as squatters). ISFs are considered the owners of structures (r residential and CIBEs), including shanty dwellers, who do not own the land where the structure is located in, and do not have the permission of the landowner to use the land.

f) Small shops

[2] Mixed use: the structure is mainly used for residential but some parts are used for commercial

Those who sell their goods in small spaces which are in their dwelling place, or ancillary to their dwelling place, such as sari-sari stores, food stalls, repair shops (car repair, appliance repair, cellphone repair, etc.), dress shops, tailor shops, beauty parlors, etc. These businesses would normally earn from up to 10,000 pesos monthly, and may employ 1 (in the case of sari-sari store, usually a member of the household), or 2 to 3 people (in the case of food stalls or repair shops, who do the repairs work of appliances or cars; or seamstress or hairdresser in the case of dress shop and beauty shop), who may or may not be part of the household, They include those businesses that have permits or those without permits from the LGU concerned.

g) Micro, Small, Medium to Large Business

Any business activity or enterprise engaged in commercial, industry, agribusiness and/or services, whether single proprietorship, cooperative, partnership or corporation whose total assets, inclusive of those arising from loans but exclusive of the land on which the particular business entity's office, plant and equipment are situated; must have value falling under the following categories shown in the table below.

Table 7.2.13 Categoryies of Business Activty

Enterprise	Asset Size	Number of Employees
Micro	Up to Php 3,000,000	1 - 9 employees
Small	Php 3,000,001 - Php 15,000,000	10 - 99 employees
Medium	Php 15,000,001 - Php 100,000,000	100 - 199 employees
Large	Above Php 100,000,000	Over 200 employees

Source: Department of Trade and Industry

h) Vendors

Those who sell their goods in street pavements, sidewalks or public / private open space, with or without temporary enclosures. They may be stationary, using tables to display their goods for sale, or mobile, using carts or mobile means for displaying their goods for sale. These may include those with or without permits from concerned LGUs.

i) Commercial Stall Tenants

Those who pay monthly rent to the building owner for the use and occupation of a commercial stall in a commercial building or mall, to be able to sell their goods in the said stall.

j) Workers employed with the commercial and industrial establishment

Workers are regular, contracted or casual employees of affected commercial (including small shops, micro, small and medium to large business, vendors and commercial stall tenants) or industrial establishments, who will be displaced once the said affected establishments are relocated.

k) Vulnerable Groups:

Vulnerable groups in this RAP consist of the poor, the elderly, women headed household, and persons who need special assistance.

- Poor:
  - Those PAFs who have a total family income below the poverty threshold (to meet both the family's basic food and non-food needs). The poverty threshold is determined by the National Statistical Coordination Board as Php10,000 per month.

- Elderly:
    - A PAP who is over 60 years old.
- Women headed household
    - A PAF who is headed by a woman.
- Persons who need special assistance:
    - A PAPs who need special assistance, such as persons with physical and mental disabilities, who needs assistance to walk, who needs special medical care, who have serious illness, who have difficulties in communication.

2) Project Impacts

PAPs will be compensated in accordance with the significance of the impact (severe or marginal) on the affected properties. Properties to be acquired may include the entire area, or a portion of the properties.

There are two critical impacts that are expected from the ROW of the project:

- Severe (severely-affected) – for properties (land and structures / improvements) that are acquired for the project covering more than 20%; or if less than 20% but the remaining area is no longer economically viable or will no longer function as intended.
- Marginal (marginally-affected) – for properties (land and structures / improvements) that are acquired for the project covering less than 20%, and the remaining area is still viable for continued use.

For severely affected properties, the entire land and or structure including improvements, crops and trees shall be compensated at replacement cost.

For marginally affected properties, only the portion affected, including the improvements, crops and trees contained in the affected portions will be compensated at replacement cost.

Regarding the business activities such as commercial and industry, severe (severely-affected) means that the properties acquired for the project are covering more than 20%; or if less than 20% but the remaining portion is no longer economically viable to continue their business. Marginal (marginally-affected) means that the properties that are acquired for the project covering less than 20%, and the remaining area is still viable for continued use.

7.2.6 Measures of Compensation and Assistance

The adopted measures of compensation and assistance to all PAPs are based on the JICA Guidelines for Environmental and Social Considerations (2010) and World Bank OP 4.12 and other established and applicable Philippine Laws and similar policies and guidelines, such as the Republic Act No. 8974, otherwise known as An Act to Facilitate the Acquisition of Right-of-Way (2000) and Republic Act No. 7279, also known as the Urban Development and Housing Act of 1992. Also adopted for compensation and assistance is the Land Acquisition, Resettlement, Rehabilitation and Indigenous Peoples' Policy (LARRIP) (3rd edition, 2007) of the Department of Public Works and Highways.

7.2.6.1 Entitlement Matrix

Table 7.2.14 shows the Entitlement Matrix providing for compensation and entitlements for project affected families based on the type of impacts created by the project.

Table 7.2.14 Draft Entitlement Matrix

Type of Loss	Application	Entitled Person	Compensation	Responsible Organization
1. LAND **Classified as** **• Agricultural,** **• Residential,** **• Commercial,** **• Industrial**	More than 20% of the total landholding is lost or where less than 20% is lost but the remaining land holding becomes economically non-viable.	PAPs who have a full title such as OCT or TCT, or other acceptable proof of ownership (tax declaration) Holders of CLOA granted under the Comprehensive Agrarian Reform Act	• Cash compensation for loss of land at full replacement cost at the informed request of PAPs (free from taxes and transaction cost)	DOTC LIAC and /Implementing Agencies
		Holders of CLOA granted under Commonwealth Act 141	• No cash compensation for land • Cash compensation for structures and improvements therein, at full replacement cost, with no deductions for salvaged materials.	
	Less than 20% of the total landholding, and the remaining land is still economically viable.	PAPs who have a full title such as OCT or TCT, or other acceptable proof of ownership (tax declaration) Holders of CLOA granted under the Comprehensive Agrarian Reform Act	• Cash compensation for loss of land at full replacement cost at the informed request of PAPs (free from taxes and transaction cost)	DOTC LIAC and Implementing Agencies
		Holders of CLOA granted under Commonwealth Act 141	• No cash compensation for land • Cash compensation for the affected portion of the structures and improvements therein, at full replacement cost, with no deductions for salvaged materials.	
	Temporary impacts during construction (for use as access road, for soil dumping, borrow sites and contractor's camps, etc.)	PAPs who have a full title such as OCT or TCT, or other acceptable proof of ownership (tax declaration)	• Contractors will be responsible for paying rental at prevailing rental rates in the location of the property. • Restoration of land will also be the responsibility of the Contractors. • Affected non-land assets will be paid at replacement cost by the Contractors.	Contractors
2. STRUCTURES	More than 20% of the total landholding loss or where less than 20% loss but the remaining	PAPs who own the structure and also the land where the structure is located in; PAPs who own the structure but do not own the land where the structure is located in, but have the written	• Cash compensation for entire structure at full replacement cost (without depreciation or deductions for salvaged building materials). • In case for residential structures, rental subsidy equivalent to 3 months of rental payment for temporary dwelling place and relocation expenses, maximum amount of which will be determined based on	DOTC LIAC and Implementing Agencies

Type of Loss	Application	Entitled Person	Compensation	Responsible Organization
	structures no longer function as intended or no longer viable for continued use.	permission (lease or rental contract) of the landowner to use the land	city/municipality standards, but not more than Php 15,000.00.	
		PAPs who own the structure but do not own the land where the structure is located in, and have no written permission of the landowner to use the land	• Cash compensation for entire structure at full replacement cost (without depreciation or deductions for salvaged building materials).	DOTC LIAC and Implementing Agencies
		Absentee owners of affected structures	• Cash compensation for entire structure at full replacement cost (without depreciation or deductions for salvaged building materials).	DOTC LIAC and Implementing Agencies
		Renters of affected structures	• Rental subsidy equivalent to 3 months of rental payment for temporary dwelling place, maximum amount of which will be determined based on city/municipality standards, but not more than Php 15,000.00.	DOTC LIAC and Implementing Agencies
	Less than 20% of the total landholding lost or where the remaining structure can still function and is viable for continued use.	PAPs who own the structure whether or not they own the land where the structure is located in	• Cash compensation for the affected portion of the structure at full replacement cost, including the cost of restoring the remaining structure (without depreciation or deductions for salvaged building materials).	DOTC LIAC and Implementing Agencies
3. IMPROVEMENTS	Severely or marginally affected	PAPs who own the improvements whether or not they own the land where the structure is located in	• Cash compensation for the affected improvements at full replacement cost (without depreciation or deductions for salvaged building materials).	DOTC LIAC and Implementing Agencies
		PAPs who owns the structures (residential and CIBEs), except ISFs who opt to be relocated to the resettlement site.	• Cash Compensation to cover the cost of reconnecting the facilities such as water and power	
4. CROPS, TREES, PERENNIALS	-	PAPs with or without the full title of the land	• Cash compensation for crops, trees and perennials at current market value as prescribed by the following: o Department of Agriculture for crops o Department of Environment and Natural Resources for trees o LGU Assessors Office also for crops and perennials	DOTC LIAC and Implementing Agencies

Type of Loss	Application	Entitled Person	Compensation	Responsible Organization
5. INCOME LOSS	Severely affected	PAPs who own micro business; PAPs who own small shops (e.g., Sari-sari store, carinderia, food stand, repair shop, etc.) with or without permits from the LGU concerned	• Cash compensation equivalent to income loss based on the latest copy of the tax record or business permit for the period corresponding to the stoppage of business activities during demolition and reconstruction of their shop but not to exceed one month period. • Assistance to access to business capital loan with low interest rates if the PAP will have to start or restart their business at a resettled place.	DOTC LIAC and Implementing Agencies
		PAPs who own small, medium and large business establishment (including apartments for rent)	• Cash compensation equivalent to one month net income based on the average monthly net income over the period of 3 years, as declared by the PAPs at the Bureau of Internal Revenue (BIR).	DOTC LIAC and Implementing Agencies
		Workers employed with the commercial and industrial establishment, if they lose their jobs	• Cash compensation equivalent to one month salary (without loss of seniority and other benefits) as prescribed by Philippine Labor and the Regional Wage Board	DOTC LIAC and Implementing Agencies
		Venders (e.g., 10th Avenue) with or without permits from the LGU concerned	• Cash compensation equivalent to income loss based on the latest copy of the tax record or business permit for the period corresponding to the stoppage of business activities not to exceed one month period. • Assist to find the alternative sites to continue their business • Provision of rental subsidy to cover the rent at the alternative market • Transportation assistance	DOTC LIAC and Implementing Agencies
		Commercial Stall Tenants (e.g., Tutuban Center)	• Cash compensation equivalent to income loss based on the latest copy of the tax record or business for the period corresponding to the stoppage of business activities not to exceed one month period. • Assist to find the alternative sites to continue their business within the Tutuban Mall Complex	DOTC LIAC and Implementing Agencies
6. RESETTLEMENT FOR ISFs	More than 20% of the total landholding loss or where less than 20% loss but the remaining structures no longer function as intended or no longer viable for continued use.	PAPs (structure owners (residential)) without land titles or other acceptable proof of land ownership, in addition, who are qualified in accordance with the following conditions: a. Structure owners who actually occupying the structures b. Those who are classified as renters and sharers within the structure located inside the informal settlement	Resettlement Package Option: A: Affected ISFs who opt to be relocated to the resettlement site/s: • House and lot (to be amortized monthly by ISFs) • Transportation assistance from current living area to resettlement site • Food Assistance during transfer (minimum of three (3) days) • Special assistance for vulnerable households • Allowance to commute to working place and/or school (Php 10,000 per ISF) (only for vulnerable households, or ISFs whose family members need to commute to current working place and/or school) Or, B: Affected ISFs who opt to go back to their place of origin:	DOTC LIAC and Implementing Agencies

Type of Loss	Application	Entitled Person	Compensation	Responsible Organization
		c. The PAP has not availed of any government housing assistance. d. The PAP must agree to dismantle his/her structure that is erected in the affected areas of the project. e. The PAP must have included in the Census Masterlist[*1]	• The minimum daily wage multiplied by 60 days (RA7279 Article 78, Section 28, Paragraph 8) • Transportation assistance from current living area to resettlement site • Food Assistance during transfer (minimum of three (3) days) • Special assistance for vulnerable households	
7. VULNERABLE HOUEHOLDS	-	PAPs who are classified as: • Poor • Elderly • Women headed household • Persons who need special assistance	• Inconvenience allowance in the amount of Php 10,000. • For the families with persons who need special assistance and/or medical care, respective LGUs to provide nurses or social workers to help them before and during the resettlement activities.	DOTC LIAC and Implementing Agencies
8. LIVELIHOOD REHABILITATION ASSISTANCE	Severely affected (land, income loss)	PAPs whose present means of livelihood is no longer viable and will have to engage in a new income activity	• Rehabilitation assistance in the form of skills training and other development activities and equivalent to PhP 15,000 will be provided in coordination with other government agencies.	DOTC LIAC and Implementing Agencies, NHA
	-	Vulnerable households		
9. ADDITIONAL ASSISTANCE TO PAHS IN NORTHRAIL PROJECT[2]		Vulnerable households	• Rehabilitation assistance in the form of skills training and other development activities will be provided in coordination with other government agencies.	DOTC NHA

Source: JICA Study Team

Note:1) The Census Masterlist is based on the census survey conducted in October 2013. During the Detailed Design Stage, the Census Masterlist will be updated in accordance with the Detailed Measurement Survey (DMS) based on the final ROW/ affected area. 2) This is spontaneous assistance by DOTC. Details of assistance will be decided in the Detailed Design Stage through discussion with NHA and needs hearing to PAHs.

7.2.6.2 Income Restoration and Livelihood Development Program

The purpose of the income restoration and livelihood development program is to assist those severely affected households and those affected PAFs who are considered as vulnerable, in order to restore their income at pre-project levels and enable them to improve their livelihoods to better levels than before the project. Vulnerable households include those PAFs who live below the poverty threshold, the elderly, women headed households, and persons who need special assistance.

1) Beneficiaries

Beneficiaries of the income restoration and livelyhood programs are those severely affected households (e.g., land or income loss) and those affected PAFs who are considered as vulnerable.

2) Income Restoration and Livelihood Development Strategy

While the RAP addresses most of the measures to compensate PAFs, additional strategies are to be taken to provide the mechanisms for income restoration and livelihood development in order to enable the Vulnerable households / PAFs to be better off after relocation, than their previous condition prior to their displacement.

The strategy for income restoration and livelihood development will consist of short term and long term interventions to restore income and livelihood rehabilitation for vulnerable households under NSCR Project.

In order to sustain the income restoration and livelihood development program and its impact on the vulnerable PAFs, it will be important to monitor the relocated PAFs and assess their their ability to restore/improve living conditions after relocation. There should be monthly consultation meetings to determine the present income levels of the beneficiaries. The assessment in coping up with activities such as job hunting, engaging in small family business, women helping their husbands augment their income.

a) Short Term Interventions

i) As a short term measure, it is the responsibility of the proponent agency to provide the compensation and entitlements to all the PAFs prior to displacement. For the Vulnerable households, additional benefits are being provided as follows:

- Rehabilitation assistance in the form of skills training equivalent to the amount of Php 15,000.00 per family will be provided. This will be coordinated to the receiving LGU through livelihood programs (see above lists of skills training programs of national government agencies and LGUs)

  Additional cash allowance in the form of inconvenience allowance

  Special assistance and/or medical care

ii) The proponent agency will undertake a needs assessment and skills base assessment of the PAFs especially vulnerable households. It is ideal that during the finalization of the RAP at the detailed design stage, FGD consultations with the Vulnerable Groups be conducted to assess their current skills (if any) and gauge their interests in what skills they would like to acquire in order to enable them to have livelihoods. The proponent agency will then consolidate a needs assessment table to show the different skills of the Vulnerable Groups, and also a desired list of skills trainings and potential livelihoods.

iii) Employment in construction of infrastructure projects of DPWH, DOTC, NIA, DA (farm to market roads), and NSCR Project in accordance with RA 6685, where the infrastructure projects of these agencies are required to hire at least 50% unskilled and 30% skilled labor from the province, city, municipality where the projects are undertaken. The proponent will require the contractors to include this in their contract, and compliance to this will be monitored by the LIAC, through the IMA and EMA. Priority for employment in construction should come from the PAFs and vulnerable

households. This should be a continuing program for all PAFs, given that future projects will be undertaken in their place of relocation, with priority being given to Vulnerable Groups.

iv) Employment in construction of women and PWDs in accordance with the Magna Carta of Women (RA 9710 – Section 13; 18; 21-23), and the Magna Carta for Disabled Persons (RA 7277). The latter requires at least 5% of labor force to be PWDs (Section 5, RA 7277). This will also be included by the proponent in the contractual obligations of the Contractors, to be monitored during implementation, by the LIAC through the IMA and EMA. These requirements are in accordance with RA7277 for PWDs and RA 9710 for Women.

b) Long Term Interventions

i) In accordance with the RAP, Vulnerable households will be entitled to relocate to a Resettlement site within the same municipality or city where they reside. There will be a house and lot package, to be amortized at low interest and affordable monthly rates.

ii) PWDs and elderly PAFs will be given priority to ground floor housing units.

iii) Conduct of Skills Development Training Programs for the Vulnerable groups in coordination with TESDA, DOLE, DTI, DSWD, NHA, Provincial Government of Bulacan and the concerned LGUs where Vulnerable households are relocated.

iv) Credit Support for Livelihoods: The proponent will consult with government agencies and LGUs for their available programs for livelihood training and microfinance from government agencies and LGUs, to be tapped by Vulnerable Groups. Capital support will be arranged with LGU and financial institutions for microfinance, technical support from LGUs, NHA, DSWD, and other government agencies.

v) For women-headed households, under RA 8972, they will be given allocation in the socialized housing projects identified for the NSCR Project. The project will also coordinate with Philhealth for medical assistance benefits and with DOE and TESDA and the LGUs for the mandated educational benefits.

vi) For PWDs, under Sec 39 of the Magna Carta for Persons with Disabilities, priority for government Housing program, and the NHA will take into consideration, the special housing requirements of disabled persons. PWDs and Elderly persons should be located in the ground floor dwelling units of the housing buildings.

3) Programs and Projects

The proposed programs for income restoration and livelihood development will be drawn up in detail when the RAP will be updated based on the result of Detailed Measurement Survey (DMS) at the detailed design stage.

a) Current National Government Programs and Projects

There are several programs and projects of national government agencies in coordination with local government units, most of which are included in the National Anti-Poverty Program of the National Anti-Poverty Commission (NAPC).

The NSCR Project will coordinate with the national government agencies concerned and the Provincial LGU and city/municipal LGUs for the inclusion of the PAFs vulnerable households in these programs and projects.

b) Employment Opportunities in the Province of Bulacan

In terms of employment, there are a number of industrial parks in Bulacan and Valenzuela City that will

be explored in the updating of the RAP for possible employment opportunities for PAFs, especially vulnerable households.

Bulacan Province's proximity to Metro Manila has made it a fast growing commercial and industrial center, with industrial parks and commercial centers in most of its growing cities and municipalities.

In employment terms, the province has a high employment rate, and most of the labor force is in the service sector (60%, which includes wholesale and retail trade, transportation, storage and communication, community, social and personal services). This is followed by the industry sector 30% consisting of manufacturing, construction, electricity, gas and water and mining) and the third is agriculture which comprises 10 percent of the total employment in Bulacan (Bulacan Province Socio-Economic Profile, 2003).

Such opportunities will be tapped in the formulation of an income restoration program for the PAFs who will be relocated to the different resettlement sites that are being planned for the NSCR Project. Opportunities for employment will be discussed with the human resources departments of selected industries and commercial establishments in order to match these with the skills training opportunities for the PAPs, and also for placement purposes.

c) LGU Programs and Projects

The different LGUs also have their own skills development programs,

- Malolos City has a Barangay Livelihood Center in every barangay where unemployed residents in the barangay form a cooperative group (called "entrepreneurs") and the city is responsible for providing technical support (planning, organizing, training, initial implementation, management, marketing), and help access loan assistance (through the Development Bank of the Philippines). The identification of pilot barangay beneficiaries is based on highest percentage of unemployed, and out of school youth in the said barangays. (*http://www.maloloscity.gov.ph/kabuhayan/91-proposal-on-barangay-livelihood-center*)
- Valenzuela City has an active Job Generation Office under the City Government, which serves as a job placement office for Valenzuela constituents. An innovative mechanism used is the interactive website where jobseekers register for job search updates, and networking to job sources (ValenzuelaTrabaho.gov.ph). The city also has various skills trainings under the Skills Training Program ("REXponsableng Pangkabuhayan Program") of the Livelihood Development Office. Among the skills trainings are those on food processing, baking and cooking, handicrafts, candle and soap making, hair cutting, sewing, etc.

4) Monitoring and Evaluation

The LIAC, through the IMA and EMA, will monitor and evaluate the progress of implementation of this Income Restoration and Livelihood Development Program for Vulnerable Groups and assess the impacts. The Monitoring and Evaluation Chapter 13 of this RAP will be followed.

7.2.7 Relocation Site

7.2.7.1 Relocation Package

All qualified PAPs who are Informal Settlers and are affected by the NSCR Project, are qualified to be relocated to the relocation sites to be identified for the NSCR Project. Qualified PAPs shall be determined in accordance with the following guidelines and in accordance with RA 7279 (Urban Development and Housing Act of 1992). The relocation of PAPs will ensure their security of tenure that they cannot be evicted nor their dwellings demolished without just or acceptable reason and ample consultation with the affected people.

a. Structure owners who actually occupying the structures in public and private lands;

b. Those who are classified as renters and sharers within the structure located inside the informal settlement;
c. The PAP has not availed of any government housing assistance previously;
d. The PAP must agree to dismantle his/her structure that is erected in the affected areas of the project; and,
e. The PAP must have included in the Census Survey conducted in October 2013 for Bulacan and Valenzuela, and in December 2015 for Manila.

The availability of relocating NSCR PAPs in the identified relocation sites have been discussed with NHA, and it has been agreed that the sites can be included in this study for further discussion. Other sites may be considered should there be developments that may be available in the future.

DOTC, NHA and the LGUs will be working closely to see to it that during the detailed design stage, the actual number of PAPs to be relocated will be assigned to the appropriate relocation sites, based on the results of the detailed measurement survey (DMS).

This study is the initial stage of determining relocation site options, and during the detailed design stage, further study and negotiations will be done with DOTC and NHA in coordination with the respective LGUs.

1) Preference on Relocation Sites

According to the result of interview with the affected ISFs, 182 or 70.3% of ISFs prefer the relocation package option. On the other hand, 77 or 29.7% preferred to cash compensation (Refer to Section 7.2.3.4). Majority (62.1%) of PAFs prefer to be relocated within the same barangay, 13.4% of PAFs prefer to be relocated to near the barangay, and 17.7% prefer in the same municipality/city.

2) Potential Relocation Sites

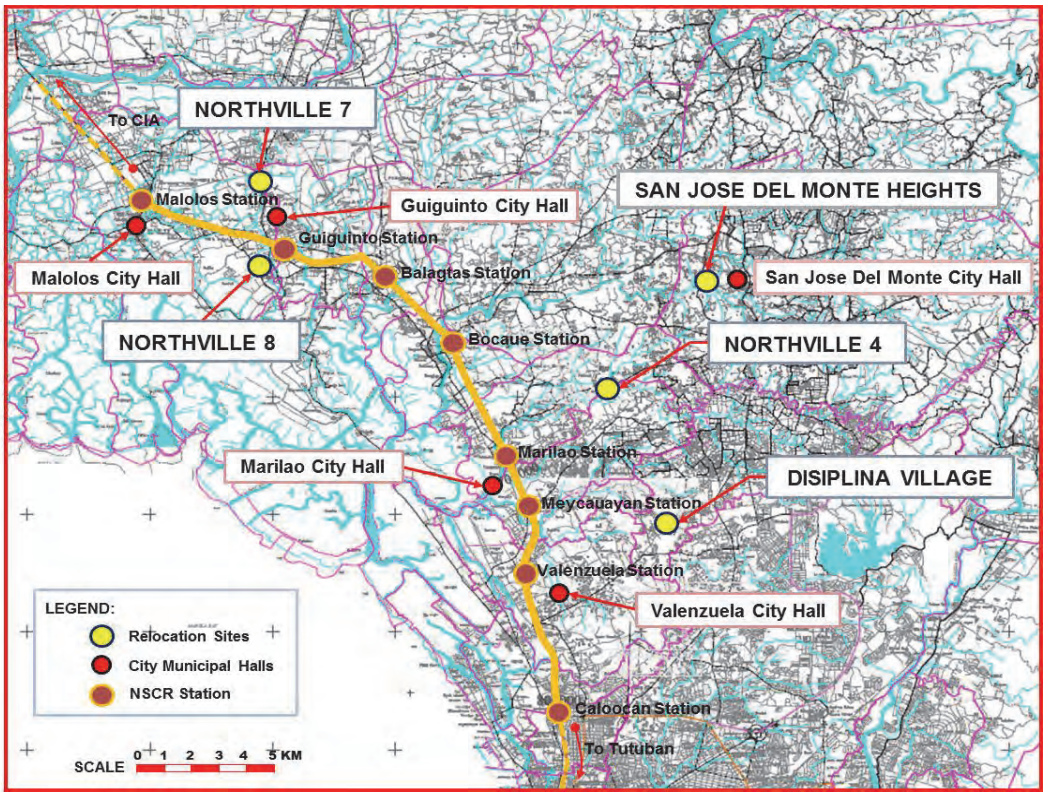
The potential relocation sites are previously existing relocation sites of the National Housing Authority (NHA) with possible expansion or additional houses that may accommodate the PAFs of the NSCR project.

According to the NHA, there may be available units in the existing relocation sites, Northvilles in Bulacan, that were developed for the Northrail Project. Because affected ISFs are identified in Malolos, Guigionto and Marilao, the Northville 8 in Malolos, Northville 7 in Guiguinto and Northville 4 in Marilao are the in-city candidate relocation sites. The existing relocation sites also include San Jose Del Monte Heights in Bulacan and Disiplina Village in Valenzuela City as shown in Table 7.2.15 and Figure 7.2.4. According to NHA, some relocation sites developed in the Province of Cavite are also potential relocation sites. However, the concrete relocation sites are not yet provided by NHA.

Table 7.2.15 Tentative Candidate Relocation Sites

Site	Location	Tentative Available Units	Present Status
Northville 8	Brgy. Bangkal, City of Malolos, Bulacan	Subject for cancellation of existing awardee	Number of existing units: 2,696 Power and water supply: available
Northville 7	Brgy. Malis, Guiguinto, Bulacan	Subject for cancellation of existing awardee	Number of existing units: 1,702 Power and water supply: available
Northville 4	Brgy. Lambakin, Marilao, Bulacan	Subject for cancellation of existing awardee	Number of existing units: 1,911 Power and water supply: available
San Jose Del Monte Heights	Brgy. Muzon, San Jose Del Monte, Bulacan	2,000	Developed Power and water supply: available
Disiplina Village	Brgy. Bignay Valenzuela City	Affected ISFs in Valenzuela city only	Under Planning (to be completed by 2016)

Source: NHA



Source: JICA Study Team

Figure 7.2.4 Location Map of Candidate Relocation Sites

Table 7.2.16 shows availability of public transportation, transportation fee, linear distance between NSCR ROW and the resettlement sites and so on. Condition of public utilities such as electricity and water, and public facilities such as schools and hospitals/health center and so on are summarized in Table 7.2.17.

Table 7.2.16 Public Transportation Available in the Resettlement Sites

Item	Northville 8	Northville 7	Northville 4	San Jose Del Monte Heights	Disiplina Village
Public Transportation (Operation of Jeepney between the resettlement site and neighbor city/municipality)	Existing	Non-existent*	Non-existent*	Existing	A Jeepney terminal and a Tricycle terminal are to be constructed.
Linear distance from NSCR ROW to the resettlement site (Km)	5.3	2.1	5.6	11.0	7.4
Linear distance from the resettlement site to Manila (City Hall) (Km)	30	30	20	25	18
Transportation fee per person from the resettlement site to NSCR ROW by Tricycle (Peso)	50	40～50 (21peso per person if 3persons ride on a tricycle.)	50	200(Tricycle) 25-30(Jeepney)	40
Trip time from the resettlement site to NSCR ROW by Tricycle(Min)	10	5-7	10	30-45	20

Source: JICA Study Team

*If no public transportation available, the necessity of public transportation terminal will be examined in consultation with DOTC.

Table 7.2.17 Public Facilities such as Schools and Health Centers for the Resettlement Sites

Item	Northville 8	Northville 7	Northville 4	San Jose Del Monte Heights	Disiplina Village
Condition of Electricity and Water	Electricity and water are supplied to each house.	Electricity and water are supplied to each house.	Electricity and water are supplied to each house.	Under construction. Electricity and water are supplied to some houses.	Electricity and water are supplied to each house.
Market inside the resettlement site	Talipapa market	Talipapa market, many shops	Talipapa market	Talipapa.	Talipapa market
School building inside the resettlement site	2-Storey 6 Classroom 2-Storey 6 Classroom	2-Storey 4 Classroom 3-Storey 15 Classroom 3-Storey 9 Classroom	2-Storey 12 Classroom 3-Storey 15 Classroom 2-Storey 4 Classroom 2-Storey 8 Classroom 2-Storey 4 Classroom 1-Storey 2 Classroom	3-Storey 15 Classroom 3-Storey 15 Classroom	3-Storey 24-Classroom 4-Storey 43-Classroom
Total no. of classrooms	12	28	45	30	67
Schools near the resettlement site	＜Elementary School＞ Bangal Elemental School Taal Primay School Mambog Elementary SchoolPanasahan Elementary School ＜High School＞ Cong.eodulo C. Natividd High School	＜Elementary School＞ Malis Elementary School Guiguinto Central School Sta. Cruz Elementary School ＜High School＞ Guiguinto National Vocational High School	＜Elementary School＞ Lambakin Elementary School Lambakin Elementary School Annex ＜High School＞ Prenza National High School	＜Elementary School＞ City of San Jose Del Monte Central School ＜High School＞ Muzon High School San Jose Del Monte High School	＜Elementary School＞ Bignay Elementary School ＜High School＞ Bignay National High School
Health centers/ hospitals near the resettlement site	Rural Heal Unit (Public), omel Cruz Hospital (rivate)	Guguinto Health Center & Lying-in Clinic (Public), Hospital ng Guiguinto (Public)	Santa Clara de Montefalco Hospital (Private)	Skyline Hospital and Medical Center (Private) Grace General Hospital (Private)	Valenzue City Health Center (Public)
Others	Police Center, Multi-purpose Livelihood Training Center	Police Center, Multi-purpose Livelihood Training Center, Day care center, Health Center			4 day care centers to be built.

Source: JICA Study Team

In Northville 7 and Northville 4, regular routes of public transportation such as Jeepney and Tricycle are not available. It is recommended that DOTC shall consider the necessity of transportation terminals for the localities in consultation with concerned LGUs.

The updated RAP to be prepared during the Detailed Design will cover a final decision about arrangement of public transportation terminals.

7.2.7.2 Selection of Relocation Sites for ISFs

The DOTC has been currently discussing with NHA regarding the relocation of the ISFs who will be affected by NSCR. NHA has agreed in principle to relocate them in the available resettlement sites in Bulacan and Cavite for the ISFs of Malolos, Guiguinto and Marilao, and for those ISFs of Manila. In the case of ISFs of Valenzuela, previous coordination with the LGU Valezuela City and NHA have agreed to relocate those ISFs from Valenzuela to the relocation site in Barangay Bignay, Valenzuela City, which is exclusively for Valenzuela constituents. A Memorandum of Agreement (MOA) will have to be entered into between DOTC, NHA and Valenzuela City LGU.

In the case of the relocation of Bulacan and Manila ISFs, a MOA will be entered into between DOTC and NHA. Prior to this, DOTC will have to coordinate with NHA to submit the list of ISFs to be relocated so that NHA and PCUP will validate whether the ISFs are legitimate beneficiaries of the relocation sites, i.e., they have not been previously awarded any housing and resettlement benefits, and they are not professional squatters, pursuant to RA 7279.

The draft MOA will include provisions for the responsibilities of DOTC which includes the provision of a budget for the expenses for site development and construction of housing units for the affected ISFs by the NSCR, or equivalent budget for existing units that will be reserved for the ISFs. The expenses will also include the social development package for the ISFs, and the management fee of NHA. The NHA in turn will select the sites according to their criteria and in consideration of JICA guidelines. NHA will also design, develop and construct the relocation sites for the ISFs, and provide the social development package (community organization, skills trainings and livelihood programs) for the ISFs. NHA will also be the estate manager for the relocation sites. Actual relocation of the ISFs will be spearheaded by NHA, in coordination with DOTC and LIAC. The MOA will provide the details for the transfer of funds from DOTC to NHA, and the modes and schedules for such fund transfer. NHA will coordinate with TESDA, DSWD and other government agencies including LGUs for the implementation of the social development package.

The MOA will be entered into during the detailed design stage so that the site development and housing construction will be done in time for the removal of the ISFs from the project areas and relocated to the resettlement sites. The ROW will have to be cleared and relocation of ISFs will have to be completed before the NSCR construction starts.

Majority of PAFs prefer to be relocated within the same barangay. According to the NHA, however, there are no existing relocation sites within the same barangay. During the detailed design stage, based on the results of the detailed measurement survey, further coordination and negotiation will be done with NHA and LGUs to provide the appropriate relocation sites.

7.2.7.3 Relocation Site for Vendors in Caloocan City

As early as December 2014, the need for a relocation site for vendors situated on both sides along the PNR tracks and ROW at the 10th Avenue railway crossing (Barangays 15 and 63) has been discussed during the IEC meetings conducted with the LGU and Barangay Officials. At these meetings, the LGU response was that the non-availability of a relocation site for the vendors. During the Environmental Impact Assessment (EIA) Review Committee Meeting on March 18 2015, this concern was reiterated, and the question was raised as to whether the city had any plan to construct a public market in the vicinity of 10th Avenue. The City Planning and Development Officer responded that there were long term plans for this but not in the near future.

During the 2nd Stakeholders Meeting of 07 February 2015, it was also learned from the vendors that after the meeting last December, the officers of their organization called, "*Samahan ng mga Manininda sa 10th Avenue*" (Organization of Vendors at 10th Avenue) approached their Congress Representative to seek help regarding the provision of alternative site for their vending activities. According to their officers they received strong support and were promised that their Congressman will help them find a relocation site.

In the meeting between JICA and a congressman of Caloocan City on 21st May, 2015, he presented an idea that the city juridical offices plan to move into a new city hall, which is being constructed currently, within 2016, so the vendors can be relocated into the building being used by the city juridical offices now.

Referring to the idea from the congressman, DOTC continues close discussions with Caloocan City and the PNR to guarantee the alternative market place for the vendors, and the updated RAP to be prepared during the Detailed Design will cover its final plan.

7.2.7.4 Relocation Site for Commercial Stall Tenants in Tutuban Mall

During the conduct of a stakeholder meeting last 26 February 2015 the affected commercial stall tenants of Cluster 2 Building expressed their acceptance and agreement to the implementation of NSCR Project. There was no expressed rejection of the project. The tenants have already been prepared for the eventuality of displacement even early on because their lease contracts for renewal have been reduced by TPI in number of months from two years to just six months. The management of TPI however has indicated that the displaced tenants could still be accommodated within the Tutuban Mall Complex given that there is enough vacant stall space for those who will be displaced.

7.2.8 Grievance Redress Mechanism

Grievance refers to any controversy, issue or conflict resulting from the interpretation and implementation of the NSCR Project ranging from issues on compensation (lot and structure owners) and eligibility criteria to issues on relocation sites and the quality of services extended by proper authorities and agencies in those sites. Thus, a systematic Grievance Redress Mechanism (GRM) must be established to address grievances from the PAPs. This mechanism will resolve the grievances of PAPs for the satisfactory implementation of the NSCR Project. The levels, process, roles and responsibilities, and guidelines of the Grievance Redress Mechanism are explained below.

7.2.8.1 Levels of GRM

The GRM is composed of the following levels:

a) First Level

Local Inter-agency Committee (LIAC) to be composed of the Mayors of the LGUs affected by the project, representatives from the Housing and Urban Development Coordinating Council (HUDCC), National Housing Authority (NHA), Presidential Commission for the Urban Poor (PCUP), Commission on Human Rights (CHR), and NGOs and POs representing the PAPs. The LIAC is assisted by a Secretariat.

b) Second Level

Resettlement Arbitration Committee (RAC) created by LIAC and the DOTC PMO, to be composed of concerned agencies such as NHA, PCUP, CHR, etc.

c) Third Level

DOTC Project Management Office (PMO) to be composed of the RAP Implementing and Management Team (RIMT).

7.2.8.2 Roles and Responsibilities

The corresponding roles and responsibilities of the levels of GRM are as follows.

a) LIAC shall be the first level of decision making by being the recipient of all complaints, in which People's Organization (POs) and NGOs representing PAPs will participate. It will be responsible for :

- Receiving the written or verbal complaint from the PAPs and explaining the grievance redress process to PAP. If it is a verbal complaint, LIAC will write down the complaint for the PAP and ask him/her to sign the complaint.
- Clarifying the nature of the complaint whether if is project related or not
- Forwarding the complaint to the RAC if it is project related.
- Advising the complainant if the complaint is not project-related, and assists him/her by forwarding the complaint to the appropriate agency or LGUs who could act on the complaint.
- Following up with RAC on their action on the complaint
- Providing feedback to the PAP on status of complaint, and the decision of the RAC.
- Maintaining a data base for all complaints and the corresponding actions and decisions on the complaints
- Acting and deciding on each complaint within 15 working days

b) RAC shall be the second level of decision making with regard to the complaints. It is responsible for:

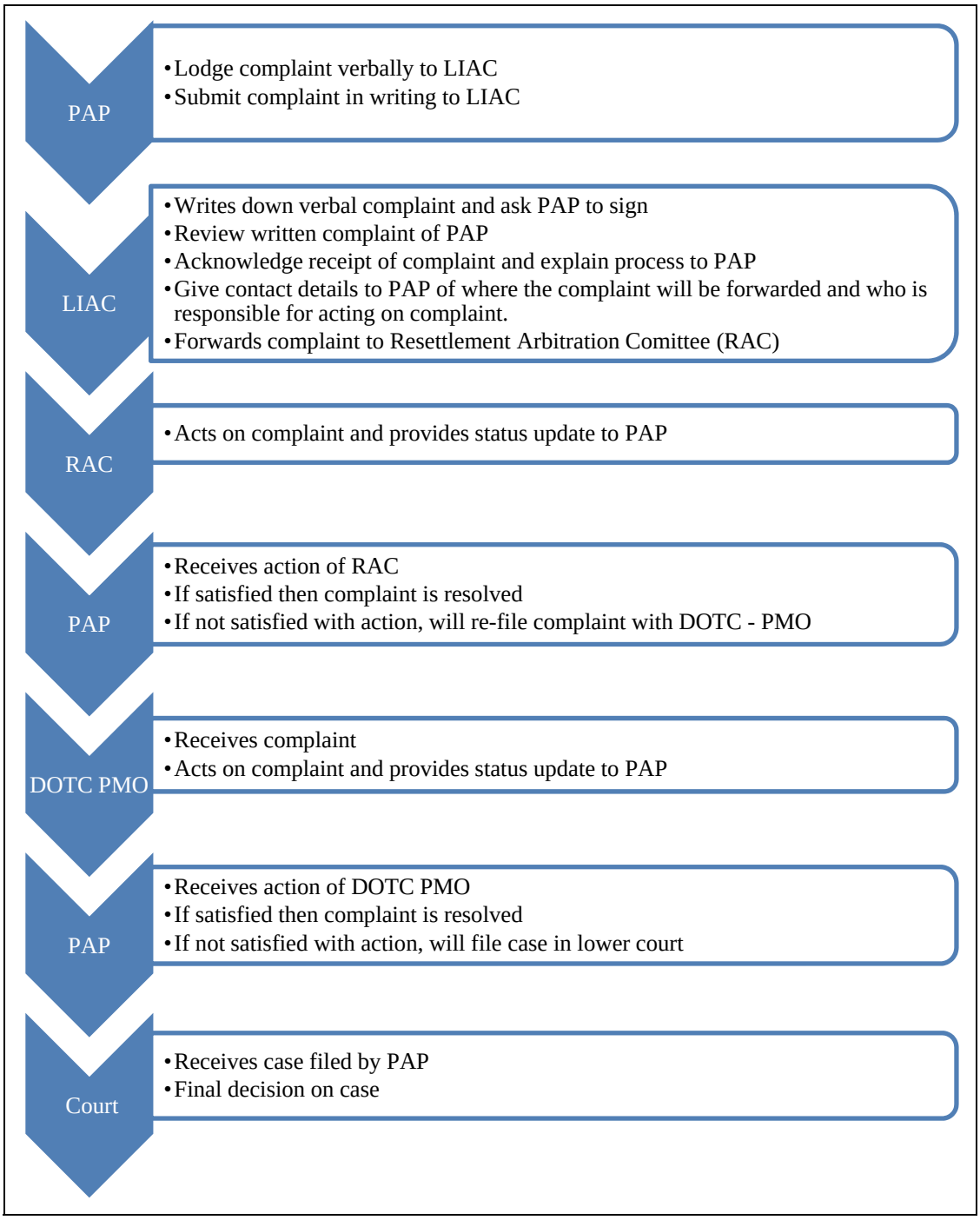
- Acting and deciding on the complaint and informing the PAP on the action and decision on the complaint
- Informing the LIAC of the action and decision of RAC on the PAP's complaint
- Acting and deciding on each complaint within 15 working days

c) DOTC PMO shall be the third level of decision making with regard to the complaints. It is responsible for:

- Acting and deciding on complaint re-filed by PAP who is not satisfied with RAC action
- Informing LIAC of action and decision on PAPs re-filed complaint.
- Acting and deciding on each complaint within 15 working days.

7.2.8.3 GRM Procedures

Grievances from the PAPs related to the resettlement implementation or any related issues with regard to the project will be handled, free of monetary charge, through a process of negotiations aimed at arriving at a consensus decision. The following the procedures will be followed (see Figure 7.2.5).



Source: JICA Study Team

Figure 7.2.5 Grievance Redress Mechanism Procedure

7.2.9 Institutional Mechanism for the Implementation of Rap

7.2.9.1 Role and Coordination of Institutions/Agencies

Organizational coordination in the implementation of the resettlement action plan is summarized in Table 7.2.16. The organizational arrangement among the responsible institutions is also described in this table.

Table 7.2.18 Organizational Coordination

Procedure of Resettlement	Responsible Organization
Household census, structure tagging, verification of eligibility of PAPs	NSCR Project Implementing Team (RIMT) in coordination with LGUs and LIAC
Estimation of Compensation cost	RIMT, to be validated by LIAC
RAP Implementation	RIMT (implementing office) in coordination with LIAC and DOTC and other appropriate office
RAP Monitoring	RIMT in coordination with LIAC
Relocation Site Development	LIAC in coordination with RIMT
Complaints and grievance handling	LIAC in coordination with RIMT
Consultation and coordination with PAPs regarding the choice of compensation, relocation and financial assistance	LIAC in coordination with RIMT and other appropriate office
Issuance of notification for structure demolition	LIAC in coordination with RIMT and other appropriate office
Preparation of necessary documents for demolition, relocation, and financial assistance	LIAC in coordination with RIMT and other appropriate office
Preparation of necessary funding for demolition, relocation, and financial assistance	RIMT in coordination with other appropriate office
Official demolition of structure and clearance of the site	LIAC in coordination with RIMT and other appropriate office
Provisions of compensations, assistance, and allowances	RIMT (implementing office) in coordination with LIAC and other appropriate office
Preventing further in-flow of ISFs on the cleared easement areas.	Barangay Captains/Chairperson and Officials assisted with local police (LGU)
Job training and livelihood rehabilitation	RIMT in coordination with other appropriate agencies, NGOs, etc.

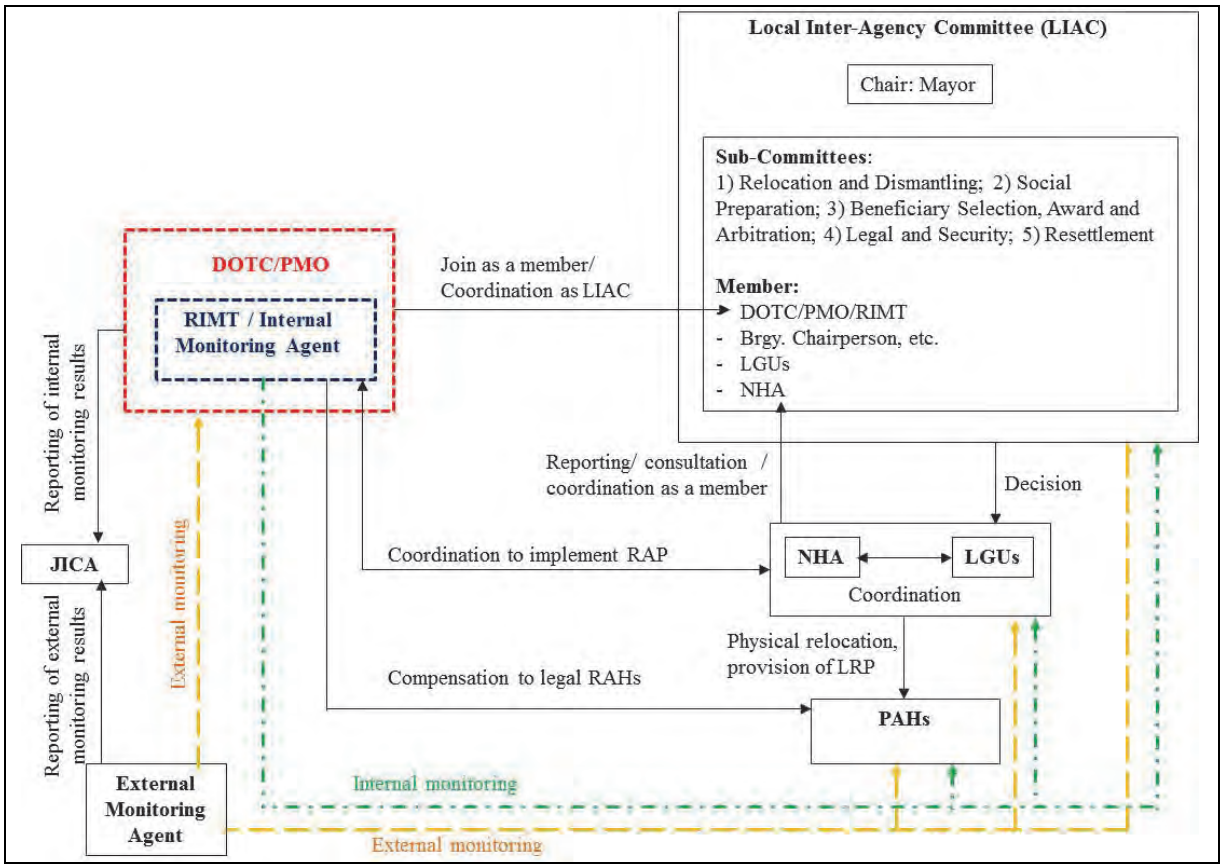
Source: JICA Study Team

DOTC-PMO and RIMT as the implementing office of the NSCR Project shall be the responsible entity for all the preparation and activities in the Resettlement Action Plan (RAP).

RIMT shall be organized with manpower both technical and administrative to conduct the assessment and payment of compensations (Figures 7.2.6 and 7.2.7).

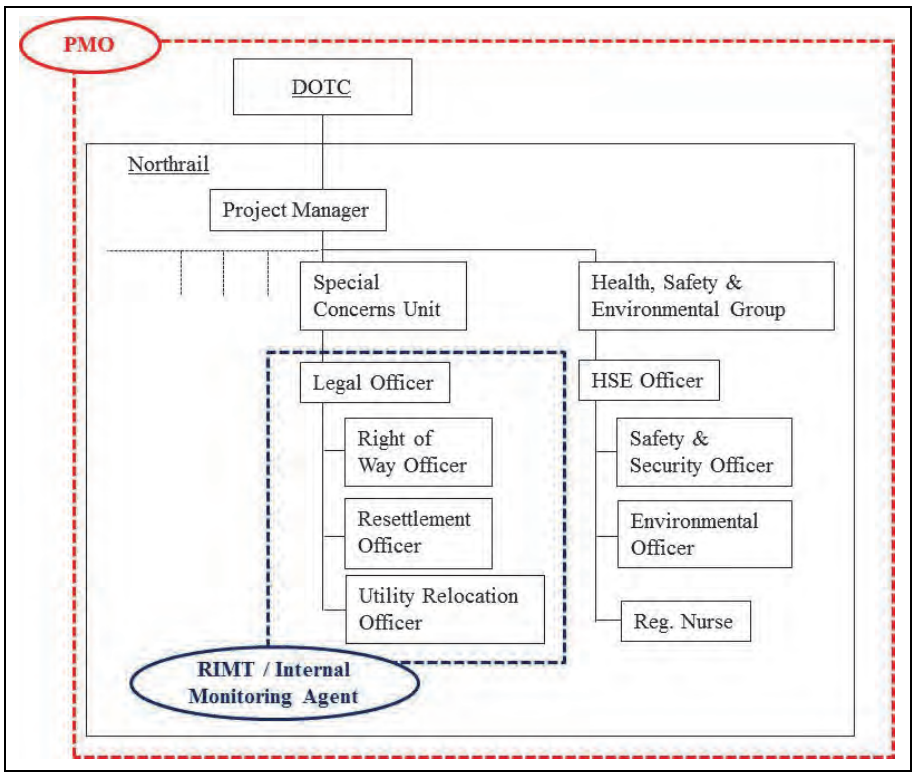
RIMT shall be part of all Local Inter-Agency Committees (LIACs) created in all affected cities/municipalities and shall attend in all meetings by LIACs. Estimation of compensation cost as proposed by RIMT shall be discussed and deliberated during LIAC meetings. The implementation of the RAP by the RIMT shall be reviewed and conformed by LIAC prior to its actual activities.

The PMO and RIMT shall conduct internal monitoring of the RAP. External monitoring shall be conducted by an independent monitoring entity (see Section 7.2.12). The monitoring report shall be discussed during LIAC meetings.



Source: JICA Study Team

Figure 7.2.6 RAP Implementation Structure



Source: JICA Study Team

Figure 7.2.7 Structure of PMO, RIMT and Internal Monitoring Agent

7.2.9.2 Capacities, Roles and Responsibilities

1) DOTC - Project Management Office (PMO)

DOTC as the Proponent to the NSCR Project shall task a PMO which shall conduct the following:

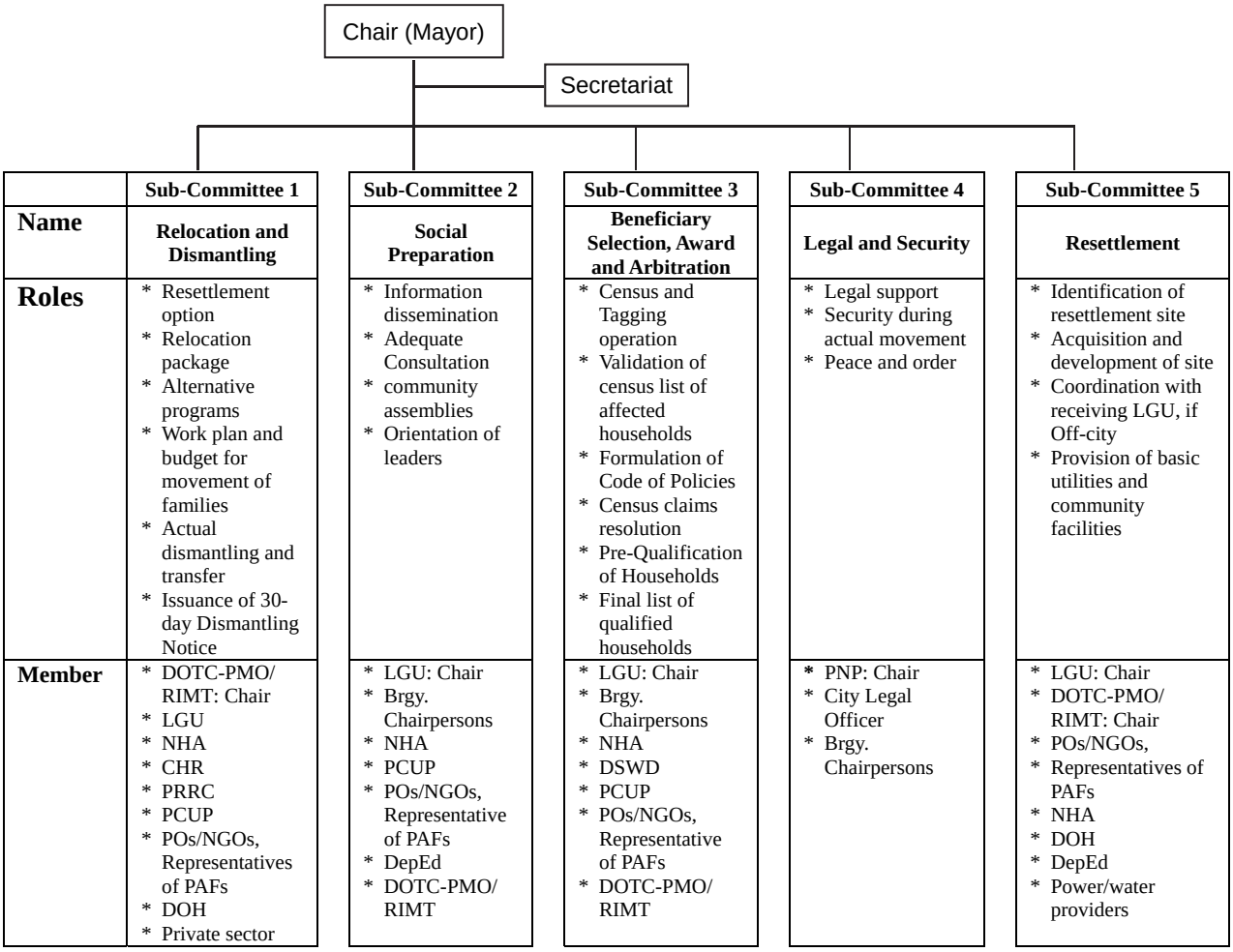
- Implement the NSCR Project including the implementation of the NSCR RAP through the RIMT.
- Monitor internally, the implementation of the project;
- Provide a financial plan and monitor the release of funds; and
- Ensure the implementation of the Social Development Plan for the Project.

2) NSCR Project RAP Implementing Team (RIMT)

NSCR Project RAP Implementing Team (RIMT) shall be the overall supervisory team in the implementation of the RAP under the DOTC PMO. It will coordinate closely with the LIAC for inter-agency and multi-sectoral concerns in implmenting the RAP. It will be a member of the LIAC. For monitoring and supervisory purposes, it will be part of the LIAC. It will provide manpower and technical assistance regarding the assessment and payment of compensations. It is in charge of the internal monitoring and the due process of decision making by other entities involved in the project implementation. It shall manage and supervise the implementation of the RAP including the resettlement activities and land acquisition in coordination with other concerned agencies. It shall ensure that funds for the implementation of the RAP are available and that expenses are properly accounted in a timely manner.

3) Local Inter-Agency Committee (LIAC)

The Local Inter-Agency Committee (LIAC) shall be created and institutionalized at all local levels where relocations will take place. LIAC will be involved actively in the implementation of the relocation and resettlement plan. It shall be headed by the concerned city/municipal mayor under whose jurisdiction the project area is located as shown in Figure 7.2.8.



	Sub-Committee 1	Sub-Committee 2	Sub-Committee 3	Sub-Committee 4	Sub-Committee 5
Name	**Relocation and Dismantling**	**Social Preparation**	**Beneficiary Selection, Award and Arbitration**	**Legal and Security**	**Resettlement**
Roles	* Resettlement option * Relocation package * Alternative programs * Work plan and budget for movement of families * Actual dismantling and transfer * Issuance of 30-day Dismantling Notice	* Information dissemination * Adequate Consultation * community assemblies * Orientation of leaders	* Census and Tagging operation * Validation of census list of affected households * Formulation of Code of Policies * Census claims resolution * Pre-Qualification of Households * Final list of qualified households	* Legal support * Security during actual movement * Peace and order	* Identification of resettlement site * Acquisition and development of site * Coordination with receiving LGU, if Off-city * Provision of basic utilities and community facilities
Member	* DOTC-PMO/ RIMT: Chair * LGU * NHA * CHR * PRRC * PCUP * POs/NGOs, Representatives of PAFs * DOH * Private sector	* LGU: Chair * Brgy. Chairpersons * NHA * PCUP * POs/NGOs, Representative of PAFs * DepEd * DOTC-PMO/ RIMT	* LGU: Chair * Brgy. Chairpersons * NHA * DSWD * PCUP * POs/NGOs, Representative of PAFs * DOTC-PMO/ RIMT	* PNP: Chair * City Legal Officer * Brgy. Chairpersons	* LGU: Chair * DOTC-PMO/ RIMT: Chair * POs/NGOs, * Representatives of PAFs * NHA * DOH * DepEd * Power/water providers

Source: JICA Study Team

Figure 7.2.8 Organizational Chart of LIAC

People's Organizations (POs), representing the PAPs will be invited in the LIAC to assist and help the entity in the implementation and monitoring of the relocation project.

LIAC, headed by local mayors and aided by a secretariat, will be composed of the following sub-committees: (1) social preparation, (2) beneficiary selection, (3) resettlement arbitration, (4) legal and security, and (5) relocation and resettlement.

LIAC is the central decision-making, coordinating and consultative body, a pool of manpower, resources and expertise of concerned local government units and national government agencies, as well as the working group that implements and/or causes the carrying out of the various activities, plans, programs and projects regarding resettlement. LIAC members gather periodically, attend all open dialogues, and observe all demolition works to secure the rights of the affected families/persons as well as to prevent conflicts.

Specifically, the LIAC shall:

a. Serve as the local clearing house of all relocation and resettlement activities, and resolve issues and concerns that may arise in the actual conduct of census and tagging operations and dismantling operations, as well as in the planning and development of resettlement sites;

b. Facilitate the orderly, peaceful and humane relocation of the ISFs occupying the affected areas;

c. Ensure that all qualified families are relocated to acceptable, secure, and affordable resettlement sites that are provided with basic utilities, facilities and services;

d. Enable all project stakeholders to participate in planning and implementing the program through a coordinative and integrated multi-sectoral approach; and

e. Monitor the implementation of plans, programs and projects as well as the operations of the subcommittees under it.

f. To hold the stakeholder meetings regularly to provide the opportunity for the stakeholders to reflect their opinions.

DOTC PMO shall organize coordination meetings of LIACs, where each LIAC will exchange and share information such as progress, issues, GRMs, and standardize the processes.

4) Local Social Welfare Development

The Department of Social Welfare and Development (DSWD) is the executive department of the national government responsible for the protection of the social welfare rights of Filipinos and to promote social development. The local Social Welfare Development offices where the relocation will happen or the relocation site will be situated will be involved for purposes of ensuring the welfare and assistance for the PAPs, from and to the relocation sites.

5) LGUs Urban Poor Affairs Office (UPAO)

The local offices of LGUs UPAO in the city/municipality where the relocation will take place will be involved in guiding the demolition activities to ensure that legal procedures are observed by implementing entities.

6) Institutions and Agencies Related to Livelihood Rehabilitation Assistances and Trainings

Institutions and agencies such as the Department of Agriculture (DA), Technical Education and Skills Development Authority (TESDA), Cooperative Development Authority (CDA), Department of Social Welfare and Development (DSWD) are expected to provide the Livelihood Rehabilitation Trainings to the relocated PAFs. Other relevant government agencies will be tapped to provide livelihood rehabilitation, assistance and trainings to PAPs.

7.2.10 Implementation Schedule

The Implementation Schedule of the RAP for the NSCR Project is shown in Table 7.2.17. During the Detailed Design Stage of the Project, which will be carried out in Calendar Year 2016, revalidation of the census/tagging survey result shall be conducted as part of the Consulting Services for the Detailed Design. Hence, if there will be identified additional households to be affected due to changes in the design/plan and construction areas of the project as compared to the preliminary design/plan proposed under the preparatory study, the RAP shall be revised to include those additional PAPs. Accordingly, current cut-off date will be set for the census/tagging of the newly identified PAPs.

The construction of the project must commence after the implementation of the RAP. The resettlement of all PAPs including removal/demolition of their affected structures will be completed by the first quarter of 2018. Therefore, the construction/civil works can be able to start from the 2nd quarter of 2018.

Table 7.2.19 RAP Implementation Schedule (Tentative)

		Responsible Organization	2015				2016				2017				2018				2019	2020	2021	2022
			1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q				
A	Detailed design and other consulting services	DOTC/PMO																				
B	Selection of Contractor	DOTC/PMO																				
C	Construction work	DOTC/PMO																				
D	Train Operation for Commuter	DOTC/PMO																				
1	Social Preparation																					
	Creation of PMO/RIMT	DOTC																				
	Detailed Measurement Survey (DMS) to validate the census master list of PAPs. Revision of RAP if ROW is changed.	PMO/RIMT																				
	Approval of revised RAP by JICA	JICA																				
	Creation of LIAC	PMO/RIMT																				
	Appointment of PAPs representatives to LIAC	LIAC, PAPs[*1]																				
	Holding of public consultation meetings before DMS and after the finalization of RAP	LIAC, PMO/RIMT																				
	Hiring of external consultant or request assistance from an appropriate government agency, to conduct Social Preparation	PMO/RIMT																				
	Creation of Grievance Redress Mechanism	LIAC, PMO/RIMT																				
	Verification of eligibility of PAFs	LIAC, PMO/RIMT																				
	Implementation of livelihood training before relocation	LIAC, PMO/RIMT																				
2	Additional ROW Acquisition (for Non ISF)																					
	Parcellary Survey and Structural Survey	PMO/RIMT																				
	Appraisal of lots, structures & improvements	PMO/RIMT																				
	Submission of Offer to Buy including negotiation with Owner	PMO/RIMT																				
	Filing of Expropriation	PMO/RIMT																				
3	Relocation of Informal Settlers																					
	Determination of relocation sites	LIAC, PMO/RIMT																				
	Finalization of lot assignment	LIAC, PMO/ RIMT, PAPs																				
	Construction of housing Units	LIAC, NHA PMO/RIMT																				
	Conduct consultation meetings with affected families regarding the schedule of transfer	LIAC, PMO/ RIMT,PAPs																				
	Issuance of Notices of Demolition	LIAC, PMO/RIMT																				

		Responsible Organization	2015				2016				2017				2018				2019	2020	2021	2022
			1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q	1Q	2Q	3Q	4Q				
	Creation of dismantling team with the beneficiaries (ISFs) for voluntary demolition	LIAC, PMO/RIMT																				
	Provide assistance (transportation assistance and meal subsidy)	LIAC, PMO/RIMT																				
	Actual relocation	LIAC, PMO/RIMT																				
4	Post Relocation Activities																					
	Capacity enhancement of Homeowner Associations/Housing Cooperatives of relocated sites	LIAC, PMO/RIMT, PAPs																				
	Post-Resettlement Monitoring at resettled locations	LIAC, PMO/RIMT																				
	Livelihood program and capacity buildings based on the monitoring results.	LIAC, PMO/RIMT																				

Source: JICA Study Team

7.2.11 Cost and Budget

7.2.11.1 Estimated Cost

The cost of the RAP implementation is estimated in Table 7.2.20, that is PhP 1,328,341,000.

Table 7.2.20 Estimated RAP Implementation Cost

Activity	Cost Item	Amount (in 1,000 PhP)	Remarks
A. Land Acquisition and Structures	Land	86,120	Estimated based on the current market values of Bulacan Provincial Assessor and City Assessors of Malolos, Meycauayan, Valenzuela and Manila
	Structures	908,497	Estimated based on replacement cost as defined in R.A. 8974
	Improvement	21,024	Estimated based on replacement cost as defined in R.A. 8974
	Subtotal for (A)	**1,015,641**	
B. Compensation	Trees and cash crops	89	Estimated based on current market values of Provincial and Municipality/City Assessors
	Damaged rice crops	10	Palay cultivated at the rice field.
	Livelihood rehabilitation assistance	10,575	Maximum amount PhP15,000 per households including ISFs
	Rental Subsidy	2,207	Structure owners, renters for one month rent of their current rental fee (but not more than Php 15,000)
	Income Loss	12,461	Compensation for income loss for declared incomes for CIBE, vendors and employees/workers
	Special Assistance for vulnerable groups	8,505	Special Assistance for vulnerable persons such as medical care due to the implementation of relocation
	Transportation Assistance	1,520	For relocation purposes only, but not to be given in cash to PAFs
	Food assistance	2,261	For relocating PAPs during relocation schedule (3days)
	Assistance to PAFs in Northrail Project	7,500	Rehabilitation assistance in the form of skills training and other development activities
	Subtotal for (B)	**45,128**	
C. Development of Relocation Sites	1-storey row house in Bulacan	26,040	Using NHA estimates for 1-storey row house 90 units.
	3-storey MRH in Valenzuela City	47,970	Using NHA estimates for 3-storey medium-rise housing. 120 units.
	Subtotal for (C)	**74,010**	
D. RAP Implementation and monitoring	LIAC coordination	4,800	Organizing and make LIAC functioning through meetings and other related activities
	RAP finalization	4,200	Census and tagging for validation during the detailed design and Public Consultation meetings
	Internal monitoring cost	7,400	RAP Internal monitoring cost for 2016 to 2023
	External monitoring cost	3,900	RAP external monitoring cost for 2016 to 2023
	Subtotal for (D)	**20,300**	
Total (A+B+C+D)		**1,155,079**	
E Administration Cost	5%	57,754	5% of Total (A+B+C+D)
Contingency	10%	115,508	10% of Total (A+B+C+D)
Total (A+B+C+D+E)		**1,328,341**	

Source: JICA Study Team

7.2.12 Monitoring and Evaluation

7.2.12.1 Internal Monitoring

The DOTC-PMO and RIMT will organize an Internal Monitoring Agent (IMA) to undertake independent internal monitoring and evaluation of the RAP (See Figure 7.2.8).

The tasks and obligations of the IMA are to:

i) Supervise and monitor the implementation of the RAP, on a regular basis, in coordination with the LIAC. The findings will be documented by IMA in the quarterly report to be submitted to the RIMT, for eventual submission to JICA by the DOTC-PMO.

ii) Verify the re-inventory of baseline information of all PAFs whether it has been carried out and that the valuation of assets lost or damaged, the provision of compensation and other entitlements, and relocation, if any, has been carried out in accordance with the JICA Guidelines and other applicable Philippine laws, and the RAP.

iii) Ensure that the RAP is implemented as designed and planned.

iv) Verify that funds provided by the RIMT for the implementation of the RAP are given in a timely manner and the amount is sufficient for each activity and for the purpose.

v) Record all grievances, specially its nature, and its corresponding resolution, and ensure that complaints are handled in a prompt manner.

7.2.12.2 External Monitoring and Evaluation

The RIMT will also commission an External Monitoring Agent (EMA) to undertake independent external monitoring and evaluation. The EMA is either a qualified individual or a consultancy firm/NGO/academia with qualified and experienced staff (See Figure 7.2.7).

The Terms of Reference of the engagement of the EMA shall be prepared by the DOTC and shall be acceptable to the JICA prior to the engagement.

The tasks of the EMA shall be the following:

i) Verify results of internal monitoring by the Internal Monitoring Agent (IMA);

ii) Verify and assess the results of the information campaign for PAPs rights and entitlements;

iii) Verify that the compensation process has been implemented with the established procedures are properly communicated with the PAPs during the consultation meetings;

iv) Assess whether resettlement objectives have been met, specifically, on the restoration or enhancement of livelihoods and living standards;

v) Assess the efficiency, effectiveness, impact and sustainability of the implemented resettlement plan and draw lessons from it (RAP) to serve as guide to future resettlement;

vi) Ascertain whether the resettlement were appropriate to meet the objectives, and whether the objectives were suited to PAP conditions;

vii) Suggest modification in the implementation procedures of the RAP, if necessary, to achieve the principles and objectives of the Resettlement Policy;

viii) Review how compensation rates were evaluated; and

ix) Review of the handling of compliance and grievance cases.

External monitoring and evaluation will be of two kinds: 1) random observation visits and 2) consultation with PAFs, both at their current residence area and at their relocation site.

7.2.12.3 Stages and Frequency of Monitoring

The stages and monitoring frequency by the IMA and EMA are as follows:

1) Inception Report

This is the first activity for both IMA and EMA to determine whether or not the RAP was implemented according to its plan and with this Policy.

The IMA/EMA will submit an Inception Report and Compliance Report one month after receipt of Notice to Proceed for the engagement. The engagement of the IMA/EMA shall be scheduled to meet the Policy's requirement of concluding RAP implementation activities at least one (1) month prior to the start of civil works.

2) IMA Monthly Monitoring

The IMA will conduct a monthly monitoring of activities related to RAP implementation.

3) IMA Final Evaluation

This will be conducted three months after the completion of payments of compensation to PAPs.

4) IMA Post-Resettlement Semi-Annual Monitoring and Evaluation

This activity will be undertaken every 6 months until the construction works end, to determine whether the social and economic conditions of the PAFs after the implementation of the project have improved.

When the living standards of the PAF have not improved or have become worse, or if their present means of livelihood have become non-viable, DOTC, in coordination with other appropriate institutions, will provide assistances, such as skills and livelihood trainings.

5) EMA Semi-Annual Monitoring

This activity will be undertaken every 6 months until the construction works end to follow-up whether the social and economic conditions of the PAFs after the implementation of the project have improved.

When the living standards of the PAFs have not improved or have become worse, or their present means of livelihood have become non-viable, DOTC, in coordination with other appropriate institutions, will provide assistances, such as skills and livelihood trainings.

6) IMA/EMA Final Evaluation and Proposal Report

Final Evaluation and Proposal Report will be submitted one month after the completion of the construction work.

7.2.12.4 Schedule of Implementation of RAP and Monitoring

The PMO/RIMT with the aid of other entities and agencies shall establish a schedule for the RAP implementation and the required monitoring taking into account the project's implementing schedule. It is expected that one month prior to the start of the civil works, all RAP activities have been determined by the IMA and EMA as having been concluded.

Table 7.2.21 RAP Monitoring Schedule

	Internal Monitoring	External Monitoring
RAP Implementation Period (January 2016 to March 2018: 27 months)	• Inception Report (1) • Monthly Monitoring and • Reporting (27) • Final evaluation (1)	• Inception Report (1) • Semi-Annual Report (4)
Construction Period (April 2018 – October 2021:42 months)	• Semi-Annual Monitoring and Reporting (7) • Final Evaluation Report (1)	• Semi-Annual Report (7) • Final Report (1)

Source: JICA Study Team

7.2.12.5 Reporting

The IMA and the EMA are accountable to the PMO/RIMT. The PMO submits copy of their reports to JICA.

7.2.13 Stakeholders Consultation

A series of stakeholders consultations for the RAP were organized during the survey. They are described in 7.1.10 Chapter 7.

7.3 Due Diligence Report on the Northrail Resettlement Program

This section summarizes the Draft Due Diligence on the Northrail Resettlement Program. For more details, refer to the said Draft DDR.

7.3.1 Background

The Northrail Project aiming to provide transportation service between Metro Manila and Northern Luzon area was planned in the 2000s. It planned to utilize the old PNR right-of-way (ROW). However, informal settler families (ISFs) had occupied a large part of the old PNR ROW. Therefore, the Northrail Project needed to conduct displacement of the ISFs between 2000 and 2005. Furthermore, the Northrail Project required additional land acquisition due to the expansion of some portions of the old PNR ROW. This additional ROW acquisition (hereinafter referred to as the ROWA) conducted from 2007 to 2008 caused displacement of ISFs as well as the legal asset owners. The legal basis of the land acquisition and resettlement done by the Northrail Project was relevant laws and regulations of the Philippines.

Although the NSCR Project plans to utilize the ROW which the Northrail Project planned to use, they are regarded as different projects in the light of their differences of project proponents, donors, project purposes, project scopes, etc. The land acquisition and resettlement in the Northrail Project were conducted not for the NSCR Project. The areas were cleared not in the anticipation of, or preparation for the NSCR Project either.

The Northrail Project was divided into 4 phases, Phase I of which was to cover an 80-kilometer rail line from the Clark Freeport Zone to Caloocan City. Phase I was planned to have two sections: Section 1 – Malolos to Caloocan; and Section 2 – Clark Freeport Zone to Malolos.

7.3.2 Objectives and Methodology of Due Diligence Study

The objective of this due diligence study is to identify magnitude of land acquisition and resettlement in the Northrail Project, compensations and assistances to the project affected persons (PAPs), and their current socio-economic conditions. Based on the identification, it was considered that the NSCR Project could provide additional assistances, if needed, to the PAPs because it utilizes the ROW which the Northrail Project planned to use.

In line with these objectives, the following methodologies were employed.

- Review of existing documents related to the resettlement programs in the Northrail Project
- Key informant interviews with relevant government agencies which were involved in the resettlement programs; and
- Survey/interview with the relocated ISFs using a questionnaire and supplemental Focus Group Discussion with vulnerable groups

7.3.3 Summaries of the Displacements under the Northrail Project

Displacement of residents from the PNR ROW was carried out two times under the Northrail Project as summarized in Table7.3.1.

Table7.3.1 Summary of the Two Displacements under the Northrail Project

Events caused displacements	Resettlement of Informal Settlers in PNR ROW	Additional ROW Acquisition	Total
Year relocation carried out	2000-2005	2007-2008	
Reason for the displacement	Retrieving of the PNR ROW, No land acquisition occurred	Additional land acquisition	
No. of Affected Cities/Municipalities	9	7	
Involvement of ISFs	Yes	Yes	
No. of ISFs affected household (HH)	20852	125	20977
No. of relocated ISFs (HH)	16,116	93	16,209
Involvement of Legal Household	No	Yes	
No. of legal affected households (HH)	0	241	241
No. of relocated legal households (HH)	0	66	66

Source: JICA Study Team

7.3.4 Findings from the Resettlement Programs of the Northrail Project

In this section findings from the two resettlement programs which were implemented in year 2000-2005 and 2007-2008 respectively are presented from aspects of (i) compensation for land, (ii) compensation for structures/improvements, (iii) livelihood rehabilitation and income restoration, (iv) public consultations and reflection of opinions, and (v) grievance redress mechanisms as follows.

Table7.3.2 Mapping of the Aspects used for the Analysis

Issue	Compensations and Assistances
(i) Compensation for Land	1) The Relocated ISFs. Not applicable
	2) The Legal PAPs • The affected owners who obtained the payment equivalent to the Development Bank of the Philippines' appraisal were considered to be compensated at the full replacement cost. • About half of the affected land owners were compensated less than the Development Bank of the Philippines' appraisal values. • No land swapping (land for land) compensation was provided.

Issue	Compensations and Assistances
(ii) Compensation for Structure/ Improvements	1) The Relocated ISFs. • The relocated ISFs could choose one of the options, the resettlement to the resettlement sites or to receive the Housing Financial Assistance. • The compensation for structures and improvements was not proposed as the option
	2) The Legal PAPs • The valuation of improvements and/or structures was conducted by the Development Bank of the Philippines using the method of Replacement Cost New Less Physical Depreciation. • About a half of the owners were compensated at the DBP's appraisal values. • On the other hand, another half of the affected owners were compensated less than the DBP's appraisal values.
(iii) Livelihood rehabilitation and Income Restoration	1) The Relocated ISFs. Livelihood rehabilitation: • The total number of the beneficiaries of NHA livelihood programs was 6,762 individuals from Northville 1 and 2 in Caloocan/Valenzuela and 36,751 from Northville 3 to Northville 8 in Bulacan for the past 10 years. • According to the general appreciation of the relocatees to the program, 26% said that it was effective, 62% admitted it was not and 12% seemed unaware. Income restoration: • About 60% of the respondents claim to have lost considerable income as a result of relocation activities such as dismantling and actual transfer. However, only 16% of respondents said that loss of income was compensated by financial assistance and housing package. • About 40% of the surveyed respondents reported a decrease in monthly household income after being relocated.
	2) The Legal PAPs • No livelihood rehabilitation and income restoration program, and support for transitional period were provided to the legal owners of lands and structures. • It is not exactly known whether livelihood rehabilitation and income restoration program for the legal asset owners was actually demanded or not during the DDR survey period.
(iv) Public Consultations	1) The Relocated ISFs • Public Consultations were held but relocated ISFs were just informed the resettlement programs. There was no process to reflect their opinions in the plan and programs. • According to the interview survey, majority of the respondents indicated that they have participated in the consultation process. • About 60% of respondents were able to participate in community meetings and 33% of respondents were able to participate in site visits organized by the LIAC.
	2) The Legal PAPs • A series of public consultations were held at each affected Barangays to explain the Northrail Project and compensation policy.
(vi) Grievance Redress Mechanisms.	1) The Relocated ISFs • According the interview survey, only 30% of the respondents were aware the procedure and personnel and venue for filling complaints and airing grievances through the LIAC representatives in their respective barangays. • In addition, according to the FGDs, most communities are denunciating the legitimacy of community representatives to the LIAC. • Although there was a grievance redress mechanisms in the LIAC, it seems difficult for PAPs to access the LIAC and address their grievance.
	2) The Legal PAPs • Grievance redress mechanism was not established for the legal owners of lands and structures.

Source: JICA Study Team

7.3.5 Living Standards of the Relocated ISFs

The Household Survey on socioeconomic conditions and living standards was conducted for about 10% of the total number of the relocated ISFs. The results of assessment on the socio economic conditions of resettled ISFs are summarized as follows:

- Ten years has been passing after the completion of the first relocation. The current socio-economic conditions of PAPs have been influenced by not only the resettlement but also other positive and negative factors.
- It is not easy to survey the current socio-economic conditions of all relocated ISFs. There are some limitation in the due diligence study.
- Compared to the living standards before relocation with after relocation, about half of the respondent said it worsened and about 20% declared status quo, while about 30% respondent that there was an improvement. Thus, their living standards have not been notably worsened.
- Incidence of poverty prior to and after relocation is relatively the same, about 95% of respondent. The poverty level is still high. There are also some vulnerable people in the resettlement sites.
- Improvement of their living standards is observed with the increase in the access to social infrastructure. For example, access to local water service provider increases 22%, and access to direct connection to electricity increases 17%.

7.3.6 Points Which Need to be Taken into Consideration

Following are points to be considered in the deliberation of additional assistances for the PAPs:

- Based on the findings, it appears that the land acquisition and resettlement in the Northrail Project were conducts referring to the legal and institutional framework of the Philippines.
- The resettlements were conducted around 10 years ago. The details and actual amount of the compensation could not be confirmed.
- The total number of ISFs is more than 20,000. Out of it, about 16,200 households were resettled in 11 relocation sites. On the other hand, 4,700 households did not move to the relocation site and their whereabouts were not recorded. Tracking the PAPs including ISFs was extremely difficult.
- The current socio-economic conditions of PAPs have been influenced not only by the resettlement itself but also by other factors. It is not easy to conclude neither their current socio-economic conditions are better off nor worse off.
- The due diligence study has identified that the poverty level is still high and there are some vulnerable people in the resettlement sites. Some additional assistances, which must be implementable and practical, to the poor and vulnerable seem to be beneficial to them.
- If needed, additional assistances must be considered in the light of fairness, and not creating new community division.

7.3.7 Framework for Additional Assistances

Based on the above mentioned considerations, Table 7.3.3 shows additional assistances to be provided by the NSCR Project for the PAPs affected in the Northrail Project. However, they must be contemplated further within the DOTC as the project proponent of the NSCR Project, and among relevant organizations such as NHA before its finalization.

Table 7.3.3 Additional Assistances to PAPs Provided by NSCR Project (Draft)

Item	For Affected ISFs	For Affected Legal PAPs
Compensation – Lands	N.A.	
Compensation – Structures and Improvements	N.A.	
Livelihood Rehabilitation and Income Restoration	• Eligible to skill trainings and other development activities provided by the NSCR Project, if needed • Provision of job opportunities in the NSCR Project, if needed	• Eligible to skill trainings and other development activities provided by the NSCR Project, if needed
Public Consultations	N.A.	
Grievance and Redress Mechanism	Eligible to the GRM developed by the NSCR Project	
Monitoring of PAPs	Through sharing of information from NHA, the NSCR Project periodically monitors the conditions of ISFs	N.A.

Source: JICA Study Team

7.4 Consultation with DOTC Regarding EIA, Draft RAP and Draft DDR

The JICA study team explained and discussed with DOTC on EPRMP, draft RAP and draft DDR at every opportunity. DOTC understood and agree on the basic policy and guidelines on environmental social considerations described in these reports, but it is necessary to discuss in more detail.

7.4.1 EPRMP

EPRMP was explained and discussed with DOTC before the submission of required documents for ECC application to DENR EMB. In addition, for preparation of the EIA Review Committee meetings, the following impacts and mitigation measures and environmental monitoring plan were explained and discussed.

- Soil contamination/remediation of RAMCAR battery site and former dump site at Meycauayan
- Noise and vibration during construction and operation
- Replanting of Narra trees
- Offset site of the lost wetland at Valenzuela depot

7.4.2 Draft RAP

The draft RAP was explained and discussed with DOTC on the following issues:

- Affected area due to additional land acquisition
- Number of PAFs including ISFs
- Eligibility criteria and entitlement matrix
- RAP implementation cost
- Relocation sites of ISFs

7.4.3 Draft DDR

The draft DDR was explained and discussed with DOTC on the following issues:

- Relocation package of ISFs of Northrail Resettlement Program
- Findings and Assessment
- Framework for Additional Assistances

CHAPTER 8

ASSESSMENT OF CLIMATE CHANGE MITIGATION POTENTIAL

CHAPTER 8 ASSESSMENT OF CLIMATE CHANGE MITIGATION POTENTIAL

In this project, greenhouse gas (hereinafter referred to as GHG) reduction which this project contributes was calculated and the effect was evaluated. However, in this estimate, emission of CO_2 by energy consumption for electricity is not including, because the amount of electricity is not yet estimated at this moment.

8.1 Emission Reduction of GHG from Vehicles

1) Methodology

In order to estimate the emission reduction of GHG from vehicles, the bottom-up approach was applied. The bottom-up approach is a method based on cumulating all the vehicle emission in a target region. The key steps of this approach are summarized below.

(i) The vehicle speed and volume by vehicle type by link: These data were determined from the demand forecast model. The model combined road/ rail assignment model was used. The assignment process used is based on Equilibrium method, where the traffic from each OD pair is assigned interactively to the network until no cheaper/ quicker route could be found. The shortest path was build based on the generalized cost such as operating cost of vehicle, public transport fares and wait & walk times. Therefore the rail passengers will be transfer from private mode, bus and Jeepney and be decided based on the rail network and the road traffic situation. It means the number of rail passengers will be dynamically changed each assignment. The equilibrium method re-calculates the new travel time based on the road capacity and assigned traffic volume after each assignment interaction. The road speed is calculated by using BPR function below depend on the road congestion.

$$\text{BPR function} \quad t = t_0 \left\{ 1 + \alpha \left(\frac{X}{C} \right)^{\beta} \right\}$$

Where, t : Travel Time
t_0 : Free Flow Time
X : Traffic Volume
C : Road Capacity
α, β : Parameters $\alpha = 3.0, \beta = 4.0$

This model was considered four road modes, car, Jeepney, bus and truck. The covered area by this model are Mega Manila, Region III and IV-A.

(ii) The emission factor by vehicle type by vehicle speed class: It was applied the factors which was developed by JICA road map study (Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Area, JICA, 2014). They were shown in the table below.

Table 8.1.1 Reference Vehicle CO_2 Emission Factor

Unit: g/km

Vehicle Type	Speed Classes / Speed of Representative (km/h)						
	3 to 5 4	**5 to 10 7.5**	**10 to 15 12.5**	**15 to 25 20**	**25 to 40 32.5**	**40 to 60 50**	**60 to 80 70**
Gas car	447.6	363.7	327.5	306.3	292.0	282.5	277.3
Diesel utility vehicle/ jeepney	643.7	544.6	501.8	476.7	459.9	448.7	442.5
Diesel truck/ bus	1182.9	1083.9	1041.1	1016.0	999.1	987.9	981.7

Source: Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Area, JICA (2014)

Note: Dr. Karl N. Vergel of UP-NCTS updated existing Manila emission factors (1992, 1996) upon request of study team as a reference. There emission factors have limitations as they were not based on a reliable chassis dynamometer test.

(iii) Calculation of emissions by vehicle type by link with both outputs of with case and without case. The equation of emission is shown in below.

$$E = \sum_k \sum_i \left(D_k \times T_{k,i} \times EF_{k,i} \times Days \right)$$

Where: k: Link number, D_k: Link length (km),
$T_{k,i}$: Traffic volume by vehicle type by link (vehicles/day)
$EF_{k,j}$: Emission factor by vehicle type by vehicle speed (g/km), and
Days: the number of days in year (days), 345 day.

(iv) Calculation of emission reduction compared with and without case.

2) Emission Reduction of GHG

The vehicle emissions are estimated by traffic assignment results of the case with Malolos-Tutuban section and without Malolos-Tutuban section. The results for 2020, 2030 and 2040 are summarized in Table below. The result shows that GHG emission in 2020 will be reduced 97,000 t-CO_2/year by starting the operation of NSCR. In addition the GHG reduction will increase with increased the passengers of NSCR in the future. In 2030 and 2040, GHG emission will be reduced 206,000 and 261,000 t-CO_2/year respectively.

Table 8.1.2 Emission Reduction of GHG

Unit: 1000t-CO_2/year

Year	Mode	Without case	With case	Reduction
2020	Car	5,823	5,774	50
	Jeepney	1,254	1,216	38
	Bus	1,218	1,211	7
	Truck	3,831	3,828	3
	Total	**12,126**	**12,029**	**97**
2030	Car	7,297	7,187	109
	Jeepney	1,565	1,485	80
	Bus	1,561	1,554	7
	Truck	4,966	4,956	10
	Total	**15,388**	**15,182**	**206**
2040	Car	8,818	8,656	162
	Jeepney	1,793	1,717	77
	Bus	1,807	1,793	14
	Truck	6,170	6,161	9
	Total	**18,588**	**18,327**	**261**

Source: JICA Study Team

8.2 Loss of Carbon Stock by Land Conversion

Some negative impacts of the project would include reduction of carbon sink area due to clearing of trees and vegetation and GHG emission due to operation of standby generator sets. The impact, however, is minimal.

1) Loss of Carbon Stock by Land Conversion from Paddy Fields to Depot

The paddy fields of 0.4 ha for proposed depot site in Valenzuela will be disappeared. This conversion of cropland leads loss of carbon stock. The calculation was carried out by the following equation.

$CP_{CONVERSION} = AD_{CONVERSION}$ X CSP

Where, $CP_{CONVERSION}$: Carbon stocks in biomass on paddy fields to other land-use (depot) (tCO_2)

$AD_{CONVERSION}$: Area of depot (ha)

CSP: Carbon stocks on paddy fields (tCO_2/ha)

Where, CSP = CSPc X 44/12

CSPc = 4.7 tC/ha (*)

(*: source: for Cropland in Table 8.4 Default biomass carbon sticks removed due to land conversion to settlements, Chapter 8 Settlements, Volume 4: Agriculture, Forestry and Other land Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories)

The loss of carbon stock by land conversion from paddy fields to depot is estimated 7 tCO_2.

2) Loss of Carbon Stock by Land Conversion from Wetland to Depot

The soil in wetland (2 ha) for proposed depot site in Valenzuela will be disappeared. This leads loss of carbon stock.

The calculation was carried out by the following equation.

Cwt = Wa X Cwu X (44/12)

Where, Cwt: Carbon stocks in soil in wetland tor removal (viaduct) (tCO_2)

Wa: Area of removal of soil in wetland (km^2); 0.015 km^2

Cwu: Wa: Carbon contained in soil in wetland (tC/km^2); 69 tC/km^2

Data Source Chapter 7: Forest Land, Volume 4: Agriculture, Forestry and Other land Use, 2006 IPCC Guidelines for National Greenhouse Gas Inventories)

The loss of carbon stock by removal of soil in wetland is estimated 5 tCO_2.

8.3 Estimation of Reduction Effect for Climate Change

Emission reduction of GHG from vehicles will be much larger than the losses of carbon stock by land conversion. As mentioned above, reduction of GHG emission will be 97,000 t-CO_2/year at starting the operation of NSCR. Then, the GHG reduction will increase up to about 200,000t-CO_2/year after 2030. However, increase of CO_2 by energy consumption for electricity is not included in these reductions because the amount of electricity is not yet estimated at this moment.

CHAPTER 9

PROJECT EVALUATION

CHAPTER 9 PROJECT EVALUATION

9.1 Project Performance Indicators

The NSCR project will generate various impacts on wide spectrum of socio-economic and environment aspects in general and accessibility of the project more specifically. As the NSCR project is intended to form a significant backbone in overall metropolitan transport network especially along the north-south corridor, the project is expected to bring about extensive positive impacts on mobility and accessibility of the people in the influence area. However, in order to maximize the expected benefits due to the project, it must be implemented, operated and managed properly. Of which performance indicators, main performance indicators are as follows;

(a) **Operation and Impact indicators:** They are designed by "JICA Yen loan operation and impact indicators reference" (2014).

(b) **Network Performance Indicators:** In urban area, a transport project is intended to improve not only the corridor where the project is implemented but also the overall transport network performance at city level. Therefore, a primary set of performance indicators should include those which represent service levels of overall transport network. Comparing the values under the situation of "with" and "without" project, effects of the project will be clearly shown. Main indicators include following;

  (i) Impact on road traffic congestions: Volume capacity ratio, travel speed;

  (ii) Impact on traffic demand: The number of person trips, person-kms, person hours, pcu-kms, pcu-hours, modal share; and,

  (iii) Impact on transport user costs: Vehicle operating cost, travel time, public transport fares, road tolls.

(c) **Economic and Financial Indicators:** They relate to the above network performance indicators closely, especially with transport user costs. They are explained in Chapter 9.3 in detail.

(d) **Social and Environmental Indicators:** Contribution of mass transit project to the improvement of air quality by replacing road vehicles using fossil fuel can be estimated based on quantification of emissions of related air pollutants such as NOx, CO2, etc. Improved access and affordability of low income group can also be estimated based on reduction in travel time and the amount of fare to be paid for transport services.

Table 9.1.1 and Table 9.1.2 show the operation and impact indicators and the results of estimated values of main indicators for assessment of overall transport network due to the construction of NSCR.

Table 9.1.1 Operation and Impact Indicators

Indicators	Without Project(2025)		With Project(2025)	
	Road	Rail	Road	Train
Passenger Kms (000 passenger kms/day)	156,425	-	151,345	5,411
No. of operating train vehicle(vehicle/day/direction)	-	-	-	142
Operating rate of traing vehicle (%)	-	-	-	82.4
Train vehicle kms (000 vehicle kms/day)	-	-	-	85.2
Travel time (Malolos-Tutuban)	103 min		85 min	35 min 20 sec.

Source: JICA Study Team

Table 9.1.2 Estimated Impact of Project on Network Improvement

Province	Indicators		2025								
			Without Project			With Project			Different		
			Road		Rail	Road		Rail	Road		Rail
			Private	Public		Private	Public		Private	Public	
Metro Manila	V/C Ratio		1.05		-	1.03		-	-0.02		-
	% of Sections	< 10 kph	50.9		-	48.8		-	-2.1		-
		< 20 kph	75.4		-	74.5		-	-0.9		-
	Demand	No. of Rail Boarding (million pax)	-		3.9	-		4.1	-		0.2
		Person-kms (000)	42,682	73,890	33,094	42,052	70,673	38,254	-630	-3,217	5,160
		Person-hrs (000)	4,397	6,368	1,022	4,217	5,889	1,129	-180	-480	107
		pcu-kms (000)	33,171	7,396	-	32,828	6,967	-	-343	-429	-
		pcu-hrs (000)	3,396	673	-	3,267	616	-	-129	-57	-
Bulacan	V/C Ratio		0.70		-	0.67		-	-0.03		-
	% of Sections	< 10 kph	18.2		-	19.0		-	0.9		-
		< 20 kph	37.0		-	36.0		-	-1.1		-
	Demand	No. of Rail Boarding (million pax)	-		-	-		0.2	-		0.2
		Person-kms (000)	11,362	28,491	-	10,715	27,914	1,010	-647	-577	1,010
		Person-hrs (000)	837	1,662		831	1,620	15	-7	-43	15
		pcu-kms (000)	10,352	2,428	-	9,946	2,365		-406	-63	-
		pcu-hrs (000)	689	146	-	684	142		-6	-4	-

Source: JICA Study Team

9.2 Review of Qualitative Effects

9.2.1 Review of Qualitative Effects

Mass transit is also expected extensive benefits which are difficult to be quantified. A notable aspect of mass transit development is TOD (transit-oriented development) which is integrated transit and urban development. When TOD is properly developed, it will bring about significant impacts both on transport and urban development. Properly designed and implemented TOD will enhance ridership of the rail and value of the lands and space at and around the stations which will create new investment and employment opportunities. The effects of TOD farther include following;

(i) Possible catalytic role for re-organization of efficient land use in the influence area;

(ii) Contribution to local economic development;

(iii) Contribution to local traffic circulation; and,

(iv) Promoting image of communities.

9.2.2 Improvement of local traffic circulation

As mentioned above, TOD will contribute to local traffic circulation due to improvement of accessibility from/to station or optimization of a traffic management. Therefore the impact on local traffic by operating of NSCR in 2020 and the benefit of road improvement and traffic management will be discussed in this section. The target area for analysis is surrounding area of Tutuban station which will generate huge boarding and alighting passengers as a terminal station of NSCR and also a transfer station with LRT2.

In order to grasp the current traffic situation, the 16 hours count survey (AM8 to PM10) and the 15 minute count survey (15minute between PM4:30 to PM8:45) were conducted at locations below.

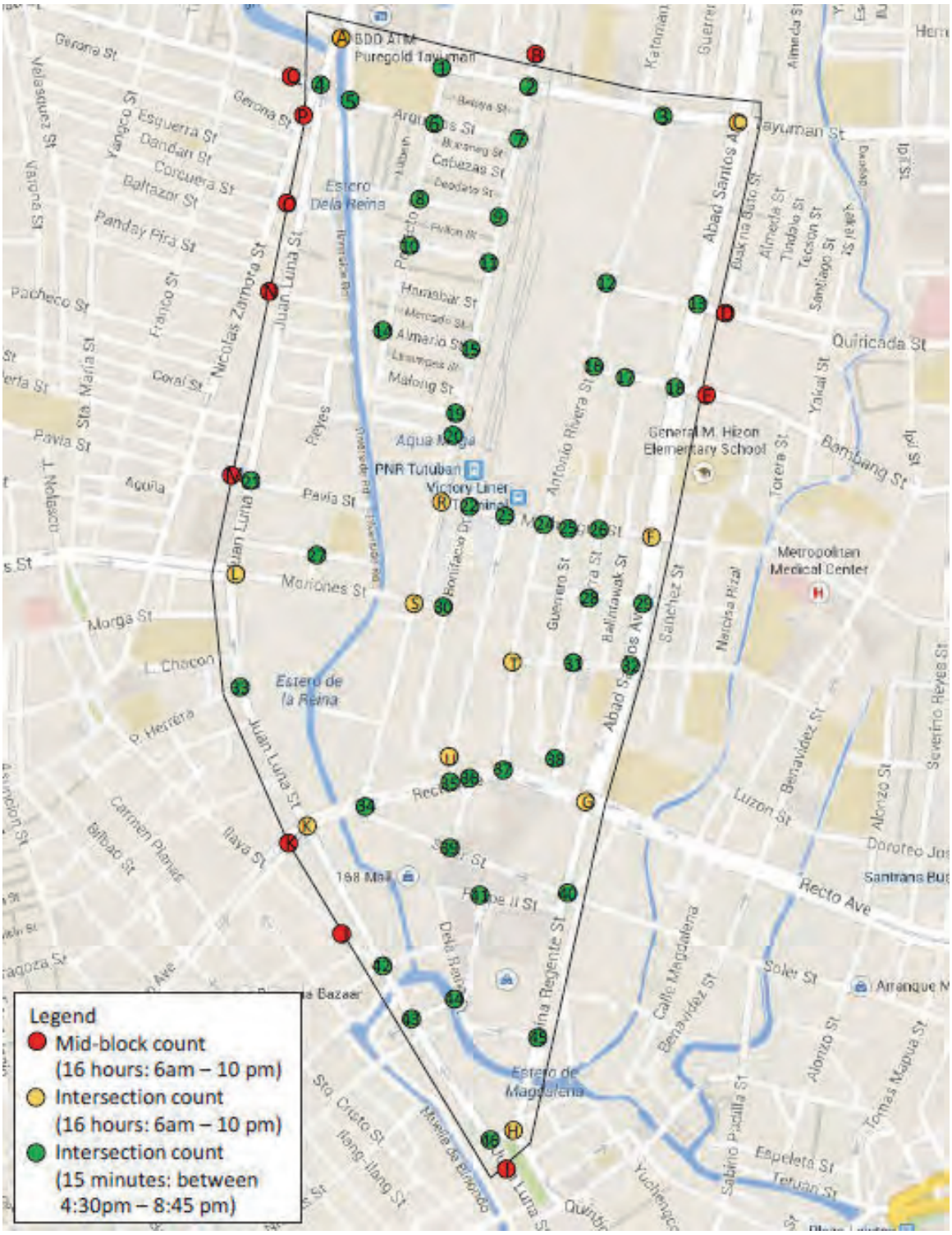
The collected traffic data was expanded to data in 2020 by using expansion rate which was calculated from the result of traffic assignment model (see Chapter 3). The expanded traffic data shows that traffic congestion will happen during morning peak hour (AM7 to AM8) at following locations which are access road to Tutuban area.

Table 9.2.1 Moring Peak Traffic Volume in 2020 (Congested Road Only)

Location	Road Name	Direction	Traffic Volume Total (PCU/Hour)	Road Capacity*1 (PCU/Hour)	V/C Ratio	Speed (kph)*2
A	Capulong/ Juan Luna	To Tutuban from Raxa Bago	988	1,009	0.98	13.3
D	Quiricada	To Tutuban from Rizal Ave.	295	322	0.91	16.1
E	Bambang	To Tutuban from Rizal Ave.	1,132	1,009	1.12	8.7
F	Mayhaligue/ Abad Santos	To Rizal Ave. from Tutuban	386	322	1.20	7.0
N	Penalosa	To Tutuban from west area	322	322	1.00	12.6
P	Nicolas Zamora	To south from Tutuban	1,585	1,356	1.17	7.6

Source: Study Team

**1: Capacity was calculated based on Indonesian Highway Capacity Manual, 1997*
**2: Speed was calculated based on BPR function. (Free flow speed: 50km, Parameters a=3.0, b=4.0)*



Source: Study Team

Figure 9.2.1 Survey Locations

In order to evaluate the impact of access road improvement and traffic management optimization, the traffic volume was decreased by 10% as optimization of traffic management and the traffic capacity was increased by 10% as improvement of road. As shown in following table, the road speed of some locations still was below 20 km/h.

Table 9.2.2 Improvement Effect
(10% reduction in traffic volume and 10% increase in road capacity)

Location	Road Name	Direction	Traffic Volume Total (PCU/Hour)	Road Capacity (PCU/Hour)	V/C Ratio	Speed (kph)
A	Capulong/ Juan Luna	To Tutuban from Raxa Bago	889	1,110	0.80	22.4
D	Quiricada	To Tutuban from Rizal Ave.	265	355	0.75	25.8
E	Bambang	To Tutuban from Rizal Ave.	1,019	1,110	0.92	16.0
F	Mayhaligue/ Abad Santos	To Rizal Ave. from Tutuban	347	355	0.98	13.3
N	Penalosa	To Tutuban from west area	290	355	0.82	21.4
P	Nicolas Zamora	To south from Tutuban	1,427	1,492	0.96	14.2

Source: Study Team

In the case that the traffic volume was decreased by 20% and the traffic capacity was increased by 20%, the traffic congestion of all roads was solved as shown in the following table.

Table 9.2.3 Improvement Effect
(20% reduction in traffic volume and 20% increase in road capacity)

Location	Road Name	Direction	Traffic Volume Total (PCU/Hour)	Road Capacity (PCU/Hour)	V/C Ratio	Speed (kph)
A	Capulong/ Juan Luna	To Tutuban from Raxa Bago	790	1,211	0.65	32.4
D	Quiricada	To Tutuban from Rizal Ave.	236	387	0.61	35.3
E	Bambang	To Tutuban from Rizal Ave.	906	1,211	0.75	25.8
F	Mayhaligue/ Abad Santos	To Rizal Ave. from Tutuban	309	387	0.80	22.5
N	Penalosa	To Tutuban from west area	257	387	0.67	31.5
P	Nicolas Zamora	To south from Tutuban	1,268	1,628	0.78	23.7

Source: Study Team

The road speeds of location A, D, E, F, N and P were increased 19.1km/h, 19.2km/h, 17.1km/h, 15.6km/h, 18.9km/h and 16.2km/h respectively by improvement of access road and optimization of traffic management.

It is inevitable to increase the local traffic around the stations by the railway development. Implementing the access road improvement and/or traffic management optimization together with the railway development can generate the further benefit such as the abovementioned travel seed improvement which can consider as a part of economic benefit.

9.3 Economic Evaluation

9.3.1 Methodology

The study team conducted incremental discounted cash flow analysis to assess the economic viability of the Malolos to Tutuban Section of the North-South Commuter Railway Line. The economic internal rates of return (EIRRs) and economic net present values (ENPVs) were calculated to determine the viability of the proposed alignment. The analysis focused on the assessment of the "with-project" and "without project" scenarios to measure the incremental impact of the project. The duration of the project was assumed to be 40 years – construction period of 5 years and operating period of 35 years.

A sensitivity analysis was carried to assess the responsiveness of the viability indicators to changes in critical variables such as economic costs and economic benefits.

9.3.2 Economic Cost of the Project

The economic costs were determined by deducting all taxes and price contingencies included in the financial cost and by applying the shadow wage rate to the unskilled labor component of investment cost. Economic costs were estimated to be equivalent to about 85% of financial cost. The conversion factor applied to the operating and maintenance (O&M) costs were also 85%.

Table 9.3.1 Estimated Economic Cost of the Project

(In million US dollars, constant 2014 prices)

Items		Total
Construction		1,749.9
Consulting Services		147.5
Land Acquisition		27.2
Taxes	Import Duty	0.0
	Value-Added Tax	0.0
Administration cost		57.7
TOTAL		**1,982.3**

Source: JICA Study Team

9.3.3 Economic Benefits

The main economic benefits of Malolos to Tutuban section are the savings owing to the reduction in vehicle operating cost (VOC) and travel time cost (TTC). The construction of the NSCR Line is expected to reduce traffic volume, which in turn will result in shorter travel times and faster vehicle operating velocity. The shorter travel time translates into lower traveling times costs, while the faster vehicle velocity implies lower operating costs. The values of these economic benefits will be based on the willingness to pay for time cost and VOC per trip. Additional economic benefits that may be included in the analysis such as accident cost savings, reduction in carbon dioxide emissions, and avoided road maintenance cost.

In the process of calculating the core benefits of project, the unit VOC and TTC were estimated. The unit VOC were based on the average operating costs of a representative set of vehicles. The cost items that were considered in the computation were: (1) fuel cost, (2) lubricant cost, (3) tire cost, (4) repair cost, (5) depreciation cost, (6) capital opportunity cost, (7) overhead cost, and (8) crew cost. The results of the computation were consolidated and expressed as a function of travel speed.

Table 9.3.2 Unit VOC in the Philippines, 2014

(In pesos per kilometer)

	Speed (Km/hour)	Motor cycle	Car	HOV/Van	Jeepney	Standard Bus	Small Truck	Big Truck
Financial Cost	5	11,868	37,303	59,561	50,300	100,491	162,488	197,130
	10	6,918	22,622	33,840	30,010	58,068	88,321	110,870
	20	4,353	14,851	20,616	19,095	36,479	50,749	67,278
	30	3,476	12,129	15,284	15,651	29,529	37,314	48,920
	40	3,001	10,721	12,527	13,658	25,930	31,121	40,103
	50	2,785	9,944	11,247	13,647	25,399	27,899	36,175
	60	2,764	10,011	10,616	14,674	26,609	26,349	34,154
	70	2,824	10,337	10,436	16,275	28,685	25,536	33,826
	80	2,946	10,838	10,629	18,134	31,186	26,123	35,285
	90	3,144	11,583	11,238	19,719	33,441	27,391	37,844
Economic Cost	5	10,353	27,333	50,773	44,244	85,799	151,082	178,178
	10	6,038	16,746	28,298	25,742	49,323	81,375	99,240
	20	3,803	11,145	17,081	16,308	30,827	46,187	59,533
	30	3,038	9,188	12,595	13,361	24,941	33,756	43,107
	40	2,625	8,182	10,318	11,663	21,888	28,035	35,274
	50	2,437	7,658	9,223	11,658	21,473	24,994	31,702
	60	2,421	7,744	8,669	12,580	22,519	23,447	29,762
	70	2,473	8,024	8,474	13,973	24,316	22,571	29,308
	80	2,581	8,454	8,544	15,527	26,491	22,937	30,423
	90	2,756	9,083	8,987	16,854	28,449	23,928	32,533

Source: JICA Study Team

The estimates of unit TTCs were based on the mode of transportation across household income groups. The monthly TTC per mode of transportation was the weighted average of household income with percentage of vehicle ownership as weights. However, these values represented the value of time while working and not the travel time cost. The average value of travel time per mode of transportation was the product of value of time per hour and the share of business trip and "to work" trip. Unit TTCs was assumed to grow in line with per capita GRDP of the Mega Manila area.

Table 9.3.3 Present and Future Time Value of Passengers

(In Pesos per hour)

Year	Private	Public		
	Car	LRT	Jeepney	FX
2012	111.8	97.4	66.0	71.0
2020	141.6	123.3	83.5	89.9
2030	182.6	159.0	107.7	115.9
2040	233.2	203.1	137.6	148.1

Source: JICA Study Team

The summary of economic benefits after the TTC savings are adjusted is shown in Table 9.3.4.

Table 9.3.4 Summary of Economic Benefits for Benchmark Years

(In million US dollars)

Year	VOC Savings	TTC Savings	Total
2020	285.3	70.2	355.4
2025	596.4	146.0	742.4
2030	507.9	258.5	766.4
2040	1,417.2	457.0	1,874.2

Source: JICA Study Team

9.3.4 Results of Economic Evaluation

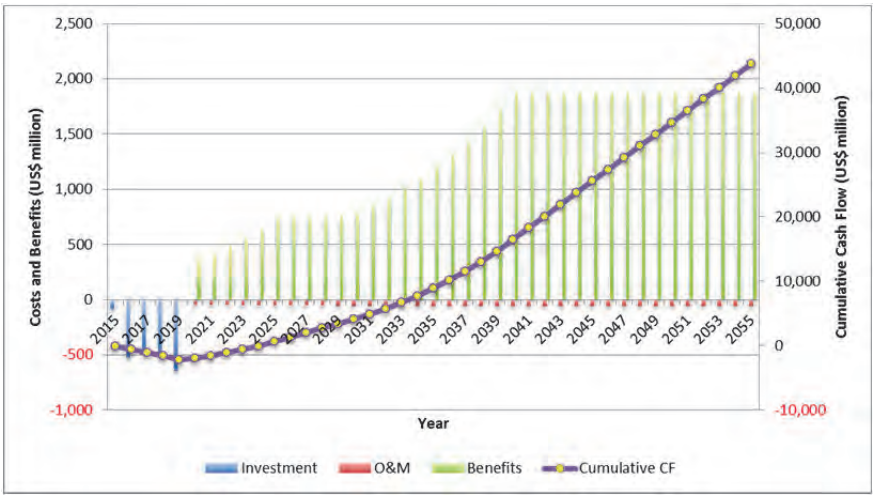
The economic analysis for the base case yields an EIRR of 19.7% and an ENPV of US$829.8 million relative to the social discount rate of 15%, and given a project life of 35 years. The FNPV and FIRR were estimated using constant 2014 prices with US dollar as the functional currency. These indicate that the proposed Malolos to Tutuban section of the NSCR project is economically viable. The results of the economic analysis and the computation of the EIRR and the EPNV are in Table 9.3.5.

Table 9.3.5 Evaluation of Economic Costs and Benefits

(In million US dollars, constant 2014 prices)

Year	Investment	O&M Cost	Benefits	Net Cash Flow	Discounted Cash Flow at 15%		
					Costs	Benefits	Net
2015	90			-90	78	0	-78
2016	531			-531	401	0	-401
2017	477			-477	313	0	-313
2018	486			-486	278	0	-278
2019	649			-649	323	0	-323
2020	6	41	355	309	20	154	133
2021	3	44	412	364	18	155	137
2022		48	477	-90	16	156	140
2023		51	553	502	15	157	143
2024		52	641	589	13	158	146
2025		53	742	690	11	160	148
2026		53	741	688	10	139	129
2027		54	743	689	9	121	112
2028		55	747	693	8	106	98
2029		55	755	700	7	93	86
2030		56	766	710	6	82	76
2031		56	836	780	5	78	73
2032		56	913	857	5	74	69
2033		56	998	942	4	70	66
2034		56	1,090	1,034	3	67	63
2035		56	1,192	1,136	3	63	60
2036		56	1,304	1,248	3	60	58
2037		56	1,427	1,371	2	57	55
2038		56	1,562	1,506	2	55	53
2039		56	1,711	1,655	2	52	50
2040		56	1,874	1,818	1	50	48
2041		56	1,874	1,818	1	43	42
2042		56	1,874	1,818	1	37	36
2043		56	1,874	1,818	1	33	32
2044		56	1,874	1,818	1	28	27
2045		56	1,874	1,818	1	25	24
2046		56	1,874	1,818	1	21	21
2047		56	1,874	1,818	1	19	18
2048		56	1,874	1,818	0	16	16
2049		56	1,874	1,818	0	14	14
2050		56	1,874	1,818	0	12	12
2051		56	1,874	1,818	0	11	10
2052		56	1,874	1,818	0	9	9
2053		56	1,874	1,818	0	8	8
2054		56	1,874	1,818	0	7	7
2055		56	1,874	1,818	0	6	6

Source: JICA Study Team



Source: JICA Study Team

Figure 9.3.1 Cash Flow of the Economic Costs and Benefits

Table 9.3.6 Results of Economic Valuation

Indicator	Unit	Value
EIRR	%	19.7%
ENPV	US$ Million	829.8
B/C	-	1.53

Source: JICA Study Team

A sensitivity analysis was carried out to determine the sensitivity of EIRR to changes in costs and benefits. The results of sensitivity analysis are summarized in Table 9.3.7.

Table 9.3.7 Sensitivity Analysis of Economic Evaluation

Benefits	Cost	Change in Economic Cost			
	Change	Base Case	+10%	+20%	+30%
Change in Economic Benefit (%)	Base Case	19.7%	18.6%	17.6%	16.7%
	-10%	18.5%	17.4%	16.4%	15.6%
	-20%	17.1%	16.1%	15.2%	14.4%
	-30%	15.7%	14.7%	13.9%	13.1%

Source: JICA Study Team

9.4 Financial Viability

9.4.1 Methodology

Discounted cash flow (DCF) analysis will be used to determine the financial viability of the proposed Malolos to Tutuban Section of the North-South Commuter Railway (NSCR) Line. Free cash flows to the project will be computed on the "with-project" and "without-project" scenarios to measure the financial impact of the railway project.

Free cash flow, which is a measure of financial performance, is computed as operating income less capital expenditures. Cash inflows of the project include fare and non-fare revenues. Cash outflows of the project will consist of recurrent costs such operation and maintenance (O&M) expenses, and capital expenditures

Based on the estimated incremental cash flow to the project, the team financial internal rate of return (FIRR) and the financial net present value (FNPV) will be computed using the relevant discount rates. The FIRR and FNPV will indicate whether the Malolos to Tutuban Section will generate sufficient cash flows to cover operating and maintenance expenses, capital expenditures, and investment cost.

The FIRRs and the financial net present values FNPVs were calculated using constant 2014 prices with the US dollar as the functional currency. In the cash flow analysis, there were no provisions made for incomes taxes, depreciation and income tax expenses, and loan amortization.

9.4.2 Project Costs

The proposed Malolos to Tutuban commuter railway system is estimated to cost US$2,637.0 million. The breakdown of the major components of project cost is presented in Table 9.4.1. There was likewise no provision for price contingency since the analysis will be in constant prices.

Table 9.4.1 Estimated Project Cost

(In million US dollars, constant 2014 prices)

Items		Total
Construction		2,058.7
Consulting Services		173.6
Land Acquisition		32.0
Taxes	Import Duty	33.2
	Value-Added Tax	271.7
Administration cost		67.9
TOTAL		**2,637.0**

Source: JICA Study Team

Once the appropriate contractor has been identified, the construction of the Malolos to Tutuban commuter railway system is to be completed in five years including the train test runs. The Malolos to Tutuban section is expected to commence operations in 2020. The total route length of the railway system will be 37.9 kilometers and it will have a total of 10 stations for revenue operation start in 2020, 5 additional stations in 2030.

Project implementation will be over a period of seven years including preparation of feasibility study, preliminary design and tender documents, land acquisition and resettlement, environmental impact assessment, and utility relocation. A 35-year operating period is used in the financial analysis of the project. However, the physical life of the railway system can stretch up to 60 years when the project proponent implements the necessary regular and periodic repairs and maintenance.

The project's O&M costs are comprised of: (1) manpower, (2) spare parts, (3) power, and (4) station services. Annual O&M costs will include preventive maintenance works, and regular and period repairs of the rolling stock, track works, E&M system, and other equipment and structures. Depending on the scheme

that will be adopted by the government, the responsibility for the project's O&M can either be carried out by an in-house workforce or outsourced to a third-party contractor.

The summary of the annual O&M costs is re-presented in Table 9.4.2 (see 5.7.5).

Table 9.4.2 O&M Cost (repeated)

(In million US dollars, constant 2014 prices)

Item / Year	2020	2025	2030	2040
Manpower	10	10	13	13
Spare Parts	28	36	36	36
Power	10	14	17	17
Total	48	60	66	66

Source: JICA Study Team

9.4.3 Project Revenues

The daily boarding on the commuter system is estimated to be 407,000 in 2020. By 2025, daily boarding will reach its peak of 953,000. This represents an average increase of 19% per annum over a 5-year period. Non-fare revenues are assumed to be 5% of farebox revenues. Based on the proposed fare system, the summary of the revenue projections in the benchmark years is shown in Table 9.4.3.

Table 9.4.3 Revenue Projections for Benchmark Years

(In million US dollars, constant 2014 prices)

Year	Fare Revenues	Non-Fare Revenues	Total Revenues
2020	163.1	8.2	171.2
2025	237.5	11.9	249.3
2030	388.7	19.4	408.1
2040	597.8	29.9	627.7

Source: JICA Study Team

9.4.4 Results of Financial Evaluation

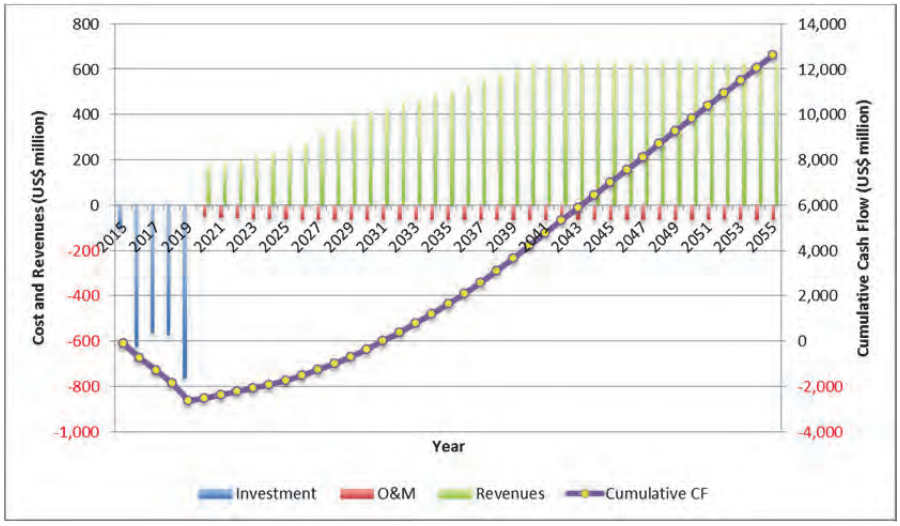
The results of the financial evaluation show that revenues generated by the project will not be enough to cover investment cost, capital expenditures, and O&M cost. The project will realize a FIRR of 9.2% and a FNPV of US$2,189.1 million using a discount rate of 5.1%.

Table 9.4.4 Evaluation of Financial Costs and Revenues

(In million US dollars, constant 2014 prices)

Year	Investment	O&M Cost	Revenues	Net Cash Flow	Discounted Cash Flow at 5.1%		
					Costs	Revenues	Net
2015	106.1			-106.1	101.0	0.0	-101.0
2016	624.4			-624.4	565.3	0.0	-565.3
2017	560.8			-560.8	483.1	0.0	-483.1
2018	571.9			-571.9	468.9	0.0	-468.9
2019	763.4			-763.4	595.5	0.0	-595.5
2020	6.6	48.3	171.2	116.3	40.8	127.1	86.3
2021	3.8	52.0	184.6	128.8	39.4	130.4	91.0
2022	0.0	56.0	199.0	143.0	37.7	133.8	96.1
2023	0.0	60.4	214.5	154.2	38.6	137.2	98.6
2024		61.1	231.3	170.2	37.2	140.7	103.5
2025		61.9	249.3	187.4	35.8	144.4	108.5
2026		62.7	275.2	212.5	34.5	151.6	117.1
2027		63.5	303.7	240.2	33.3	159.2	125.9
2028		64.3	335.1	270.8	32.1	167.2	135.1
2029		65.1	369.8	304.7	30.9	175.5	144.6
2030		66.0	408.1	342.1	29.8	184.3	154.5
2031		66.0	426.0	360.1	28.3	183.1	154.8
2032		66.0	444.8	378.8	27.0	181.9	154.9
2033		66.0	464.4	398.4	25.7	180.7	155.0
2034		66.0	484.8	418.8	24.4	179.5	155.1
2035		66.0	506.1	440.2	23.2	178.3	155.1
2036		66.0	528.4	462.4	22.1	177.2	155.1
2037		66.0	551.6	485.7	21.0	176.0	155.0
2038		66.0	575.9	510.0	20.0	174.8	154.8
2039		66.0	601.3	535.3	19.1	173.7	154.6
2040		66.0	627.7	561.8	18.1	172.5	154.4
2041		66.0	627.7	561.8	17.3	164.2	146.9
2042		66.0	627.7	561.8	16.4	156.2	139.8
2043		66.0	627.7	561.8	15.6	148.7	133.0
2044		66.0	627.7	561.8	14.9	141.5	126.6
2045		66.0	627.7	561.8	14.1	134.6	120.5
2046		66.0	627.7	561.8	13.5	128.1	114.6
2047		66.0	627.7	561.8	12.8	121.9	109.1
2048		66.0	627.7	561.8	12.2	116.0	103.8
2049		66.0	627.7	561.8	11.6	110.3	98.8
2050		66.0	627.7	561.8	11.0	105.0	94.0
2051		66.0	627.7	561.8	10.5	99.9	89.4
2052		66.0	627.7	561.8	10.0	95.1	85.1
2053		66.0	627.7	561.8	9.5	90.5	81.0
2054		66.0	627.7	561.8	9.0	86.1	77.0
2055		66.0	627.7	561.8	8.6	81.9	73.3

Source: JICA Study Team



Source: JICA Study Team

Figure 9.4.1 Cash Flow of Financial Cost and Revenue

Table 9.4.5 Results of Financial Valuation

Indicator	Unit	Value
FIRR	%	9.2%
FNPV	US$ Million	2189.1
B/C	-	1.72

Source: JICA Study Team

A sensitivity analysis was likewise carried out to determine the responsiveness of the FIRR to changes in the financial costs and revenues. Table 9.4.6 summarizes the results of the sensitivity analysis.

Table 9.4.6 Sensitivity Analysis of Financial Evaluation

Revenue	Cost	Change in Cost (%)			
	Change	-20%	-10%	Base Case	+10%
Change in Revenues (%)	+20%	12.8%	11.7%	10.8%	9.9%
	+10%	12.0%	10.9%	10.0%	9.2%
	Base Case	11.1%	10.1%	9.2%	8.5%
	-10%	10.2%	9.2%	8.4%	7.6%

Source: JICA Study Team

9.5 Case Analysis

The results above were calculated based on the with rail projects case includes LRT2 west extension and NSRP (South) and so on. In this section, the without LRT2 west extension and NSRP (South) case was tested as a test case analysis. The assumptions were not changed.

The number of daily boarding passenger and PPHPD were shown in the table below. In 2020, number of daily boarding passenger and PPHPD will be 402,000 pax and 12,990 respectively. In 2040, they will be 712,000 pax and 20.440.

Table 9.5.1 Number of Daily Boarding Passenger and PPHPD (test case)

Year	Section	Number of Daily Boarding passenger (Pax/ day)	PPHPD
2020	Malolos-Tutuban	402,000	12,990
2025	Malolos-Tutuban	469,000	15,110
2030	Malolos-Tutuban	671,000	21,590
2040	Malolos-Tutuban	712,000	20,440

Source: JICA Study Team

Table 9.5.2 and Table 9.5.3 shows updated the operation and impact indicators and the estimated impact of project on network improvement.

Table 9.5.2 Operation and Impact Indicators (test case)

Indicators	Without Project(2025)		With Project(2025)	
	Road	Rail		Road
Passenger Kms (000 passenger kms/day)	162,364	-	158,325	4,913
No. of operating train vehicle(vehicle/day/direction)	-	-	-	142
Operating rate of traing vehicle(%)	-	-	-	82.4
Train vehicle kms (000 vehicle kms/day)	-	-	-	85.2
Travel time (Malolos-Tutuban)	102min		86min	35min20sec

Source: JICA Study Team

Table 9.5.3 Estimated Impact of Project on Network Improvement (test case)

Province	Indicators		2025								
			Without Project			With Project			Different		
			Road		Rail	Road		Rail	Road		Rail
			Private	Public		Private	Public		Private	Public	
Metro Manila	V/C		1.09		-	1.08		-	-0.01		
	% of Sections	< 10 kph	52.6		-	52.3		-	-0.2		
		< 20 kph	76.8		-	76.2		-	-0.6		
	Demand	No. of Rail Boarding (million pax)	-		3.4	-		3.7	-		0.3
		Person-kms (000)	44,412	78,115	24,331	44,023	75,653	28,107	-389	-2,462	3,776
		Person-hrs (000)	4,696	6,988	835	4,594	6,644	908	-102	-344	73
		pcu-kms (000)	34,134	8,058	-	33,931	7,775	-	-203	-283	-
		pcu-hrs (000)	3,605	745	-	3,532	706	-	-73	-39	-
Bulacan	V/C		0.70		-	0.68		-	-0.02		-
	% of Sections	< 10 kph	18.0		-	18.7		-	0.7		-
		< 20 kph	37.7		-	36.3		-	-1.4		-
	Demand	No. of Rail Boarding (million pax)	-		-	-		0.1	-		0.1
		Person-kms (000)	11,382	28,456	-	10,924	27,726	895	-458	-730	895
		Person-hrs (000)	839	1,664		829	1,611	13	-11	-54	13
		pcu-kms (000)	10,358	2,427	-	10,074	2,346	-	-284	-81	-
		pcu-hrs (000)	691	147	-	683	141	-	-8	-6	-

Source: JICA Study Team

Based on updated results of demand forecast, the economic financial analysis was updated. The assumptions were explained in the previous sections. The results show the tables and figures below. EIRR, ENPV, FIRR and FNPV became 17.4%, US$ 348.5 million, 10.0% and 2,658.6 million respectively.

Table 9.5.4 Summary of Economic Benefits for Benchmark Years (test case)

(In million US dollars)

Year	VOC Savings	TTC Savings	Total
2020	321.2	60.4	381.6
2025	546.7	104.1	650.7
2030	115.3	206.5	321.8
2040	1,289.4	409.2	1,698.6

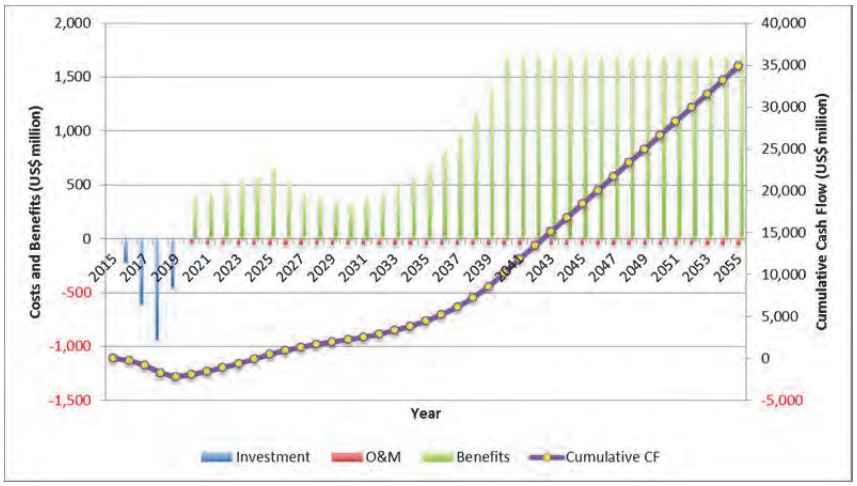
Source: JICA Study Team

Table 9.5.5 Evaluation of Economic Costs and Benefits (test case)

(In million US dollars, constant 2014 prices)

Year	Investment	O&M Cost	Benefits	Net Cash Flow	Discounted Cash Flow at 15%		
					Costs	Benefits	Net
2015	7			-7	6	0	-6
2016	214			-214	162	0	-162
2017	608			-608	400	0	-400
2018	943			-943	539	0	-539
2019	455			-455	226	0	-226
2020		41	382	341	18	165	147
2021		44	425	380	17	160	143
2022		48	472	425	16	154	139
2023		51	526	474	15	149	135
2024		52	585	533	13	145	132
2025		53	651	598	11	140	129
2026		53	520	467	10	97	87
2027		54	430	376	9	70	61
2028		55	372	317	8	53	45
2029		55	337	282	7	41	35
2030		56	322	266	6	34	28
2031		56	368	312	5	34	29
2032		56	424	368	5	34	30
2033		56	491	435	4	35	31
2034		56	574	518	3	35	32
2035		56	676	620	3	36	33
2036		56	802	746	3	37	34
2037		56	958	902	2	38	36
2038		56	1,152	1,096	2	40	38
2039		56	1,395	1,339	2	42	41
2040		56	1,699	1,643	1	45	43
2041		56	1,699	1,643	1	39	38
2042		56	1,699	1,643	1	34	33
2043		56	1,699	1,643	1	30	29
2044		56	1,699	1,643	1	26	25
2045		56	1,699	1,643	1	22	22
2046		56	1,699	1,643	1	19	19
2047		56	1,699	1,643	1	17	16
2048		56	1,699	1,643	0	15	14
2049		56	1,699	1,643	0	13	12
2050		56	1,699	1,643	0	11	11
2051		56	1,699	1,643	0	10	9
2052		56	1,699	1,643	0	8	8
2053		56	1,699	1,643	0	7	7
2054		56	1,699	1,643	0	6	6
2055		56	1,699	1,643	0	6	5

Source: JICA Study Team



Source: JICA Study Team

Figure 9.5.1 Cash Flow of the Economic Costs and Benefits (test case)

Table 9.5.6 Results of Economic Valuation (test case)

Indicator	Unit	Value
EIRR	%	17.4%
ENPV	US$ Million	348.5
B/C	-	1.23

Source: JICA Study Team

Table 9.5.7 Sensitivity Analysis of Economic Evaluation (test case)

Benefits	Cost	Change in Economic Cost			
	Change	Base Case	+10%	+20%	+30%
Change in Economic Benefit (%)	Base Case	17.4%	16.3%	15.3%	14.4%
	-10%	16.2%	15.1%	14.2%	13.4%
	-20%	14.8%	13.9%	13.0%	12.2%
	-30%	13.5%	12.5%	11.7%	11.0%

Source: JICA Study Team

Table 9.5.8 Revenue Projections for Benchmark Years (test case)

(In million US dollars, constant 2014 prices)

Year	Fare Revenues	Non-Fare Revenues	Total Revenues
2020	160.3	8.0	168.3
2025	242.5	12.1	254.6
2030	431.6	21.6	453.2
2040	658.5	32.9	691.4

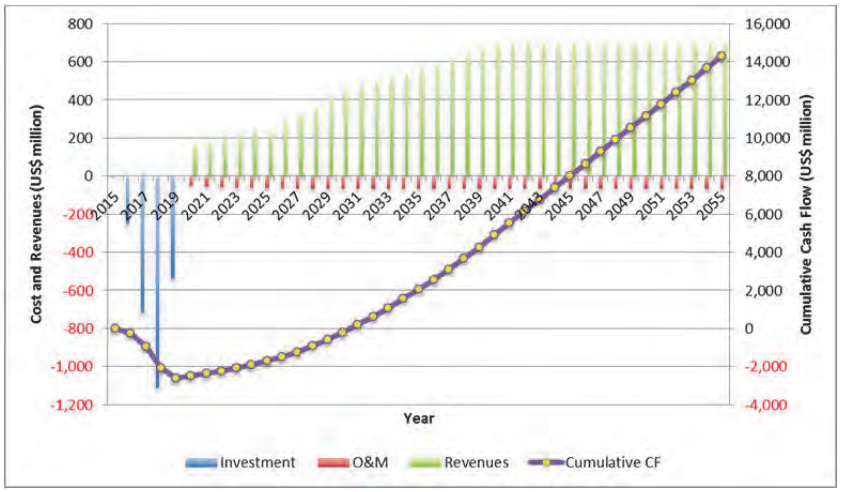
Source: JICA Study Team

Table 9.5.9 Evaluation of Financial Costs and Revenues (test case)

(In million US dollars, constant 2014 prices)

Year	Investment	O&M Cost	Revenues	Net Cash Flow	Discounted Cash Flow at 5.1%		
					Costs	Revenues	Net
2015	7.8			-7.8	7.4	0.0	-7.4
2016	251.5			-251.5	227.6	0.0	-227.6
2017	715.2			-715.2	616.0	0.0	-616.0
2018	1,109.9			-1,109.9	909.7	0.0	-909.7
2019	535.1			-535.1	417.3	0.0	-417.3
2020		48.3	168.3	120.0	35.8	124.9	89.1
2021		52.0	182.9	130.8	36.7	129.1	92.4
2022		56.0	198.6	142.6	37.6	133.4	95.8
2023		60.4	215.8	155.4	38.6	137.9	99.3
2024		61.1	234.4	173.3	37.2	142.5	105.4
2025		61.9	254.6	192.7	35.8	147.3	111.5
2026		62.7	285.7	223.0	34.5	157.3	122.8
2027		63.5	320.7	257.2	33.3	168.0	134.7
2028		64.3	359.9	295.5	32.0	179.3	147.3
2029		65.1	403.8	338.7	30.9	191.5	160.6
2030		66.0	453.2	387.2	29.8	204.5	174.7
2031		66.0	472.7	406.8	28.3	202.9	174.6
2032		66.0	493.1	427.2	26.9	201.4	174.5
2033		66.0	514.4	448.5	25.6	199.9	174.3
2034		66.0	536.6	470.7	24.4	198.4	174.0
2035		66.0	559.8	493.8	23.2	196.9	173.7
2036		66.0	583.9	518.0	22.1	195.5	173.4
2037		66.0	609.1	543.2	21.0	194.0	173.0
2038		66.0	635.4	569.4	20.0	192.6	172.6
2039		66.0	662.8	596.9	19.0	191.1	172.1
2040		66.0	691.4	625.5	18.1	189.7	171.6
2041		66.0	691.4	625.5	17.2	180.5	163.3
2042		66.0	691.4	625.5	16.4	171.7	155.4
2043		66.0	691.4	625.5	15.6	163.4	147.8
2044		66.0	691.4	625.5	14.8	155.5	140.6
2045		66.0	691.4	625.5	14.1	147.9	133.8
2046		66.0	691.4	625.5	13.4	140.8	127.3
2047		66.0	691.4	625.5	12.8	133.9	121.1
2048		66.0	691.4	625.5	12.2	127.4	115.3
2049		66.0	691.4	625.5	11.6	121.2	109.7
2050		66.0	691.4	625.5	11.0	115.4	104.4
2051		66.0	691.4	625.5	10.5	109.8	99.3
2052		66.0	691.4	625.5	10.0	104.4	94.5
2053		66.0	691.4	625.5	9.5	99.4	89.9
2054		66.0	691.4	625.5	9.0	94.5	85.5
2055		66.0	691.4	625.5	8.6	90.0	81.4

Source: JICA Study Team



Source: JICA Study Team

Figure 9.5.2 Cash Flow of Financial Cost and Revenue (test case)

Table 9.5.10 Results of Financial Valuation (test case)

Indicator	Unit	Value
FIRR	%	10.0%
FNPV	US$ Million	2,658.6
B/C	-	1.89

Source: JICA Study Team

Table 9.5.11 Sensitivity Analysis of Financial Evaluation (test case)

Revenue	Cost	Change in Cost (%)			
	Change	-20%	-10%	Base Case	+10%
Change in Revenues (%)	+20%	13.7%	12.6%	11.6%	10.8%
	+10%	12.9%	11.8%	10.8%	10.0%
	Base Case	12.0%	10.9%	10.0%	9.2%
	-10%	11.0%	10.0%	9.1%	8.4%

Source: JICA Study Team

9.6 Necessity of the Project

Population growth and urbanization have led to traffic congestion in Metro Manila. In addition, expansion in car ownership and decline in car occupancy also resulted in increased car traffic, while reducing public transport use at certain level since 1996. As a result, the traffic volume almost reached the capacity of the current road network and travel speed declined significantly, specifically on major arterial roads, such as EDSA. In spite of declined public transport use, road based public transport services, including buses, jeepney, and Asian utility vehicles (AUVs), are still dominant on road. These public transport performance and congestion of roads result in a vicious cycle. For example, frequent stops of buses or jeepney aggravate traffic congestion, while traffic congestion lowers travel speed of public transport.

The impact of the current traffic congestion in Metro Manila cannot be neglected. According to DOTC, the traffic congestion caused economic loss of Php137.7 billion in 2012.[1] This would cover lost opportunities of business, inefficiency in economy, pollution, waste of energy and resources, impact on health, decline of quality of life, increased risk of accidents, etc. It was estimated that the economic losses originated from traffic congestion in the last decade are indeed four times larger than investments needed for the public transport projects in Metro Manila.[2] As discussed, motor vehicles are the main polluter of air as well as and the emitter of GHG.

Traffic congestion in Metro Manila needs integrated approach based on urban mass transit, since improvement of road network alone cannot solve the issue. In particular, for the urban poor, a lack of transport choices significantly restricts their mobility and then reduces a job opportunity, because of high transport cost. Without any intervention, the traffic congestion problem is anticipated to exacerbate so that its cost would be more than doubled by 2030.

In order to strengthen the international competitiveness of the Philippines, it is necessary to improve accessibility to the global market. As well as development of infrastructure in Metro Manila and surrounding regions, it is necessary to improve the capacity of regional logistics and passenger traffic.

As stated in Section 2.3 "Confirmation of Project Necessity" in Chapter 2, broad-based regional development and transportation infrastructure development such as port and harbor, airport etc., is also in progressing. Therefore, highway and railway shall support the development of Metro Manila as trunk traffic corridor, there is a need to achieve an appropriate functional division. It is enhanced north-south axis by railway is in place, elimination of traffic congestion, improvement of regional accessibility, furthermore it is expected to lead to the strengthening of international competitiveness.

[1] *The Philippine Star, "Traffic congestion cost PhP137 billion last year," September 27, 2012.*

[2] *Regidor, Jose Regino F.. 2012. Revisiting the Costs of Traffic Congestion in Metro Manila and Their Implications. Proceedings of the 2012 UP College of Engineering Professorial Chair Colloquium. Available from http://d0ctrine.files.wordpress.com/2012/09/prof-chair-2012-jrfr-02july2012.pdf.Accessed on June 23, 2013.*

CHAPTER 10

KEY CONSIDERATIONS ON PROJECT IMPLEMENTATION

CHAPTER 10 KEY CONSIDERATIONS ON PROJECT OPERATION AND MAINTENANCE STRUCTURE

Taking into consideration the agreement regarding usage of PNR's ROW, current situation of the railway project agencies and proposal of PMO as the new project implementation entity, O&M body etc., described in previous chapter, the key considerations and factors for success of NSCR project are summarized as follows.

10.1 Agreement with Philippine Government

10.1.1 Usage of PNR's ROW for NSCR

Principle of route selection of NSCR was determined through comparison among 4 routes during the pre-F/S of the Clark Airport Express Railway in 2012. It was recommended to follow ROW acquired by the Northrail Project. This route plan was agreed and finalized in the Technical Working Group (TWG) meeting and Joint Coordination Committee (JCC).

During the Loan Appraisal Mission, JICA and DOTC confirmed that the proposal alignment will follow the ROW that has been acquired for the Northrail Project for the 32.1 km length between Malolos City and Samson Road, and the existing ROW of the PNR for the 5.7 km length between Samson Road and Recto Avenue.

Both sides also confirmed that the location of the Depot shall be Valenzuela, considering the required space for the Depot and the read availability of the land in that area.

10.1.2 Segment 10(from Samson Road, Caloocan City to Governor Pascual Avenue, Malabon City)

Memorandum of Understanding is signed by the representatives of DPWH, PNR, NLRC and DOTC on September, 2015. Terms and condition of proceeding the mobilization and construction of the Segment 10 were agreed in the Memorandum of Understanding. Moreover, DOTC sent the letter to NLRC which mentioned further inspection by DOTC and/or NLRC is necessary prior to the start of actual construction of permanent structures. As of November 2, 2015, as-build drawing of segment 10 isn't submitted to DOTC. To avoid any delay and/or obstruction of design and construction of NSCR, close coordination with relevant agency is recommended.

10.1.3 Project Implementation Structure

During the implementation of the project, PMO shall be created as the organization to be in charge of the actual project implementation and liaison with the Consultant, Contractor and other concerned stakeholders. As the formal establishment of PMO would take time, NLRC shall be assigned as an interim PMO within the authority of DOTC.

The DOTC explained to JICA during the Loan Appraisal Mission, the Northrail is assigned as the Project Management Unit (PMU) which shall contributes key members to the PMO to be established within the DOTC pursuant to the Special Order 2015-069 dated May 4, 2015.

10.1.4 Operation and Maintenance Structure

The financial condition of PNR informs us that it is not capable of sustainable operating and maintaining of the NSCR. Moreover due to differences of technologies between PNR and NSCR, it is recommended to outsource O&M to an experienced commuter railway operator. The Government of the Philippines

promotes active involvement of private sector in the O&M of infrastructure projects and that this policy could guide decisions on the O&M structure of the NSCR. The DOTC explained to JICA and both sides confirmed that this policy during the Loan Appraisal Mission.

Therefore it shall be considered to organize the O&M support team in GC consultants and shall involve the procurement of O&M concessionaire, and to provide support or advice, if necessary, regarding whole O&M activities to secure sufficiency of the commuter railway operation.

10.2 South line of North-South Railway Project

The proposed NSRP South Line covers Metro Manila to Legazpi City, plus a number of existing and proposed branch lines totaling to approximately 653 km. It consists of commuter railway operations between Tutuban and Calamba and long haul railway operations between Tutuban and Legazpi, including extended long haul rail operations on the branch line between Calamba and Batangas and extension between Legazpi and Matnog.

During the Loan Appraisal Mission, JICA and DOTC confirmed that NSRP will connect to NSCR near the Solis station to secure the seamless operation of both line. On the other hand, according to current discussion among relevant agencies, such as DOTC, ADB, DBP and PPPC, NSRP will directly connect to Tutuban. As of November 2, 2015, any configuration of alignment of NSRP isn't agreed. To avoid any delay and/or obstruction of design and construction of NSCR, close coordination with relevant agency is recommended.

10.3 Key Factor for Early Project Commitment

PMO shall be responsible for implementation of the project package which will be commenced prior to the mainline construction. In order to ensure sufficient and timely financial and human resources, both technical and financial requirement shall be clarified. Furthermore, technical specifications, design and bill of quantities, procurement plan, construction plan, quality control plan etc. shall be established and reviewed carefully.

A comprehensive plan for post construction activities shall be in place, and its responsibilities shall be clearly defined between implementation, management and other related units. Such activities of monitoring of various economic benefit and environmental impact at the post construction stage shall be in compliance with efficiency, usability accessibility, punctually, security and cost efficiency.

The plan to collect information, exam, analyze and evaluate, including resources for such activities shall be established in time prior to the planning stage of the project.

All plans mentioned above shall be reviewed not only on a regular basis of the project management strategy to ensure reliability of quality and efficiency of the project, but also timely budget allocation.

Public relation is one of the most important elements to successfully launch a large infrastructure project such as NSCR. A comprehensive plan shall be developed to promote understanding of the project to the public, sufficient resources allocated to conduct such activities shall also be a key factor of success of NSCR project.

Public relation strategy including introduction of the overall project information, for example, benefit, procedure and timelines shall be considered with various material through various media.

10.4 Human Resource and Capacity Building

First of all, it is necessary to analyze the capability of current staff of the implementing agency. It is necessary to secure sufficient number of technicians and staff available to provide, as mentioned in the previous chapter, implementation organizations and plans. In order to ensure a sufficient number of project staff are in place, detailed plan in timeline shall be set on each stage of the project as well as the clarification of critical paths.

When new technology, method or protocol will be introduced to NSCR project, it shall be reviewed and evaluated by its efficiency from both technical adequacy and cost- effectiveness. Expert team for technical support on each stage of the project such as design, tender, construction and operation, shall be established to define issues and problems, then to introduce countermeasure at an earlier stage.

Furthermore, it is necessary to consider association with foreign contractor and/or operator for the purpose of training of personnel of LRC at all levels. Training of personnel is in order to develop in-house capacity to conduct implementation and operation includes training of in-house trainers. Such decision mentioned above will be the subject to make consensus LRC.