

ANNEX C
Meeting Records

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Steering Committee (SC) Meeting No.1	20 February 2015
Inter-Agency Working Group (IAWG) Meeting No.1	11 March 2015
Inter-Agency Working Group (IAWG) Meeting No.2	15 April 2015
Inter-Agency Working Group (IAWG) Meeting No.3	21 May 2015
Steering Committee (SC) Meeting No.2	24 June 2015

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Appendix

Minutes of Meeting	
Project	Information Collection Survey for the Mega Manila Subway Project
Subject	Steering Committee Meeting No.1
Date and Time	12:00 – 13:30 on Friday, 20 Feb. 2015
Venue	DOTC meeting room (17F)
Attendees	DOTC: Mr. Rene K. Limcaoco, Mr. J.F.A. Caringal, Dr. Deo Leo Manalo, Mr. Jedd Carlo F. Ugay, Mr. Mirick Paala, Ms. Vera Reyes (DPWH: Mr. Constante A. Lianes, JR., Mr. Maximo Ewald M. Montaña II, Ms. Pelita V. Galvez – separate meeting on 25-Feb-15) MMDA: Ms. Luisa Angangan JICA Philippines Office: Mr. Yuya Takagi (JICA Tokyo H.Q.: Mr. Nozomu Yamashita – separate meeting on 25-Feb-15) JICA Study Team: Mr. Shinya Nakamura, Mr. Takayuki Isaka, Mr. Jose Salonga, Mr. Akira Honda, Mr. Hiroshi Utsugi, Dr. Jorge Muller, Mr. Masayuki Tsuji, Mr. Shinsuke Mogi
<p>After JICA Study Team explained the preliminary consideration on subway route selection, discussion and exchange of opinions were made among DOTC, DPWH, MMDA and JICA Study Team, which can be summarized as follows:</p> <ul style="list-style-type: none">• DOTC underlined that considering the process on the Philippines side, the highest priority is to submit application of the Mega Manila Subway Project (MMSP) in June for NEDA ICC process.• All the criteria on route selection were understood as explained by the JICA Study Team, which are: 1) geological stability (elevation, soil condition), 2) minimization of impact from flooding and earthquake, 3) population density and growth, 4) existing and planned CBDs, 5) consistency and connectivity in railway network, 6) avoidance with on-going projects (highways, etc.), 7) connection with planned Integrated Transport System (ITS) facilities.• It was endorsed that consideration of the subway route would be carried out by dividing the whole route in three zones; i.e. the north zone, the central zone, and the south zone.• It was understood in principle that the most probable route for the central zone would be the one going through the EDSA (C4) as proposed in the Roadmap Study. It was, however, noted that a preliminary consideration to compare other alignment options for the central zone was needed.• Clarification was made on the traffic demand along EDSA road, and how both MRT3 and the MMSP could contribute to meet the demand. JICA Study Team explained that, based on the demand in the Roadmap Study, both the MRT3 and the MMSP could complement each other, and committed to provide sound evidence to support this.• Concern was raised about the cease of operation of the MRT3 during construction of the MMSP. JICA Study Team confirmed that there would be no impact on the MRT3 operation	

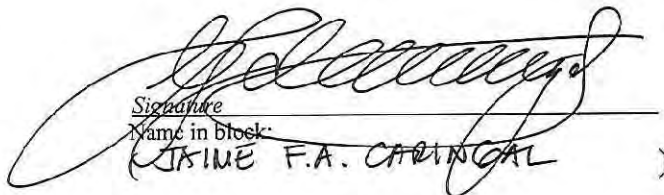


**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



- while constructing the MMSP.
- It was understood that the MMSP would function as the North-South transport backbone for the Metro Manila, and that consideration of connecting MMSP and the NAIA was out of the scope for this Study.
 - It was raised that, since Makati Loop covering Makati CBD had been approved by NEDA ICC, EDSA route option should go through Bonifacio Global City (BGC) rather than Makati CBD.
 - It was agreed that Inter-Agency Working Group Meeting would be held early March 2015, hopefully in the week of 9 March.
 - The JICA Study Team reminded DOTC, DPWH and MMDA to kindly cooperate the Team to provide information and data already requested in its letter to DOTC. All three organizations committed to fully cooperate and support the MMSP Study.

DOTC: Accepted by


 Signature _____
 Name in block:
 (JIMIE F.A. CARINGAL)

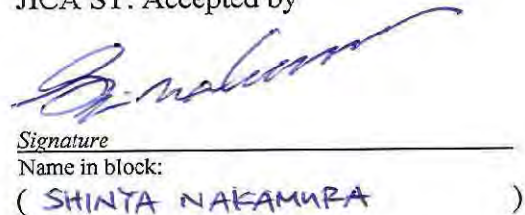
DPWH: Accepted by


 Signature _____
 Name in block:
 (MAXIMO M. MONTAÑA II)

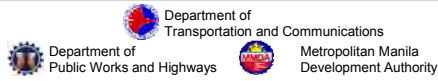
MMDA: Accepted by


 Signature _____
 Name in block:
 (LUISA P. ANGANGAN)

JICA ST: Accepted by


 Signature _____
 Name in block:
 (SHINTA NAKAMURA)

JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)

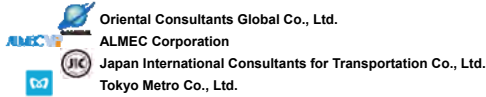


Steering Committee Meeting No.1

Overview of the Study

20 February 2015

JICA Study Team



Contents

1. Background
2. Project Outline
3. Scope of Works
4. Major Issues
5. Critical Restriction in the Project Area
6. Study Team
7. Work Schedule
8. Required Assistance from Philippines Side

JICA Study Team for MMSP

1. Background

1) Urbanization and Traffic Problems

- A rapid increase of population and expansion of Manila Greater Capital Region (GCR)*
- *: 3 regions of the National Capital Region or Metro Manila, Regions III and IV-A
- Heavy traffic congestion due to insufficient and undeveloped transport network

2) Ideal Transport Network in Roadmap Study

- Approx. 300 km of railway and 500 km of highways are proposed in JICA's Roadmap Study

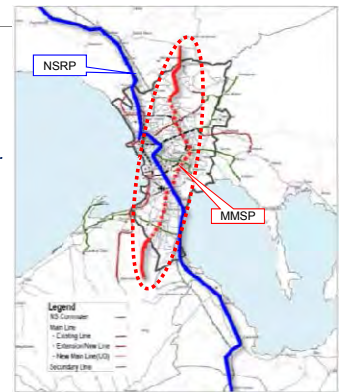
3) Development of North-South Transport Backbones

- A subway connecting San Jose del Monte and Dasmariñas via EDSA (C4) was proposed in JICA's Roadmap Study

JICA Study Team for MMSP

2. Project Area

- NSRP and MMSP (Subway) are expected to formulate the north-south backbone of public transport for Metro Manila.
- MMSP to be planned, as shown in the map at the right, shall avoid conflict with other planned lines and mutually supplement each other.



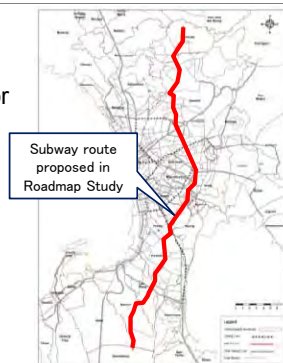
NSRP: North-South Railway Project
MMSP: Mega Manila Subway Project

JICA Study Team for MMSP

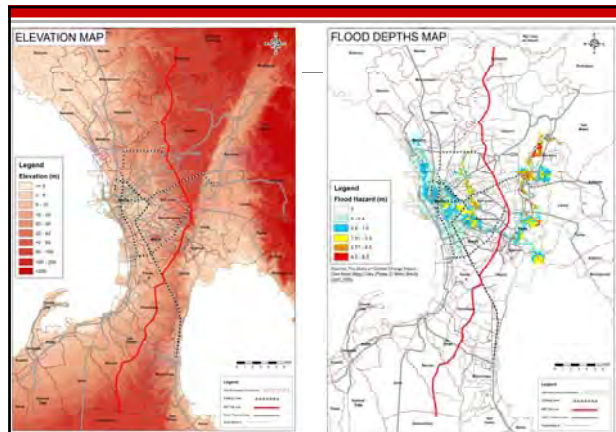
3. Scope of Works (1) → What we will do...

Propose **several potential subway routes** with:

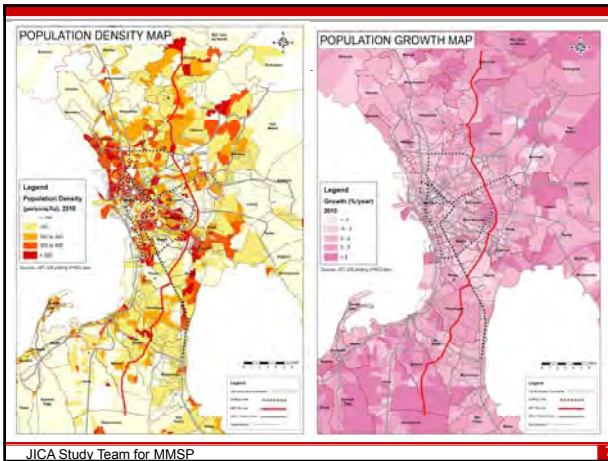
➢ **Conceptual Alignment** for each route, including tentative stations and depot locations, considering various aspects, e.g. geological condition, population density and growth, flood impact, earthquake, etc.



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JICA Study Team for MMSP



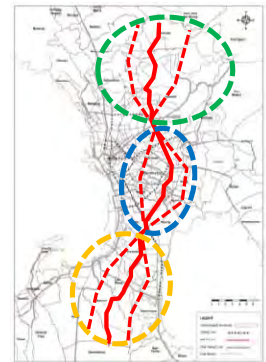
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3. Scope of Works (1) → What we will do...

Propose **several potential subway routes** with:

- **Conceptual Alignment** for each route, including tentative stations and depot locations, considering various aspects, e.g. geological condition, population density and growth, flood impact, earthquake, etc.



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3. Scope of Works (2) → What we will do...

- Proposal of **several alternative alignment routes**
- Demarcation of **vertical profile (underground / at-grade / elevated)** as well as tentative stations/depot location
- Rough **cost estimate** and **construction schedule** for each alternative route
- **Preliminary design of Railway Systems**, including potential types of rolling stock, signaling system, traction power supply system, etc.

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3. Scope of Works (3) → What we will do...

- **Phasing** of project implementation
- Potential **project implementation scheme**, including consideration of **non-railway business opportunities** at/surrounding stations and along railway corridor
- Preliminary **EIRR/FIRR** for each route
- Preview of Environmental and Social Impact



ALL of the above will be the basis for application to NEDA ICC

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4. Major Issues (1) → What we will focus on ...

Priority items

- Laws and regulations regarding **subterranean development** – possibility of utilization of “**great deep underground**”
- Possibility of usage of **underground of EDSA**



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4. Major Issues (2) → What we will focus on ...

Priority items

- Classification of **existing MRT Line 3** and MMSP to be constructed, including train operation plan of subway in the same section (on the same corridor)
- **Measures against Natural Disasters** (flood, earthquake, typhoon, etc.), in particular **protecting station entrances and structures from inundation**

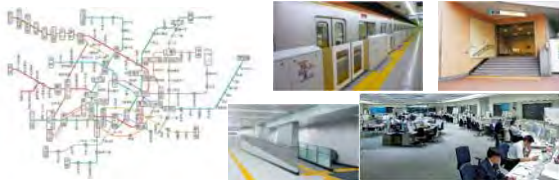


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4. Major Issues (3) → What we will focus on ...

- Utilization of **Japanese experiences and technologies**, where many subway lines were developed over 100 years having **many similarities with the Philippines** (e.g. great deep underground, protection from earthquake and inundation, consideration of life-cycle cost, etc.)

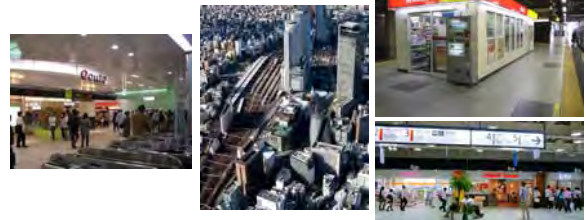


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4. Major Issues (4) → What we will focus on ...

- “**Non-railway business development**” by utilization of station space and along the railway corridor, which will contribute to profit-making to subsidize the railway O&M cost



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5. Critical Restriction in the Project Area

To avoid **conflict with on-going or planned projects**, the latest information in the project area needs to be identified and taken into consideration.

- From DPWH
 - Road and flood control plan, etc.
- From MMDA
 - Existing flyover along the EDSA
 - On going and/or planned fly over in the project area, etc.
- From MRT3
 - Existing viaduct and underground structure, etc.



JICA Study Team for MMSP

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6. Study Team (1)

Name	Position	Company
Shinya NAKAMURA	Team Leader –cum- Urban Railway Planning	OCG
Takayuki ISAKA	Deputy Team Leader / Urban Railway Plan (2) / Construction Plan and Cost Estimate	OCG
Tetsuji MASUJIMA	Urban Transport Planning	ALMEC
Tetsuo HORIE	Demand Forecast	ALMEC
Jose M. F. SALONGA	Laws and Regulation on UDG Space Usage	ALMEC
Akira HONDA	Railway Civil, Facility, Depot Plan (1)	OCG
Hiroshi UTSUGI	Railway Civil, Facility, Depot Plan (2)	OCG
Yasukazu TSUBOUCHI	Railway Civil, Facility, Depot Plan (3)	OCG
Hiroshi KAWASAKI	Railway Systems	JIC
Setsuo KIKUCHI	Rolling Stock and Train Operation Plan	JIC

JICA Study Team for MMSP

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6. Study Team (2)

Name	Position	Company
Jorge MULLER	Procurement Planning	OCG
Hiroshi IMAIZUMI	Economic and Financial Analysis / Evaluation of Implementation Model / Financing Plan / Implementation Scheme	OCG
Masayuki TSUJI	Disaster Risk Evaluation and Measure (Civil)	OCG
Taiji TANOGUCHI	Environmental and Social Impact Assessment	OCG
Takahiro TANISAKA	Operation and Maintenance Plan	TM
Shinsuke MOGI	Study Assistance / Railway Plan Assistance	OCG

OCG: Oriental Consultants Global Co., Ltd.
 ALM: ALMEC Corporation
 JIC: Japan International Consultants for Transportation Co., Ltd
 TM: Tokyo Metro Co., Ltd.

JICA Study Team for MMSP

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6. Study Team (3)

In-charge of	Team	Calendar Year 2014																				
		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	September	October	November	December									
Study Leader - Urban Railway Plan (1)	Shinya Nakamura																					
Study Team Leader - Urban Railway Plan (2)	Takayuki Isaka																					
Urban Transport Planning	Tetsuji Masujima																					
Demand Forecast	Tetsuo Horie																					
Laws and Regulation on UDG Space Usage	Jose M. F. Salonga																					
Railway Civil, Facility, Depot Plan (1)	Akira Honda																					
Railway Civil, Facility, Depot Plan (2)	Hiroshi Utsugi																					
Railway Civil, Facility, Depot Plan (3)	Yasukazu Tsubouchi																					
Railway Systems	Hiroshi Kawasaki																					
Rolling Stock and Train Operation Plan	Setsuo Kikuchi																					
Procurement Planning	Jorge Muller																					
Economic and Financial Analysis / Evaluation of Implementation Model / Financing Plan / Implementation Scheme	Hiroshi Imaizumi																					
Disaster Risk Evaluation and Measure (Civil)	Masayuki Tsuji																					
Environmental and Social Impact Assessment	Taiji Tanoguchi																					
Operation and Maintenance Plan	Takahiro Tanisaka																					
Study Assistance / Railway Plan Assistance	Shinsuke Mogi																					
Urban Transport Planning	Tetsuji Masujima																					
Demand Forecast	Tetsuo Horie																					
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Railway Civil, Facility, Depot Plan (3)	Yasukazu Tsubouchi																					
Railway Systems	Hiroshi Kawasaki																					
Rolling Stock and Train Operation Plan	Setsuo Kikuchi																					

JICA Study Team for MMSP

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7. Work Schedule (for common understanding in a short period)

Steering Committee (1) in Mid. Feb. 2015

- Project Outline & Schedule
- Critical restriction in the project area

Inter-Agency Working Group (1) in Early Mar. 2015

- Review of transport network and urban development
- Sorting out the criteria for alignment selection

Inter-Agency Working Group (2) in Mid. Apr. 2015

- Alignment options including stations/depot location
- Preliminary demand forecast for each option

Inter-Agency Working Group (3) in End May. 2015

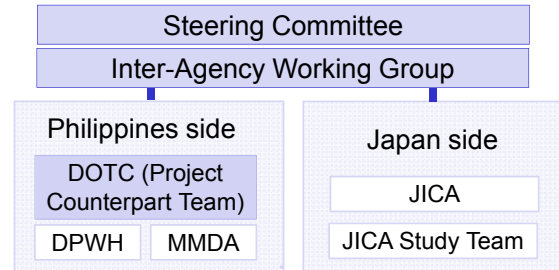
- Project implementation scheme and schedule
- Preliminary IRR (Internal Rate of Return)'s

Steering Committee (2) in Mid. Jun. 2015

- Basic concept of MMSP for NEDA ICC

8. Required Assistance from Philippines Side (1)

a) The formation of steering committee



The study team proposes holding the steering committee in February, June and August 2015.

8. Required Assistance from Philippines Side (2)

b) Inter-Agency Working Group (IAWG) Meeting

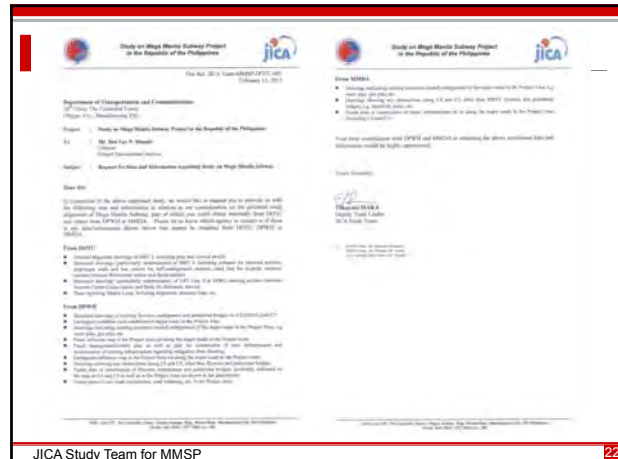
The study team proposes holding the IAWG meeting, with participants of DOTC, DPWH and MMDA, on a monthly basis from March to May to exchange information and opinions.

c) Coordination with the following organizations:

DOF, DOST, NEDA, PPP Center, BCDA, LRTA, MRTC, LGUs along the alignment

d) Provision of Project related data / reports

(A detailed list was officially submitted to DOTC, DPWH and MMDA.)



From DOTC

- Detailed alignment drawings of MRT 3, including plan and vertical profile
- Structural drawings (particularly substructures) of MRT 3, including columns for elevated sections, diaphragm walls and box culvert for half-underground sections, track bed for at-grade sections. (section between Balintawak station and Ayala station)
- Structural drawings (particularly substructures) of LRT Line 2 at EDSA crossing section (between Acroneta Center-Cubao station and Betty Go Belmonte station)
- Plans regarding Maktal Loop, including alignment, structure plan, etc.


From DPWH

- Structural drawings of existing flyovers, underpasses and pedestrian bridges on C4 (EDSA) and C5.
- Geological condition (soil condition) of major roads in the Project Area
- Drawings indicating existing structures buried underground of the major roads in the Project Area, e.g. water pipe, gas pipe, etc.
- Flood influence map in the Project Area (or along the major roads in the Project Area)
- Flood management/control plan as well as plan for construction of new infrastructure and improvement of existing infrastructure regarding mitigation from flooding
- Earthquake influence map in the Project Area (or along the major roads in the Project Area)
- Drawings showing any obstructions along C4 and C5, other than flyovers and pedestrian bridges
- Future plan of construction of flyovers, underpasses and pedestrian bridges, preferably indicated on the map on C4 and C5 as well as in the Project Area (as shown in the attachment)
- Future plans of new road construction, road widening, etc. in the Project Area


From MMDA

- Drawings indicating existing structures buried underground of the major roads in the Project Area, e.g. water pipe, gas pipe, etc.
- Drawings showing any obstructions along C4 and C5, other than MRT3, flyovers and pedestrian bridges, e.g. electricity poles, etc.
- Future plan of construction of major infrastructure on or along the major roads in the Project Area (including C4 and C5)


JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)



Department of
Public Works and Highways



Department of
Transportation and Communications




Metropolitan Manila
Development Authority


*Preliminary Consideration on
Subway Route Selection*

20 February 2015


JICA Study Team




Oriental Consultants Global Co., Ltd



ALMEC Corporation



Japan International Consultants for Transportation Co., Ltd



Tokyo Metro Co., Ltd.

Contents

1. Basis on Route Selection
2. Major Criteria on Route Selection
3. Initial Consideration on Route Options
4. Verification of Route Options

JICA Study Team for MMSP 2

1. Basis on Route Selection

- Roadmap for Transport Infrastructure Development for Metro Manila and Its Surrounding Areas (**Roadmap**) approved by NEDA Board, including railway network and highway network
- **Demarcation / allocation** of potential railway passengers with other railway lines (existing and planned) as well as those with other transport modes (highways, etc.)
- Function as one of the **North-South (Transport) Backbones** together with North-South Railway Project (**NSRP**), which was recently approved by NEDA Board

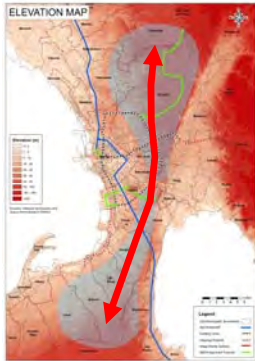
JICA Study Team for MMSP 3

2. Major Criteria on Route Selection

- **Geological** stability (elevation, soil condition)
- Minimization of impact from **flooding and earthquake**
- **Population** density and growth
- Existing and planned **Central Business District (CBD)**
- Consistency and connectivity in **Railway Network** (existing lines and planned lines in Roadmap)
- Avoidance with **on-going projects** (highways, etc.)
- Connection with planned **Integrated Transport System (ITS)** facilities

JICA Study Team for MMSP 4

2. Major Criteria on Route Selection - Elevation

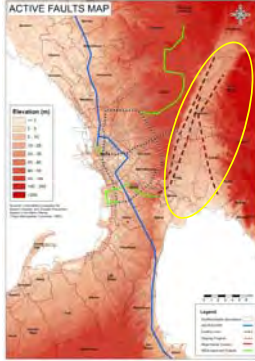


Subway route is expected to be at higher level with stable ground condition.

Areas shown with mesh in the map are the areas with relatively high elevation.

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2. Major Criteria on Route Selection – Earthquake Impact

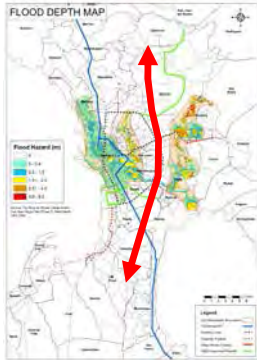


There is an active fault system crossing the east side of Metro Manila longitudinally.

The subway route should avoid areas near or cross an active fault system unless it is inevitable.

JICA Study Team for MMSP 6

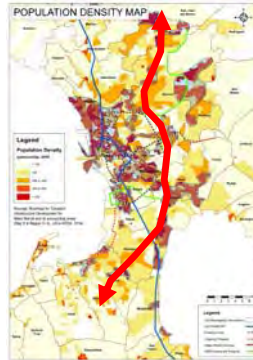
2. Major Criteria on Route Selection – Flood Impact



Subway route shall avoid, as much as possible, areas where the risk of severe flood / inundation (shown with mesh) is expected to be high. (although mitigation can be technically taken)

We assume there would be no or little impact of flood tide from ocean except the coastal areas.

2. Major Criteria on Route Selection – Population Density



The areas with medium to high density are considered to have higher expectation for using railways.

A new railway is expected to be planned by connecting such highly dense areas to attain the maximum benefit.

2. Major Criteria on Route Selection – Rail Stations' Territories



The circles on the map show the territories of railway stations (incl. existing and planned), where there are potential rail users.

Areas shown with mesh in the map, where there is no station nearby, are considered as the area requiring a new railway.

2. Major Criteria on Route Selection – CBD



There are several Central Business Districts (CBD) in and surrounding Metro Manila, where many people come to work.

Connecting CBDs by railway will be not only useful for commuters, but efficient for business activities as well.

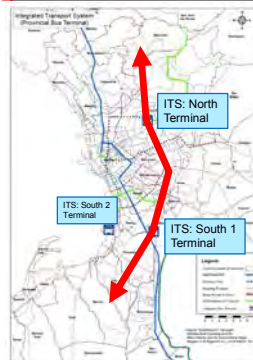
2. Major Criteria on Route Selection – Highway Network



There are several plans to construct new trunk roads and highways in and surrounding Metro Manila.

Demarcation and/or allocation of modes of transport between railways and highways needs to be considered.

2. Major Criteria on Route Selection – Integrated Transport System



Integrated Transport System (ITS) is one of the important infrastructure planned by DOTC.

ITS is planned to separate the transport mode inside and outside Metro Manila, where commuters can transfer from buses to railways, so that buses from suburban areas do not need to go into Metro Manila.

2. Major Criteria on Route Selection



Required as well as suitable corridor for a new railway (subway) that meets all of the above criteria is as shown on the map.

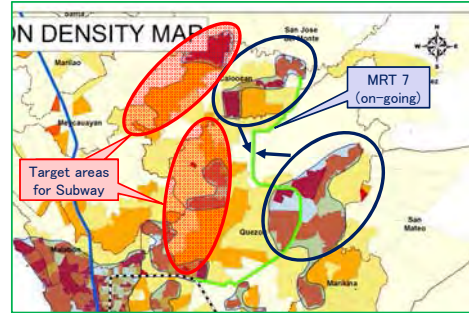
JICA Study Team for MMSP

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3. Initial Consideration on Route Options

North Zone

Population Density



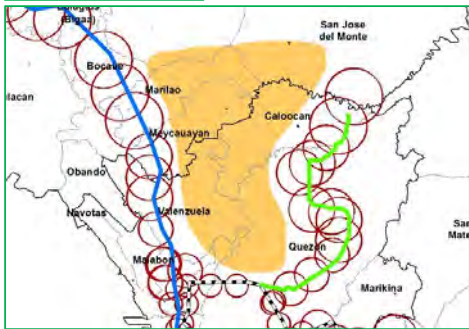
JICA Study Team for MMSP

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3. Initial Consideration on Route Options

North Zone

Stations' Territories



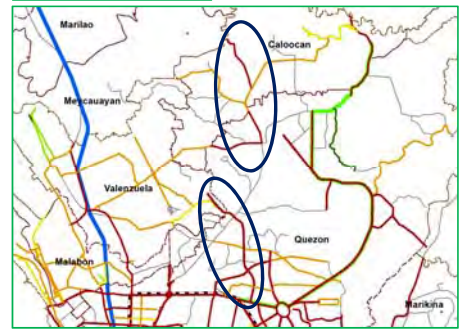
JICA Study Team for MMSP

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3. Initial Consideration on Route Options

North Zone

Traffic Volume



JICA Study Team for MMSP

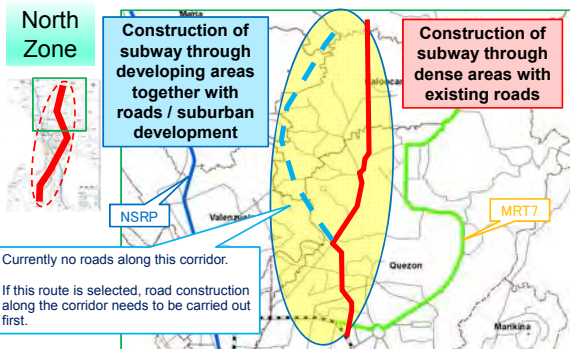
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3. Initial Consideration on Route Options

North Zone

Construction of subway through developing areas together with roads / suburban development

Construction of subway through dense areas with existing roads



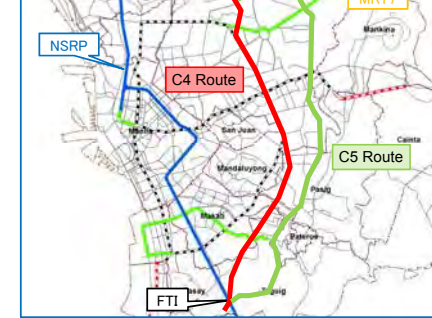
JICA Study Team for MMSP

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3. Initial Consideration on Route Options

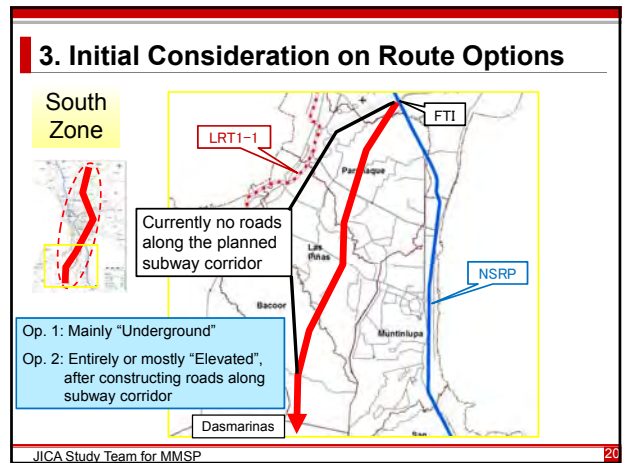
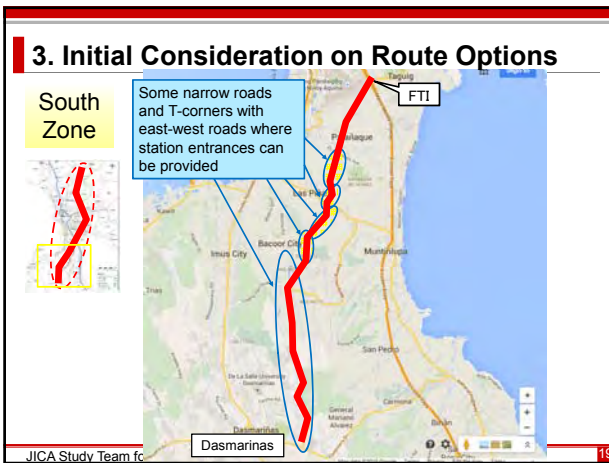
Central Zone

Central Zone



JICA Study Team for MMSP

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4. Verification of Route Options

After determining the roads and corridors of subway, locations of stations and depot, and structural type of each section (underground / elevated) of each option, each route option will be verified, if they are feasible or not, from the following aspects:

- ✓ Demand Forecast
- ✓ Environmental and Social Consideration (area of land acquisition, no. of resettlement households, etc.)
- ✓ Constructability (technical feasibility and possibility as well as practicability of construction)

JICA Study Team for MMSP

4. Verification of Route Options

Then, consider, calculate and establish:

- ✓ Detailed route avoiding existing underground structures
- ✓ Suitable Railway Systems
- ✓ Preliminary Train Operation Plan

↓

- ✓ Rough Cost Estimate
- ✓ Rough Construction Schedule

} EIRR / FIRR

JICA Study Team for MMSP

Thank you for your kind attention

JICA Study Team

JICA Study Team for MMSP



Appendix

Minutes of Meeting	
Project	Information Collection Survey for the Mega Manila Subway Project
Subject	Inter-Agency Working Group Meeting No.1
Date and Time	09:40AM – 10:40AM on Wednesday, 11 March 2015
Venue	Room No. 166 on 16 th floor of the Columbia Tower
Attendees	DOTC: Mr. Jaime Fortunato. A. Caringal, Mr. Mirick Paala MMDA: Ms. Luisa Angangan (DPWH: Mr. Maximo Ewald M. Montana II – IAWG Meeting No.2 on 15-Apr-15) JICA Philippines Office: Mr. Yuya Takagi, Mr. Floro O. Adviento JICA Study Team: Mr. Takayuki Isaka, Dr. Tetsuji Masujima, Mr. Tetsuo Horie, Mr. Jose Salonga, Mr. Akira Honda, Mr. Yasukazu Tsubouchi, Dr. Jorge Muller, Mr. Takahiro Tanisaka, Mr. Shinsuke Mogi Others: Mr. Paolo Rodriguez, Mr. Ryuichi Kuwajima (JICA Expert)
<p>The JICA Study Team explained the update status on the subway route selection (incl. tentative locations of stations and depot) and the basis of study on the application of TOD (Transit Oriented Development) in Mega Manila Subway Project (MMSP). The preliminary findings from legal framework of infrastructure projects in the Philippines, which was originally planned to be explained, was postponed to be presented in the next meeting in April 2015. Discussions and exchange of opinions were made among DOTC, DPWH, MMDA and JICA Study Team, which can be summarized as follows:</p> <ul style="list-style-type: none">• DOTC agreed that the subway route in the north zone is as presented and recommended by the JICA Study Team, which is the route along the existing roads.• It was understood and accepted by all parties that EDSA (C4) route is superior to C3 and C4 routes and the most suitable route in the central zone based on criteria presented by the JICA Study Team. A concern was raised if the co-existence of the subway and the existing MRT Line 3 could be justified, for which JICA Team explained that it would be confirmed and justified by the result of the demand forecast.• There was an opinion that the project cost of C5 route might be lower than that of C4 route since the route could be partially elevated on C5. However it was explained that the C5 route would be underground due to the existing flyovers along C5 and the planned expressway in the Roadmap Study and that C5 route would be longer than C4 route. Therefore, it was understood that the project cost of C5 route be higher than that of C4 route.• It was explained that the JICA Study Team would further consider the necessity of a minor option near C4 without commitment to include such minor option in the final route options.• The JICA Study Team agreed to include the comparison of C3, C4 and C5 routes in the report to be submitted to justify why C4 was selected among C3, C4 and C5 as the route option in the central zone.	



**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



- A concern was raised how both LRT Line 1 South extension to Dasmariñas and MMSP in the south zone could cope with each other. It was explained that both lines would run in parallel with certain distance between the lines all the way, thus the catchment areas of stations of both lines would not overlap each other. Then, it was agreed by all parties that the MMSP route in the south zone could be as proposed and recommended by the JICA Study Team.
- It was agreed that the proposed two candidate locations for depot would be remained since DOTC had not discussed the issue with related organizations and thus was unable to determine the depot location.
- There was no objection about the total length of subway route as well as the number and the location of stations, both initial and ultimate phases. It was understood that those would be precondition to carry out future studies, e.g. demand forecast, rough project cost estimation, preliminary economic and financial analysis, etc.
- Regarding the phasing of the project, it was agreed that the central zone would be the first phase, however it was not decided which zone of north or south would be the next phase (or could be at the same phase).
- The JICA Study Team presented the basic application of TOD in MMSP explained that the Study report would cover the categorization of potential TOD in each station be proposed, with a brief presentation of TOD image at a station in the BGC (Bonifacio Global City).
- It was accepted that the ROW (Right of Way) cost would not be considered in detail in this study, but in the next phase, i.e. Feasibility Study, together with RAP (Resettlement Action Plan) and EIA (Environmental Impact Assessment). Only a preliminary consideration on environmental and social issues would be included in this Study.
- Possible project implementation schemes, e.g. fully government, partly PPP, fully PPP, etc. would be presented in this Study, but will not be determined which scheme would be adopted.
- A concern was raised about the impact on the road traffic during the construction of the subway, and if the traffic management plan would be prepared in the current study. The JICA Study Team explained that the traffic impact assessment would be carried out in the Feasibility Study, and the detailed traffic management plan would be prepared in the design stage.
- It was noted that the station locations of Mass Transit System Loop (MTSL) had not been fixed. It was explained by the JICA Study Team that a subway station in the BGC was tentatively planned between 26th street and 32nd street and could be adjusted later to connect to the MTSL station in BGC area after the location of the MTSL station would be fixed.

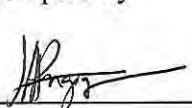
DOTC: Accepted by

Signature 
Name in block:
(JAIME FORTUNATO A. CARINGAL)

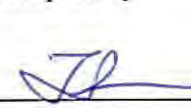
DPWH: Accepted by

Signature 
Name in block:
(MAXIMO M. MONTAÑA II)

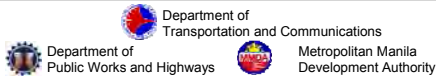
MMDA: Accepted by

Signature 
Name in block:
(LUISA P. ANGANAN)

JICA ST: Accepted by

Signature 
Name in block:
(TAKAYUKI ISAKA)

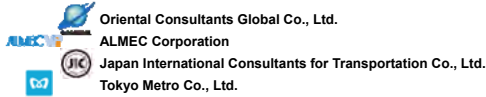
JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)



Inter-Agency Working Group Meeting No. 1

11 March 2015

JICA Study Team



Contents

1. Update on Route Selection Study
(incl. tentative locations of stations and depot)
2. Preliminary Findings on Legal Framework of Infrastructure Projects in the Philippines
(incl. existing railways, case of MTSR, case in Japan, etc.)
3. Basis of Study on the Application of TOD (Transit Oriented Development) in Mega Manila Subway Project
4. Follow-up of Data / Reports requested by JICA Study Team to DOTC, DPWH and MMDA

JICA Study Team for MMSP

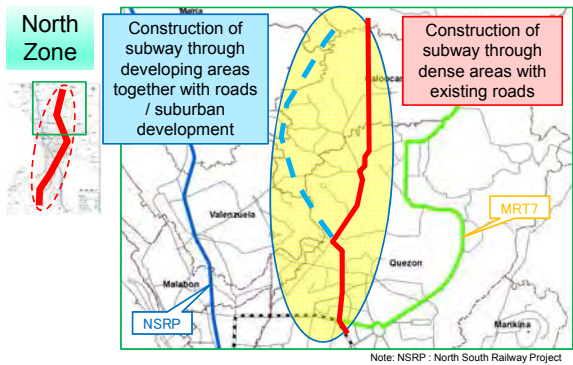
1. Update on Route Selection Study

Summary of Major Criteria in Route Selection



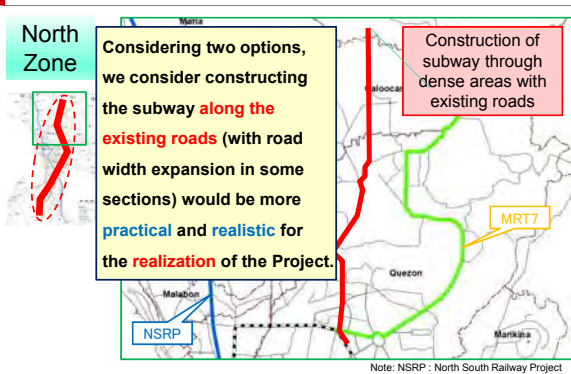
JICA Study Team for MMSP

1. Update on Route Selection Study



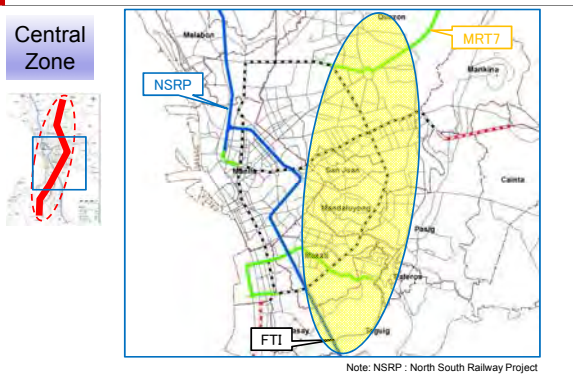
JICA Study Team for MMSP

1. Update on Route Selection Study



JICA Study Team for MMSP

1. Update on Route Selection Study



JICA Study Team for MMSP

1. Update on Route Selection Study

Further detailed investigation on practicality and appropriateness of each of the 3 options (C3/C4/C5) for Central Zone in terms of:

- ◆ Geological Condition and Disaster Prevention
- ◆ Social and Economic Condition
- ◆ Urban and Transport Planning and Development
- ◆ Construction and Cost

C3 Route
C4 Route
C5 Route

1. Update on Route Selection Study

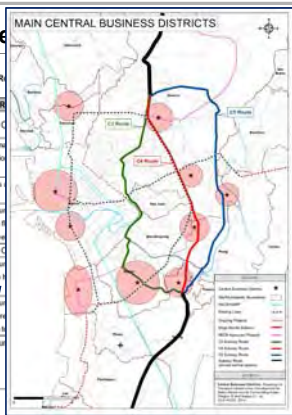
Comparison of Potential Route Options in Central Zone for Mega Manila Subway Project

Criteria	C3 Route	C4 (EDSA) Route	C5 Route
Geological Condition and Disaster Prevention	○	⊖	△
Elevation	△ C3 route mainly runs relatively low elevation areas.	⊖ C4 route entirely runs through the high elevation areas.	△ C5 route mainly runs through the high elevation areas except north of Pasig.
Active Fault	⊖ C3 route is away from active fault.	○ C4 route is partly near but mostly away from active fault.	△ C5 route crosses active fault several times.
Flood and Inundation	○ C3 route runs partly through areas with flood impact, but with relatively low impact.	⊖ C4 route runs through areas free from potential flood.	○ C5 route runs partly through areas with flood impact, but with relatively low impact.
Social and Economic Condition	○	⊖	○
Population Density	⊖ C3 route runs through several medium to highly dense areas.	○ C4 route runs through some medium to highly dense areas.	○ C5 route runs through some medium to highly dense areas.
Population Growth	⊖ C3 route runs through several areas where population growth is medium to high.	⊖ C4 route runs through some areas where population growth is medium to high.	○ C5 route runs through some areas where population growth is medium to high.
Central Business District (CBD)	△ C3 route runs through Makati CBD only.	⊖ C4 route runs through 4 CBDs (Quezon City, Araneta Center, Cubao, Ortigas and BGC).	○ C5 route runs through near 2 CBDs (Ortigas and BGC).

1. Update on Route Selection Study

Comparison of Potential Route Options in Central Zone for Mega Manila Subway Project

Criteria	C3 Route	C4 (EDSA) Route	C5 Route
Geological Condition and Disaster Prevention	△	⊖	○
Elevation	△ C3 route mainly runs relatively low elevation areas.	⊖ C4 route entirely runs through the high elevation areas.	△ C5 route mainly runs through the high elevation areas except north of Pasig.
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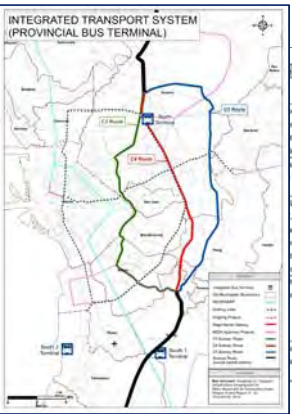


1. Update on Route Selection Study

Criteria	C3 Route	C4 (EDSA) Route	C5 Route
Urban and Transport Planning and Development	△	⊖	○
Station Territories	⊖ C3 route runs through areas without station territories of other lines, except interchanging stations.	○ C4 route partly runs through along MRT3, although the station territories sharing with MRT3 are limited.	○ C5 route runs through areas without station territories of other lines, except interchanging stations.
Integrated Transport System (ITS)	△ C3 route only runs through 1 ITS facility (South Terminal 1).	⊖ C4 route runs through 2 ITS facilities (North Terminal and South Terminal 1).	○ C5 route only runs through 1 ITS facility (South Terminal 1).
Railway Network	○ C3 route crosses LRT1, LRT2 and MRT3 as well as planned Makati Transit System Loop (MTSL) and North-South Railway Project (NSRP).	○ C4 route partly go through with MRT in parallel, and crosses LRT2 as well as planned MRT7, MTSL and NSRP.	△ C5 route crosses LRT2 as well as planned MRT7, MTSL and NSRP. DOTC has a plan to implement BRT project along C5, which is exactly the same alignment as C5 route.
Highways/Trunk Roads Network	△ C3 route partly shares roads with planned (partly under construction) highway and runs through areas with no trunk roads.	○ C4 route runs through areas where there is no planned highway.	○ C5 route mainly shares roads with highway planned in Roadmap Study.
Traffic Volume	○ C3 route mainly runs through medium to high traffic volume roads.	⊖ C4 route mostly runs through medium to high traffic volume roads.	○ C5 route mostly runs through medium to high traffic volume roads.

1. Update on Route Selection Study

Criteria	C3 Route	C4 (EDSA) Route	C5 Route
Urban and Transport Planning and Development	△	⊖	○
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1. Update on Route Selection Study

Criteria	C3 Route	C4 (EDSA) Route	C5 Route
Construction and Cost	△	⊖	○
Constructability of tunnel sections	△ C3 route may run through wide roads on C3 but with elevated highway above roads, if implemented, and also runs through areas (not on C3) where there is no wide roads along the route, where tunnels may need to be great deep underground.	○ C4 route partly runs through below EDSA where there are many existing substructures for elevated railway (MRT3) and flyovers, and also runs through areas without roads (except station areas). If construction is great deep underground, where there is no interference of other substructures, tunnel construction would become easier.	○ C5 route mainly runs through below relatively wide roads (C5), except the area with 2 light corners. There are some flyovers (even some places with 2 flyovers in parallel) along the route where there are substructures below the roads.
Constructability of stations and station entrances	△ Stations on C3 route could be constructed below wide road on C3, but not on roads not on C3 (south part of central zone) where there have been problem in land acquisition. Construction of station entrances may be difficult in some areas.	○ Stations on C4 route could be constructed on or beside C4 road, and also on relatively wide roads in south part of central zone. Construction of station entrances would be relatively easy in most areas.	○ Stations on C5 route could be constructed on C5 roads, which is relatively wide through the route. However, the length of station access corridor would be longer due to wide roads. Construction of station entrances would be relatively easy in most areas.

1. Update on Route Selection Study

Estimated Construction Cost	Unit construction cost of C3 route would be relatively high due to construction of some sections under areas without roads, thus would need to be constructed in great deep area. Consideration to protect from flooding, e.g. high station entrance, installation of water shut panels, etc., would be required.	Unit construction cost of C4 route would be relatively high due to construction of some sections under areas without roads, thus would need to be constructed in great deep area. Total length of C4 route is the shortest among 3 options, thus total construction cost would be the lowest.	Unit construction cost of C5 route would be moderate due to construction mainly under roads where construction in great deep area would not be required. Consideration to protect from flooding, e.g. high station entrance, installation of water shut panels, etc., would be required. Total length of C5 route is much longer than C4 route and thus total construction cost would be higher.
	Total length of C3 route is longer than C4 route and thus total construction cost would be relatively high.		

JICA Study Team for MMSP 13

1. Update on Route Selection Study

Central Zone

Based on the various aspects as above, **C4 (EDSA) route** is considered to be the **most viable** and the **only practical** option to be selected as a subway corridor in central zone.

Note: NSRP : North South Railway Project

JICA Study Team for MMSP 14

1. Update on Route Selection Study

Central Zone

Example of other minor option near C4 (EDSA) that may be worth considering would be ...

↓

Further consideration

Note: NSRP : North South Railway Project

JICA Study Team for MMSP 15

1. Update on Route Selection Study

South Zone

Currently no roads along the planned subway corridor

Op. 1: Mainly "Underground"
Op. 2: Entirely or mostly "Elevated", after constructing roads along subway corridor

Note: NSRP : North South Railway Project

JICA Study Team for MMSP 16

1. Update on Route Selection Study

Preliminary consideration of stations and depot

Criteria in setting station locations along the subway

- 1 – 1.5 km interval in urban areas, 2 – 4 km interval in suburban areas
- Interchange with other railways (e.g. MRT3, etc.)
- Road intersections (crossings and T-corners) where there are commercial facilities and gateways to residential areas

JICA Study Team for MMSP 17

1. Update on Route Selection Study

Preliminary consideration of stations and depot

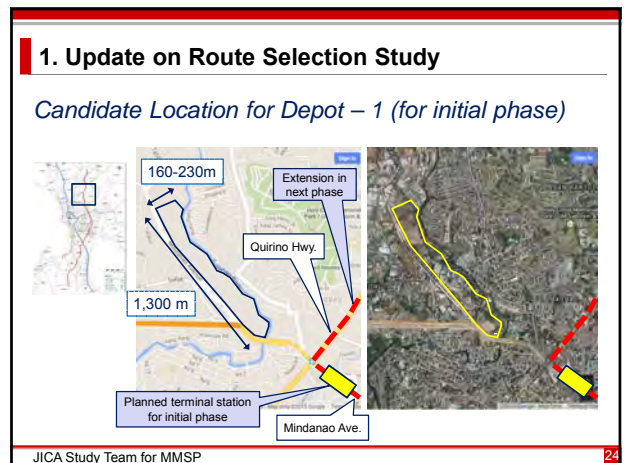
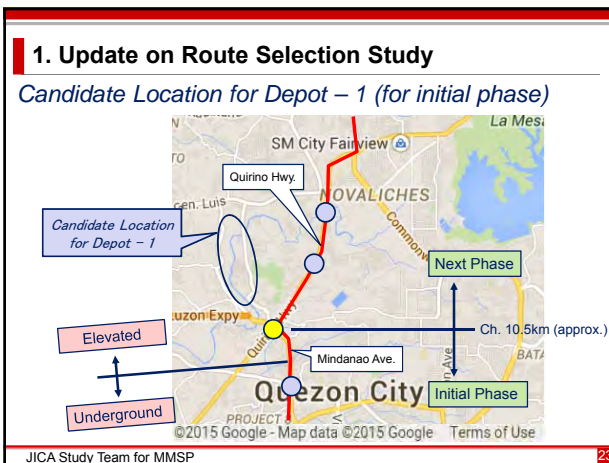
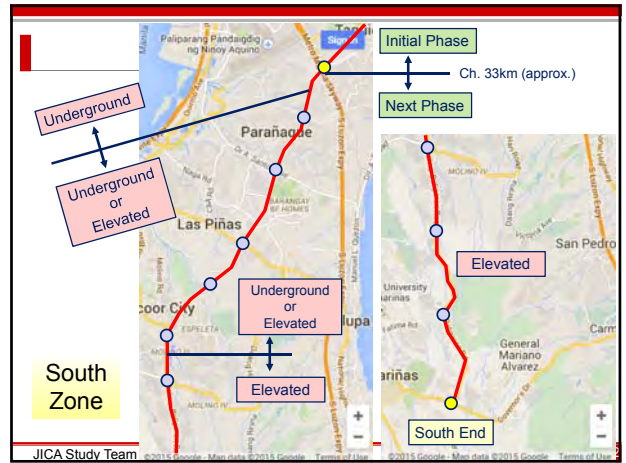
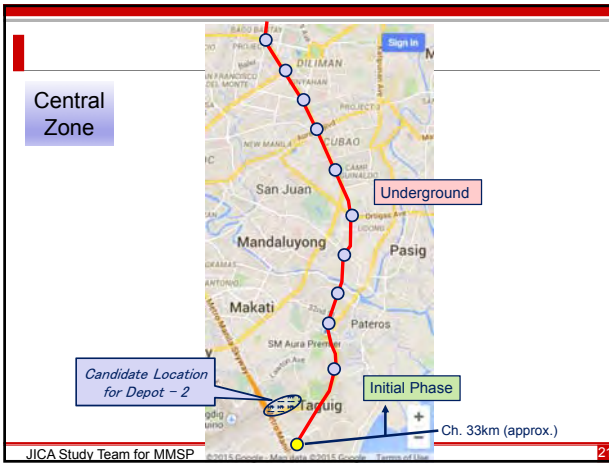
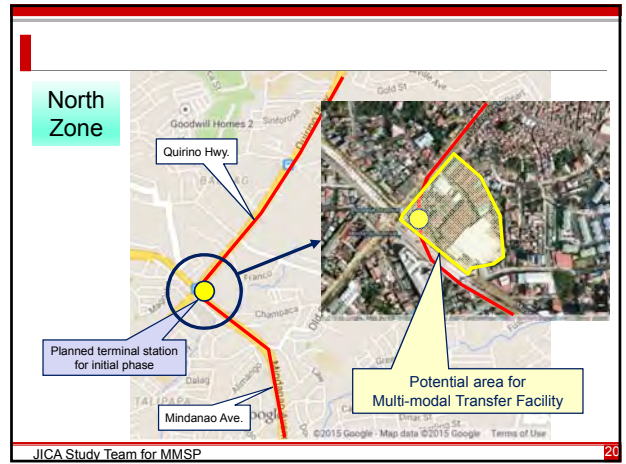
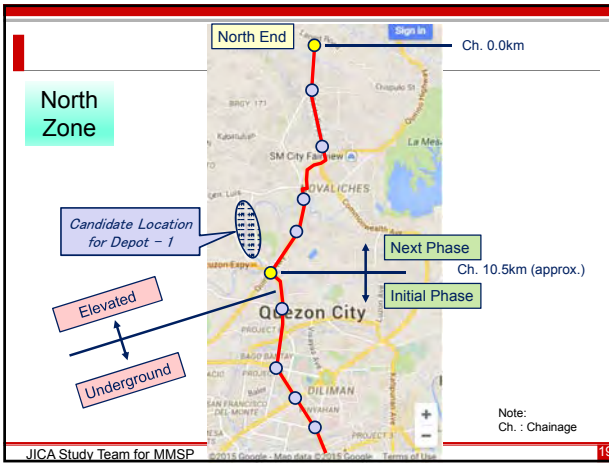
Entire Project

- Total distance: 59 km (approx.)
- No. of station: 27
- No. of depot: 2 or 3

Initial Phase

- Total distance in the initial phase: 22.5 km (approx.)
- No. of station in the initial phase: 13
- No. of depot: 1

JICA Study Team for MMSP 18



1. Update on Route Selection Study

Candidate Location for Depot – 2/2a (for initial phase)

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JICA Study Team for MMSP 25

1. Update on Route Selection Study

Candidate Location for Depot – 2 (for initial phase)

JICA Study Team for MMSP 26

1. Update on Route Selection Study

Candidate Location for Depot – 2a (for initial phase)

JICA Study Team for MMSP 27

1. Update on Route Selection Study

Summary of Route Selection

Route Alignment

North Zone: Along existing roads up to *Langit Rd.* (1 option)
 Central Zone: Along C4 (EDSA) + α (2 options)
 South Zone: 1 route down to *Governor's Dr.*, either underground and/or elevated (2 options)

Length (approx.): 22.5km (initial) / 59km (ultimate)

Stations and Depot

Stations: 13 (initial) / 27 (ultimate)
 Depot: 2 candidate locations (initial) at both ends (*Mindanao/Quirino* and *C5/SLEX*)
 Additional 1 or 2 depot in next phase

JICA Study Team for MMSP 28

2. Preliminary Findings on Legal Framework of Infrastructure Projects in the Philippines

To be presented in the next meeting

JICA Study Team for MMSP 29

3. Basic Study on the Application of TOD in MMSP

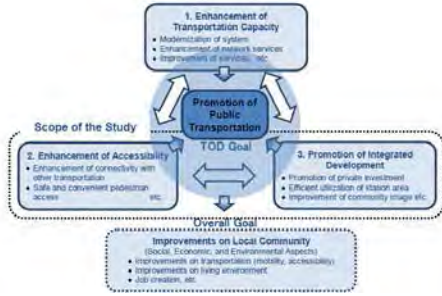
Importance of integrated development

- Integrated development of stations and their influence areas is the key for success.

JICA Study Team for MMSP 30

3. Basic Study on the Application of TOD in MMSPP

General Concept and Objectives of TOD (Transit Oriented Development)

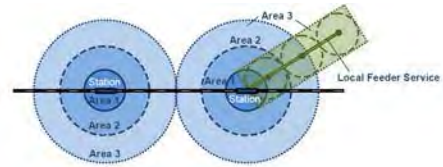


Source: Preparatory Survey on Promotion of TOD for Urban Railway in the Republic of the Philippines (DFR, February 2015)

3. Basic Study on the Application of TOD in MMSPP

Assumed Influence Area of Railway

- ◆ Area 1 (Transit Core): Immediate environs of station
- ◆ Area 2 (Transit Neighborhood): Area within walking distance (~1km)
- ◆ Area 3 (Transit Supportive Area): Area accessible with local feeder transport services (~3-5km and beyond along main roads)



Source: Preparatory Survey on Promotion of TOD for Urban Railway in the Republic of the Philippines (DFR, February 2015)

3. Basic Study on the Application of TOD in MMSPP

Key Considerations on TOD

- ◆ Maximize coverage of beneficiaries of railway by expanding and improving accessibilities in classified influence areas, thereby contribute to increased ridership and management of railway
- ◆ Promote competitive new urban core and activity/service centres at and around the stations to attract new investment and generate job opportunities locally
- ◆ Facilitate smart growth and expansion of urban areas by decongesting central areas and developing compact suburban areas with more organized land use
- ◆ Enhance local socio-economic development in influence areas
- ◆ Establish an effective TOD development mechanism with participation of private sector and LGUs to facilitate investments

Key development issues will be identified in this study

To be examined in the later studies

3. Basic Study on the Application of TOD in MMSPP

Scope of this Study: Identification of Key Development Issues and Concept of TOD for MMSPP

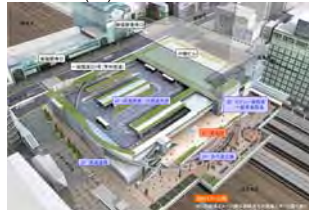
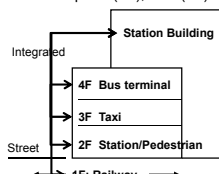
Station	Station Type	Development Issues		TOD Concept
		Transport/Traffic	Urban Development	
1.	Urban Core			
2.	Urban			
:				
:	Sub-urban			

3. Basic Study on the Application of TOD in MMSPP

Example of Integrated/Multimodal Terminal Development in Japan

TOKYO: Shinjuku Station

- 3 million passenger/day
- South exit is currently under construction to integrate the bus terminal and station square
- Constructing the artificial ground above railway and build station square (2F), Taxi (3F) and bus terminal (4F).

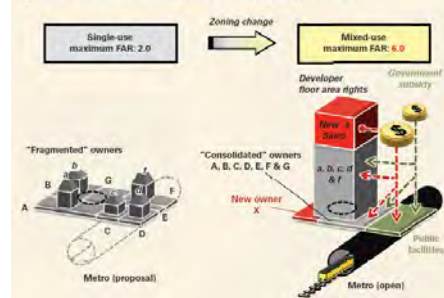


Source: MLIT (<http://www.ktr.mlit.go.jp/tokoku/saisse/shinjuku/>)

3. Basic Study on the Application of TOD in MMSPP

Urban Redevelopment Scheme for Integrated Development

Figure 60.2.1 Inclusive urban redevelopment scheme, Japan (hypothetical)

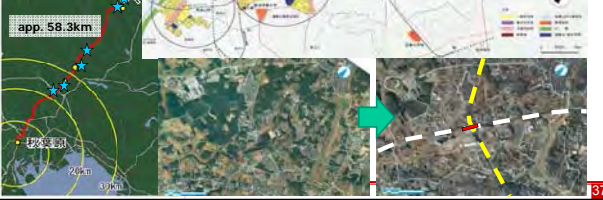


Source: Financing Transit Oriented Development with Land Value, World bank Group

3. Basic Study on the Application of TOD in MMSP

■ Example of Integrated Development of New Town and Railway in Suburban Area in Tokyo, Japan

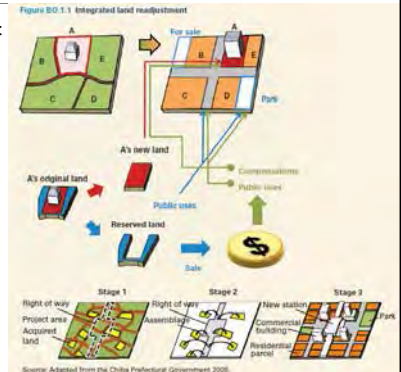
- **Tsukuba Express** (Open in 2005)
 - Number of stations: 20
 - Total length: 58.3km
- **Urban Development by Land Readjustment**
 - Development area: 2,908ha
 - Planning population: 237,000



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3. Basic Study on the Application of TOD in MMSP

■ Land Readjustment Scheme for Integrated Development



JICA Study Team for MMSP

Source: Financing Transit Oriented Development with Land Value, World Bank Group

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4. Follow-up of Data / Reports requested by JICA Study Team to DOTC, DPWH and MMDA

Agency	Contact Person	Received	Not Received	Date Submitted/ Status
DOTC	Mr. Marco Pineda Mr. Jedd Carlo F. Lugo Mr. Joseph Infante Ferrer Mr. Clifford Galera Mr. James Rampeo	Detailed alignment drawings of MRT 3 including plan and vertical profile		3/3/2015
	DOTC-MRT3 Depot Office Mr. Abel Dela Cruz Ms. Cheryl Ocampo	Structural drawings (particularly substructures) of MRT 3, including columns for elevated sections, shaft/pillar walls and top column for non-underground sections back and for 8-grade sections (section between Balintawak station and Ayala station)		6/2/2015
	DOTC Mr. Joseph Infante Ferrer	Structural drawings (particularly substructures) of LRT Line 2 of EDSA (crossing section between Aranda Center, Cubao Station and Bero Gic Electronic station)	Request letter from JICA Study Team was submitted to and received by DOTC on 8/3/2015	
	LRTA Mr. Rogelio T. Cabanela	Geological condition (site synchlog) of the Project Area	Request letter from JICA Study Team was submitted to and received by DOTC on 3/3/2015	
DOTC	Mr. Marco Pineda	Map of active faults of the Project Area		Request letter from JICA Study Team was submitted to and received by DOTC on 3/3/2015
PHIVOLCS (Philippine Institute of Volcanology and Seismology)	Mr. Erikson Espino	Map of seismic intensity of the Project Area		3/3/2015
		Hydrographic and Topographic survey data (e.g. level of groundwater in the Project Area, etc.)		

JICA Study Team for MMSP

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4. Follow-up of Data / Reports requested by JICA Study Team to DOTC, DPWH and MMDA

Agency	Contact Person	Received	Not Received	Date Submitted/ Status
DPWH	Mr. Massimo Ewald M. Mandaba (Project Preparation Division Planning/Service)		Structural drawings of existing flyovers, underpasses and pedestrian bridges on CA, CS and CS	Request letter from JICA Study Team was submitted to and received by DOTC on 11/2/2015
			Ecological condition (soil condition) of major roads in the Project Area	
		Drawings indicating existing structures buried underground of the major roads in the Project Area, e.g. water pipe, gas pipe, etc.		8/5/2015
		Road influence map in the Project Area (or along the major roads) in the Project Area		9/3/2015
		Flood management/control plan as well as plan for construction of new infrastructure and improvement of existing infrastructure regarding mitigation from flooding		
		Electrostatic influence map in the Project Area (or along the major roads) in the Project Area		Request letter from JICA Study Team was submitted to and received by DOTC on 11/2/2015
		Drawings showing any obstructions along CA and CS, other than MRT3, flyovers and pedestrian bridges, e.g. electricity poles, etc.		3/3/2015
		Future plan of construction of flyovers, underpasses and pedestrian bridges preferably related to the road on CA and CS as well as in the Project Area (as shown in the attachment)		3/3/2015
		Future plans of new road construction, road widening, etc. in the Project Area		3/3/2015

JICA Study Team for MMSP

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4. Follow-up of Data / Reports requested by JICA Study Team to DOTC, DPWH and MMDA

Agency	Contact Person	Received	Not Received	Date Submitted/ Status
MMDA	Mr. Lucia Angariga (Office and Programs Evaluation Division)	Drawings indicating existing structures buried underground of the major roads in the Project Area, e.g. water pipe, gas pipe, etc.		3/3/2015
		Drawings showing any obstructions along CA and CS, other than MRT3, flyovers and pedestrian bridges, e.g. electricity poles, etc.		3/3/2015
		Future plan of construction of major infrastructure in or along the major roads in the Project Area (including CA and CS)		3/3/2015
		GIS data of Metro Manila water utilities map which the JICA Study Team was provided by Mr. Lucia Angariga of MMDA office on the meeting held on 20th of February 2015 at the Columbia Tower	To be given on 11/3/2015	
		Structural drawings of other underground structures in the Project Area which are different to be indicated (e.g. underground powerline, high voltage cables, optical cables, etc.)		Request letter from JICA Study Team was submitted to and received by DOTC on 3/3/2015

JICA Study Team for MMSP

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Thank you for your kind attention

JICA Study Team

 Oriental Consultants Global Co., Ltd.
 ALMEC Corporation
 Japan International Consultants for Transportation Co., Ltd.
 Tokyo Metro Co., Ltd.

JICA Study Team for MMSP

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Minutes of Meeting	
Project	Information Collection Survey for the Mega Manila Subway Project
Subject	Inter-Agency Working Group Meeting No.2
Date and Time	10:10AM – 12:00AM on Wednesday, 15 April 2015
Venue	Room No. 166 on 16 th floor of the Columbia Tower
Attendees	DOTC: Mr. Joel M. Magbanua, Mr. Rafael E. Peñafiel, Mr. Mirick Paala, Mr. Mike Gyeng Chul KIM MMDA: Ms. Luisa Angangan, Mr. Emilio M. Lloror DPWH: Mr. Maximo Ewald M. Montana II, Ms. Rochelle Anne A. Garcia JICA Philippines Office: Mr. Yuya Takagi JICA Study Team: Mr. Shinya Nakamura, Mr. Takayuki Isaka, Dr. Tetsuji Masujima, Mr. Tetsuo Horie, Mr. Jose Salonga, Mr. Akira Honda, Mr. Yasukazu Tsubouchi, Mr. Hiroshi Kawasaki, Mr. Setsuo Kikuchi, Mr. Hiroshi Imaizumi, Mr. Taiji Tanoguchi, Mr. Shinsuke Mogi Others: Mr. Paolo Rodriguez
	Separate meeting No.1 at DOTC office on 20-Apr-15 DOTC: Mr. Jaime Fortunato. A. Caringal, Mr. Mirick Paala JICA Study Team: Mr. Takayuki Isaka, Mr. Shinsuke Mogi
	Separate meeting No.2 at MMDA office on 27-Apr-15 MMDA: Mr. Cesar B. Chavez, Mr. Michael M. Gison, Ms. Neomie Recio, Ms. Joelyn M. Mateo, Mr. Danneedee Bobadilla JICA Philippines Office: Mr. Eigo Azukizawa, Mr. Yuya Takagi JICA Study Team: Mr. Takayuki Isaka, Mr. Shinsuke Mogi
<p>The JICA Study Team explained the latest status of the route selection study (incl. route options and tentative locations of stations and depot), proposal on necessary legal framework for MMSP, study on the application of TOD (Transit Oriented Development), basis of economic analysis and initial result of demand forecast study. Discussions and exchange of opinions were made among DOTC, DPWH, MMDA and JICA Study Team, which can be summarized as follows:</p> <ul style="list-style-type: none">• It was noted that structures of Skyway, EDSA flyovers and the planned common station, that are on, along or crossing the subway routes, should be considered for further consideration in the selection of route options. Location of common station has not been fixed yet, so once it is confirmed the location of subway station should be finalized considering the interface with the common station. It was agreed by all parties that the tentative location of the station for MMSP to interface with the common station could be as proposed by the JICA Study Team.• JICA Study Team explained that the standard depth of underground stations is expected to be around 20 meters below the ground level.• It was understood that the depot would be either at-grade or underground, but at-grade depot was more feasible compared to the underground one in terms of the construction cost. JICA Study Team explained that the candidate depot in the northern part was planned to be at-grade because it is near the elevated section, whereas the candidate depot in southern part might be underground since it was close to the underground section.• A concern was raised whether or not MMSP would be connected to NAIA. It was explained that MMSP was designated to be the north-south transport backbone, connecting suburban	



**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



areas in north and south parts and the center of Mega Manila, to transport commuters living in the suburban areas.

- All parties accepted route options presented by the JICA Study Team in the meeting, i.e. "A" and "B" for North Zone, "1", "2" and "3" for Central Zone and "a" and "b" for South Zone, and agreed that the JICA Study Team proceed with further studies for these options.
- There is an opinion that the land acquisition cost would be quite high as the planned alignment of MMSP ran through areas without existing roads. It was explained that the land acquisition cost and resettlement cost cannot be included in the Japanese ODA Loan.
- It was understood and agreed that the cost of compensation would be considered in this Study based on the existing law and the court cases of similar nature in the past, i.e. full value of compensation to the landowner, not the areas directly affected by the construction of the subway. However, it was understood that it was too preliminary to consider in detail regarding the consideration of compensation in this Study.
- JICA Study Team explained the demand forecast used in this Study was being carried out based on the MMUTIS (Metro Manila Urban Transportation Integration Study) model with updated OD data and latest railway network plan since the MUCEP (MMUTIS Update and Capacity Enhancement Project) model has not been finalized yet.
- It was explained that the fare structure of MMSP was based on that applied for NSRP (North South Railway Project) in the study being done by JICA.
- A concern was raised if IRR and NPV shall be compared among different implementation schemes, i.e. by government own budget, by government with Japanese ODA, fully or partly by PPP, etc., comparison of which might be required to apply for NEDA approval. JICA Study Team explained that IRR was not affected by the method of investment cost, and confirmed that various implementation schemes in general would be presented in the report.
- There was an opinion that PPP would not work well for railway projects in the Philippines, and that Japanese ODA Loan would be preferable.
- It was understood that the underground section of MMSP could be constructed in the section where new roads were to be constructed on the surface, such as C3 missing link, etc. because MMSP route can be designed to avoid conflict with the road structures. However, it was agreed that available information would need to be collected and considered, e.g. interchange project on Mindanao Avenue and other places, and that such information be provided by DPWH to the JICA Study Team.
- It was understood that the Senate Bill 2447 has been already submitted but the deliberation has not been started yet.

DOTC: Accepted by

Signature

Name in block:

(RAFAEL E. PEÑAFIEL)

DPWH: Accepted by

Signature

Name in block:

(MAXIMO EWALD M. MONTAÑA II)

MMDA: Accepted by

Signature

Name in block:

(LUISA P. ANGANGAN)

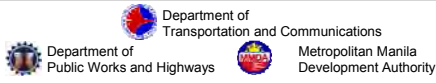
JICA ST: Accepted by

Signature

Name in block:

(Takayuki Isaka)

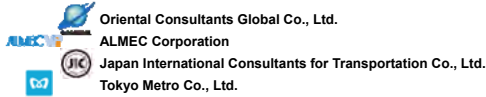
JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)



Inter-Agency Working Group Meeting No.2

15 April 2015

JICA Study Team



Contents

1. Update on Route Selection Study
2. Proposal on Necessary Legal Framework for MMSP
3. Update on Study on the Application of TOD
4. Basis of Economic Analysis
5. Initial Result of Demand Forecast Study
6. Next Step of the Study

JICA Study Team for MMSP

1. Update on Route Selection Study

Summary of Route Options

North Zone

2 Options

- (A) Along Quirino Hwy. and Zabarte Rd.
- (B) Passing Quirino Hwy. along Mindanao Rd. then going up to north of Bahay Pare Rd.

Central Zone

3 Options

- (1) Along C4 (EDSA) up to Santolan-Annapolis, then going to Ortigas North
- (2) Along West Ave. and Ortigas Ave., then going to Ortigas North
- (3) Along West Ave., Quezon Ave., G. Araneta Ave., Shaw Blvd., then going to Ortigas North

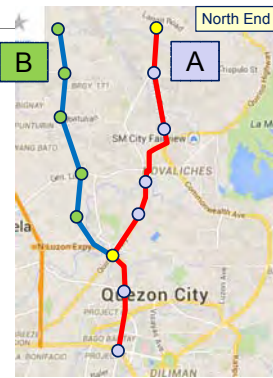
South Zone

2 Options
(by structure type)

- (a) Changing underground str. to elevated str. after passing FTI.
- (b) Changing underground str. to elevated str. after going into Molino Rd.

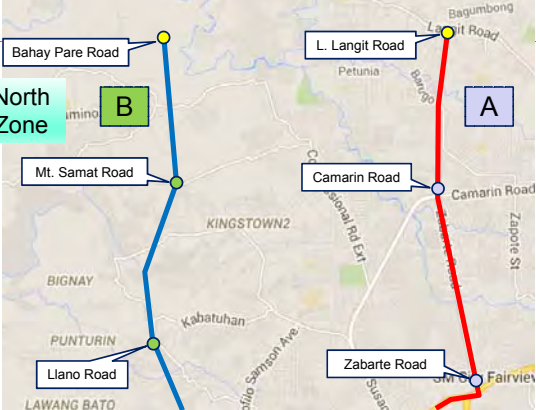
JICA Study Team for MMSP

North Zone



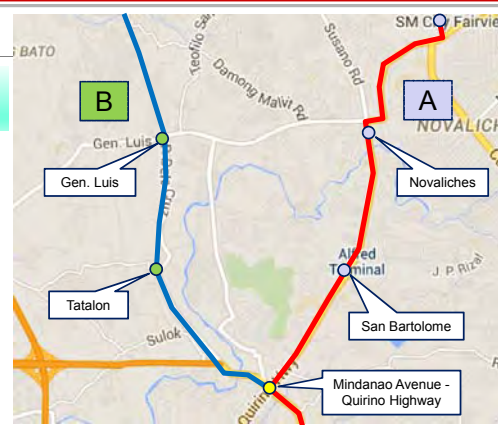
JICA Study Team for MMSP

North Zone

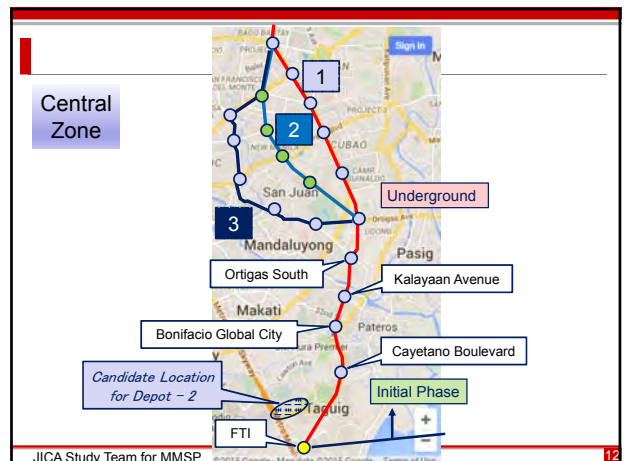
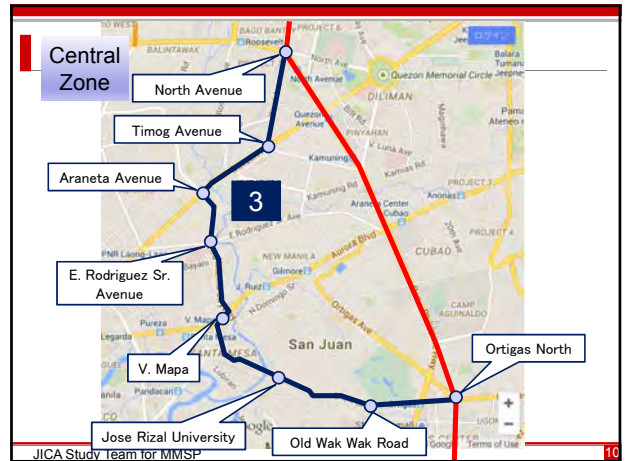
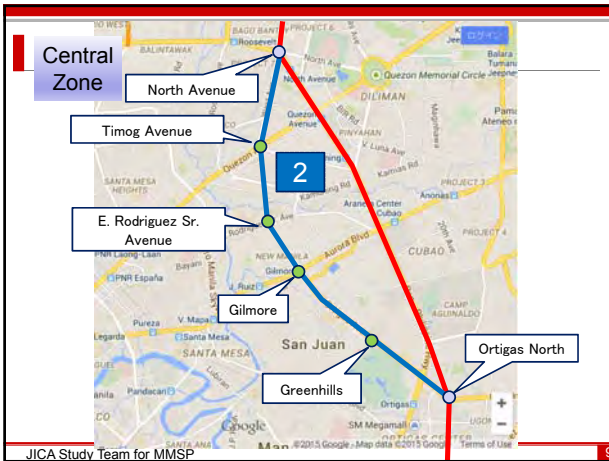
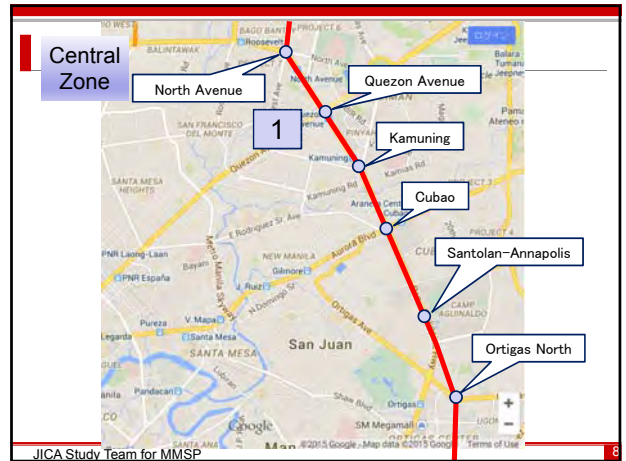
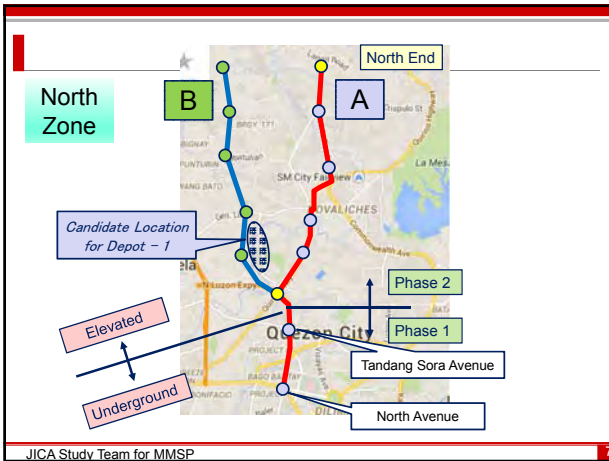


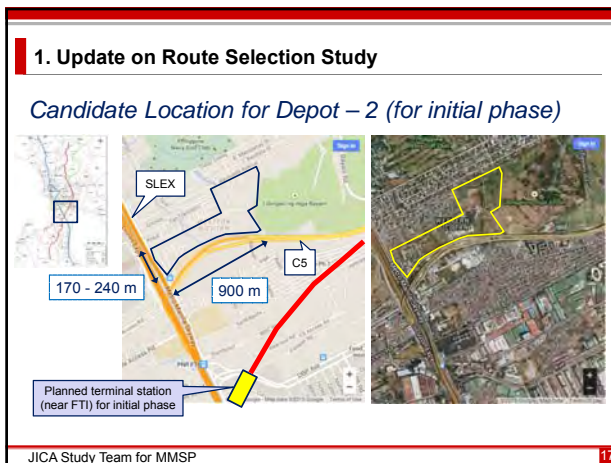
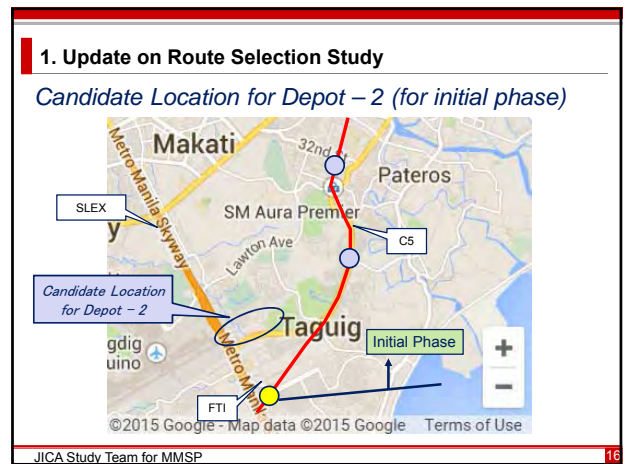
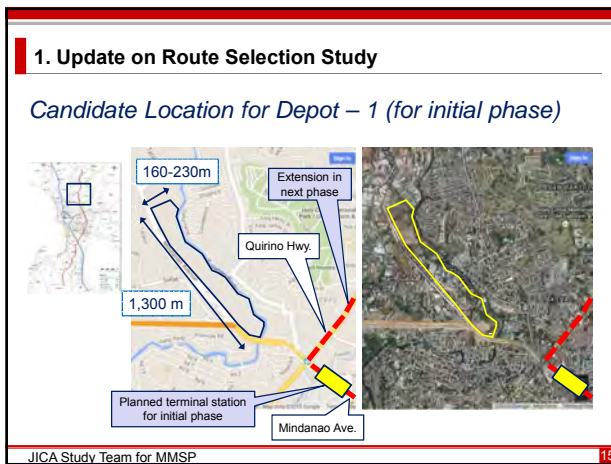
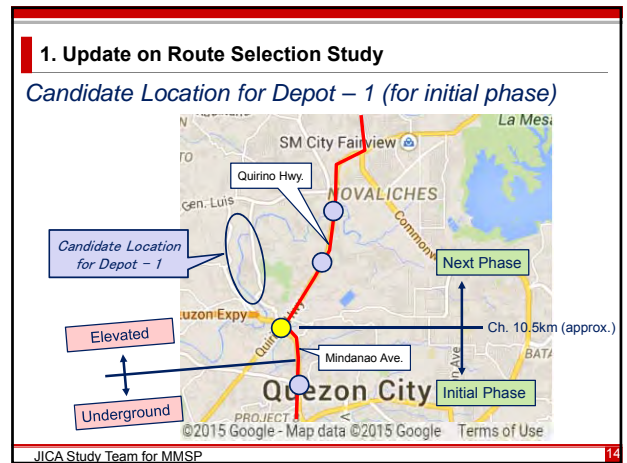
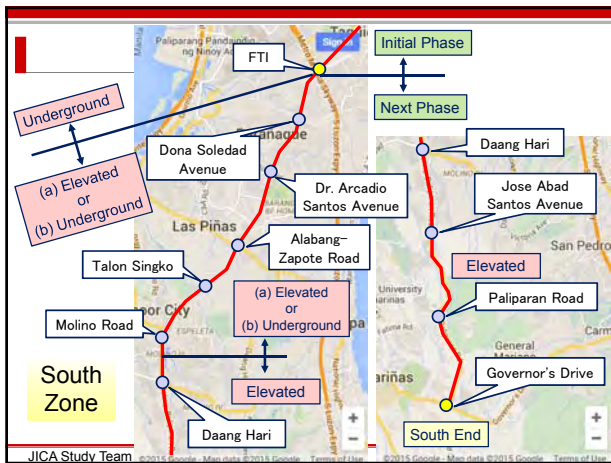
JICA Study Team for MMSP

North Zone



JICA Study Team for MMSP





1. Update on Route Selection Study

Station Chainage and Distance between Stations for Option A1a Route (tentative)

Station No.	Station Name	Chainage (km)	Station Length (km)	Station Type	Station Type	Station Type	Station Type	Station Type	Station Type	Station Type
11	Laguna Road	12.114	2.063	1.663	Elevated					
12	Quirino Road	12.297	2.033	2.133	Elevated					
13	Quirino Road	14.338	2.034	2.134	Elevated					
14	Marikina Road	16.372	2.034	2.134	Elevated					
15	Marikina Road	18.406	2.034	2.134	Elevated					
16	Marikina Road	20.440	2.034	2.134	Elevated					
17	Marikina Road	22.474	2.034	2.134	Elevated					
18	Marikina Road	24.508	2.034	2.134	Elevated					
19	Marikina Road	26.542	2.034	2.134	Elevated					
20	Marikina Road	28.576	2.034	2.134	Elevated					
21	Marikina Road	30.610	2.034	2.134	Elevated					
22	Marikina Road	32.644	2.034	2.134	Elevated					
23	Marikina Road	34.678	2.034	2.134	Elevated					
24	Marikina Road	36.712	2.034	2.134	Elevated					
25	Marikina Road	38.746	2.034	2.134	Elevated					
26	Marikina Road	40.780	2.034	2.134	Elevated					
27	Marikina Road	42.814	2.034	2.134	Elevated					
28	Marikina Road	44.848	2.034	2.134	Elevated					
29	Marikina Road	46.882	2.034	2.134	Elevated					
30	Marikina Road	48.916	2.034	2.134	Elevated					
31	Marikina Road	50.950	2.034	2.134	Elevated					
32	Marikina Road	52.984	2.034	2.134	Elevated					
33	Marikina Road	55.018	2.034	2.134	Elevated					
34	Marikina Road	57.052	2.034	2.134	Elevated					
35	Marikina Road	59.086	2.034	2.134	Elevated					
36	Marikina Road	61.120	2.034	2.134	Elevated					
37	Marikina Road	63.154	2.034	2.134	Elevated					
38	Marikina Road	65.188	2.034	2.134	Elevated					
39	Marikina Road	67.222	2.034	2.134	Elevated					
40	Marikina Road	69.256	2.034	2.134	Elevated					
41	Marikina Road	71.290	2.034	2.134	Elevated					
42	Marikina Road	73.324	2.034	2.134	Elevated					
43	Marikina Road	75.358	2.034	2.134	Elevated					
44	Marikina Road	77.392	2.034	2.134	Elevated					
45	Marikina Road	79.426	2.034	2.134	Elevated					
46	Marikina Road	81.460	2.034	2.134	Elevated					
47	Marikina Road	83.494	2.034	2.134	Elevated					
48	Marikina Road	85.528	2.034	2.134	Elevated					
49	Marikina Road	87.562	2.034	2.134	Elevated					
50	Marikina Road	89.596	2.034	2.134	Elevated					
51	Marikina Road	91.630	2.034	2.134	Elevated					
52	Marikina Road	93.664	2.034	2.134	Elevated					
53	Marikina Road	95.698	2.034	2.134	Elevated					
54	Marikina Road	97.732	2.034	2.134	Elevated					
55	Marikina Road	99.766	2.034	2.134	Elevated					
56	Marikina Road	101.800	2.034	2.134	Elevated					
57	Marikina Road	103.834	2.034	2.134	Elevated					
58	Marikina Road	105.868	2.034	2.134	Elevated					
59	Marikina Road	107.902	2.034	2.134	Elevated					
60	Marikina Road	109.936	2.034	2.134	Elevated					
61	Marikina Road	111.970	2.034	2.134	Elevated					
62	Marikina Road	114.004	2.034	2.134	Elevated					
63	Marikina Road	116.038	2.034	2.134	Elevated					
64	Marikina Road	118.072	2.034	2.134	Elevated					
65	Marikina Road	120.106	2.034	2.134	Elevated					
66	Marikina Road	122.140	2.034	2.134	Elevated					
67	Marikina Road	124.174	2.034	2.134	Elevated					
68	Marikina Road	126.208	2.034	2.134	Elevated					
69	Marikina Road	128.242	2.034	2.134	Elevated					
70	Marikina Road	130.276	2.034	2.134	Elevated					
71	Marikina Road	132.310	2.034	2.134	Elevated					
72	Marikina Road	134.344	2.034	2.134	Elevated					
73	Marikina Road	136.378	2.034	2.134	Elevated					
74	Marikina Road	138.412	2.034	2.134	Elevated					
75	Marikina Road	140.446	2.034	2.134	Elevated					
76	Marikina Road	142.480	2.034	2.134	Elevated					
77	Marikina Road	144.514	2.034	2.134	Elevated					
78	Marikina Road	146.548	2.034	2.134	Elevated					
79	Marikina Road	148.582	2.034	2.134	Elevated					
80	Marikina Road	150.616	2.034	2.134	Elevated					
81	Marikina Road	152.650	2.034	2.134	Elevated					
82	Marikina Road	154.684	2.034	2.134	Elevated					
83	Marikina Road	156.718	2.034	2.134	Elevated					
84	Marikina Road	158.752	2.034	2.134	Elevated					
85	Marikina Road	160.786	2.034	2.134	Elevated					
86	Marikina Road	162.820	2.034	2.134	Elevated					
87	Marikina Road	164.854	2.034	2.134	Elevated					
88	Marikina Road	166.888	2.034	2.134	Elevated					
89	Marikina Road	168.922	2.034	2.134	Elevated					
90	Marikina Road	170.956	2.034	2.134	Elevated					
91	Marikina Road	172.990	2.034	2.134	Elevated					
92	Marikina Road	175.024	2.034	2.134	Elevated					
93	Marikina Road	177.058	2.034	2.134	Elevated					
94	Marikina Road	179.092	2.034	2.134	Elevated					
95	Marikina Road	181.126	2.034	2.134	Elevated					
96	Marikina Road	183.160	2.034	2.134	Elevated					
97	Marikina Road	185.194	2.034	2.134	Elevated					
98	Marikina Road	187.228	2.034	2.134	Elevated					
99	Marikina Road	189.262	2.034	2.134	Elevated					
100	Marikina Road	191.296	2.034	2.134	Elevated					

JICA Study Team for MMSP

1. Update on Route Selection Study

Initial Phase

- Total distance : 22.7 / 23.7 / 27.0 km
- No. of stations : 13 / 15
- Average distance between stations : approx. 1.9 – 2.0 km
- No. of depot : 1

Entire Project

- Total distance : 59.1 / 60.2 / 63.4 km
- No. of stations : 27 / 29
- Average distance between stations : approx. 2.3 km
- No. of depot : 2

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2. Proposal on Necessary Legal Framework for MMSP

(1) Present Legal Framework: Surface Land Acquisition and Right of Way

◆ Expropriation: Law and Jurisprudence

Property acquisition by the State is governed primarily by the 1987 Constitution of the Republic of the Philippines, which prohibits the taking of private property for public use without payment of just compensation.



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2. Proposal on Necessary Legal Framework for MMSP

◆ Doctrine of Eminent Domain

Eminent domain partakes of five (5) essential requisites:

- ◆ There must be “taking”;
- ◆ Said taking must be done by competent authority;
- ◆ Said taking must be for public use;
- ◆ The private owner must be paid just compensation; and
- ◆ The requirements of due process of law must be observed.

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2. Proposal on Necessary Legal Framework for MMSP

◆ Procedure: Philippine Rules of Court

- ◆ The expropriating authority files a verified complaint with the Regional Trial Court possessing jurisdiction over the location of the property in question, and deposits, either simultaneous with or subsequent to said filing, an amount equivalent to the assessed value of the property with an authorized government depository.
- ◆ If the court finds the expropriation claim meritorious, it issues an order of expropriation which authorizes the taking of the property upon the payment of just compensation to be determined as of the date of the taking of the property or the filing of the complaint, whichever comes first.
- ◆ Upon the rendition of the expropriation order, the court appoints not more than three (3) competent and disinterested persons as commissioners to recommend to the court the just compensation for the property sought to be taken.
- ◆ Within a period prescribed by the court, the commissioners submit their report as regards the proper compensation due the private owner, and the court, once all parties have had the opportunity to comment, accepts the report and renders judgment thereon.

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2. Proposal on Necessary Legal Framework for MMSP

◆ Other Modes of Acquisition Allowed by RA8974 (The act to facilitate the acquisition of right-of-way, site or location for national government infrastructure projects and for other purposes)

- ◆ Quitclaim;
- ◆ Exchange or barter;
- ◆ Donation;
- ◆ Negotiated sale;
- ◆ Expropriation; and
- ◆ Any other mode as provided by law.

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2. Proposal on Necessary Legal Framework for MMSP

◆ State of Land Acquisition and Right of Way Cases:

All government land acquisition and right of way cases have been decided on the doctrines and jurisprudence based on the Philippine Rules of Court, the BOT Law and its IRR, and RA 8974.

The land use of DOTC projects like the Philippine National Railways (PNR), Light Rail Transit Authority (LRTA), Metro Rail Transit Corporation (MRTC) and even the proposed Makati Loop Project (MTSL) have all been decided on the above mentioned laws.

All decisions have been consistent in upholding the doctrine that “the property owner must not be deprived of full benefit and enjoyment over his or her property. If so, he or she must be compensated for the FULL value of the property.”



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2. Proposal on Necessary Legal Framework for MMSP

(2) Present Legal Framework: Subterranean Land Acquisition and Subsurface Rights

On the matter of private ownership rights over subterranean portions of land, the 2007 case of National Power Corporation (NPC) v. Ibrahim, et al. is particularly instructive. In that case, Ibrahim and his co-heirs belatedly discovered underground tunnels constructed by NPC, traversing their property and rendering them unable to commence the construction of a motorized deep well, which they had originally intended. The Supreme Court ruled that this was a deprivation of the full use and benefit of their property and thus ordered NPC to pay the full value of their land as compensation.

Philippine Civil Code Art. 437:

The owner of a parcel of land is the owner of its surface and of everything under it, and he can construct thereon any works or make any plantations and excavations which he may deem proper, without detriment to servitudes and subject to special laws and ordinances. He cannot complain of the reasonable requirements of aerial navigation.

2. Proposal on Necessary Legal Framework for MMSP

◆ Survey of Jurisprudence

CASE NAME AND DETAILS	PURPOSE FOR TAKING	RELEVANT DOCTRINE/S
J.M. Tuason and Co., Inc. v. The Land Tenure Administration, et al. G.R. No. L-21064 18 February 1970	Subdivision of Property and Sale to Various Occupants	It is well-settled that just compensation means the equivalent for the value of the property at the time of its taking. It means a fair and full equivalent for the loss sustained, which is the measure of the indemnity, not whatever gain would accrue to the expropriating entity.
Republic v. Vda. de Castellvi, et al. G.R. No. L-20620 15 August 1974	Official Use by the Philippine Air Force	"Taking" under the power of eminent domain may be defined generally as entering upon private property for more than a momentary period, and, under the warrant or color of legal authority, devoting it to a public use, or otherwise informally appropriating or injuriously affecting it in such a way as substantially to oust the owner and deprive him of all beneficial enjoyment thereof.

2. Proposal on Necessary Legal Framework for MMSP

◆ Survey of Jurisprudence

CASE NAME AND DETAILS	PURPOSE FOR TAKING	RELEVANT DOCTRINE/S
National Power Corporation v. Manubay Agro-Industrial Development Corporation G.R. No. 150936 18 August 2004	Installation of High-Powered Transmission Lines	Even where the government acquires only an easement of right of way over private property, the private landowner is still entitled to just compensation based on the full value of his property.
National Power Corporation v. Ibrahim, et al. G.R. No. 168732 29 June 2007	Construction of Underground Tunnels to Siphon Water from Lake Lanao	Notwithstanding the fact that the government only occupies the sub-terrain portion, it is liable to pay not merely an easement fee but rather the full compensation for land. This is so because in this case, the nature of the easement practically deprives the owners of its normal beneficial use.

2. Proposal on Necessary Legal Framework for MMSP

◆ Survey of Jurisprudence

CASE NAME AND DETAILS	PURPOSE FOR TAKING	RELEVANT DOCTRINE/S
National Power Corporation v. Heirs of Macabangkit Sangkay G.R. No. 165828 24 August 2011	Construction of Underground Tunnels to Divert Agus River Flow to Hydroelectric Power Plants	Statutory prescriptive periods do not apply with regard to payment of just compensation, as the latter is a constitutional guarantee.

2. Proposal on Necessary Legal Framework for MMSP

◆ It is important to remember:

- ◆ There are no subway facilities in the Philippines
- ◆ There are no laws and regulations that govern subsurface land use as of yet
- ◆ Aside from the Ibrahim and Makabangkit cases, the Supreme Court has not tackled subterranean land ownership and rights
- ◆ Hence, all cases and perhaps even future cases, will be decided according to the mentioned established court doctrines.

2. Proposal on Necessary Legal Framework for MMSP

◆ Implications for the Mega Manila Subway Project

If the current Philippine expropriation standards are applied to the Mega Manila Subway Project, the proponent can expect:

- ◆ for at least for the portions that are directly under government-owned property such as roads or highways, it need not pay for just compensation for the use of the property,
- ◆ for private property, of any kind or form, needed for the completion of the project, the proponent may rely on the existing rules to appropriate the land, subject to the payment of just compensation as discussed.
- ◆ the subsurface entrance to private property whether clandestine or overt shall entitle the land owner to the full value of his property as compensation.

2. Proposal on Necessary Legal Framework for MMSP

(3) Recommendations on Necessary Law/Regulations of Subterranean Usage

- ◆ Gaps in Law
- ◆ Gaps in Regulation
- ◆ How to Bridge



2. Proposal on Necessary Legal Framework for MMSP

"The rights to the subsurface should equally be limited to the depth reasonably required to the exploitation and utilization of the soil. Just as the Code denies to the surface owner the right to limit aerial navigation over his land, it should also refuse him any right to impede subterranean travel or mining, or the digging of underground shelters and depots (remember the atom bomb) with proper authority, so long as the enjoyment of the surface or the structures thereon is not substantially disturbed. If the ownership does not extend *ad caelum*, neither should it go down *usque ad inferos*."

— Justice JBL Reyes, 1950

2. Proposal on Necessary Legal Framework for MMSP

◆ Comparison with Other Jurisdictions

Country	Extension of Land Ownership	Limitation
China	Publicly Owned	Non-issue as the public, through the government, exercises ownership
Finland	Surface land owner extends to subsurface use up to a limited depth of six (6) meters	Limited by the Helsinki Underground Master Plan
Japan	Surface land owner extends to the subsurface but in identified cities, ownership is limited only up to 40 meters in depth	Deep Underground Utilization Act of Japan

2. Proposal on Necessary Legal Framework for MMSP

◆ Law on Special Measures for the Public Use of Deep Underground in Japan (established in 2001)

Background:

- ◆ Although underground space of public roads were congested by underground facilities, underground use of private land were not fully developed.
- ◆ Meanwhile it was possible to develop underground space without the impact to on-ground facilities by technological advancement.

Purpose:

- ◆ Encouragement of the utilization of deep underground space without compensation to land owner.

Coverage Area:

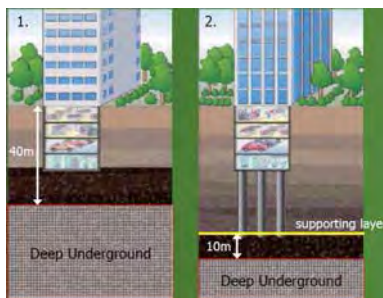
- ◆ 3 major metropolitan spheres (Tokyo Capital Region, Kinki Region, and Chubu Region)

2. Proposal on Necessary Legal Framework for MMSP

◆ Law on Special Measures for the Public Use of Deep Underground in Japan (established in 2001)

Definitions of Deep Underground

- ◆ Deep space where unutilized for basement floor (-40m in depth)
- ◆ Deep space where unutilized for building foundation (-10m below the supporting layer)



2. Proposal on Necessary Legal Framework for MMSP

◆ Senate Bill 2447 submitted in November 2014. It is now pending for committee hearing and plenary deliberations

FORMER RA No.8974 Provision	AMENDED RA No.8974 Provision
Section 1. Declaration of Policy. – Article III, Section 9 of the Constitution states that private property shall not be taken for public use without just compensation. Towards this end, the State shall ensure that owners of real property acquired for national government infrastructure projects are promptly paid just compensation.	Section 1. Declaration of Policy. – Article III, Section 9 of the Constitution states that private property shall not be taken for public use without just compensation. Towards this end, the State shall ensure that owners of real property acquired for national government infrastructure projects are promptly paid just compensation, while providing for the expeditious acquisition of the required right-of-way for the projects.

2. Proposal on Necessary Legal Framework for MMSP

◆ SB 2447 Salient Points

- ◆ it provides and offers a more comprehensive computation of the proper amount to be deposited to the court, which again facilitates a faster resolution of any issue.
- ◆ it gives the implementing agency even more ways to compel the court to issue the Writ of Possession once the proper amount has been deposited.
- ◆ the proposed amendments remove much of the discretion on the part of the court, and enables a smoother and quicker end to expropriation proceedings for covered projects.

2. Proposal on Necessary Legal Framework for MMSP

◆ SB 2447 Salient Points

Section 10. Entry into Private Lands for Subsurface or Subterranean Works. – Whenever necessary for a government infrastructure and development project to construct or install underground works like railroads or tunnels in the subsurface or subterranean portion of lands owned, occupied or leased by other persons, the government or any of its authorized representatives may not be prevented from entering into the subsurface or subterranean portions of such private lands by the surface owners or occupants if such entry is made more than fifteen (15) meters from the surface.

2. Proposal on Necessary Legal Framework for MMSP

◆ Implication of SB 2447 Section 10

- ◆ It would appear that this new provision exempts any government works more than fifteen (15) meters underground from the payment of just compensation to the owners of the surface property;
- ◆ However, seeing as the provision merely prohibits the "prevention" to the government from entering into subsurface portions of private property in order to implement said works, it is possible that payment of just compensation for an easement may still be required.
- ◆ The hearings on the proposed Bill shall likely shed further light on this issue once they have commenced

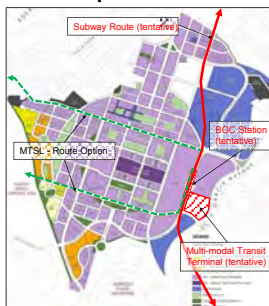
2. Proposal on Necessary Legal Framework for MMSP

Recommendations/Next Steps

- To actively monitor the progress of SB 2447
- To give data and research input to further improve on the bill
- To suggest clarification on Sec. 10 regarding the issue of just compensation
- To support efforts on the speedy passage and approval of the legislation

3. Basic Study on the Application of TOD in MMSP

■ Case Study of TOD Concept for BGC Station



Source: Land Use Map: BCDA



- Source: BCDA Source: DOTC
- Issues to be considered:
- 1) Multi-modal Transit Terminal
 - > Subway, MTSL (Makati Loop)
 - > Bus/jeepney/taxi service
 - > BGC bus service
 - > Car parking incl. P&R
 - 2) Connection with Surrounding Area by underground access pass
 - > Market2, SM Aura, Highs Street, etc.
 - 3) Commercial/business Space
 - > Upper floors of terminal building
 - > Underground shopping arcade
 - 4) Traffic management of surrounding road network including bus/jeepney routing

3. Basic Study on the Application of TOD in MMSP

■ Areal View



3. Basic Study on the Application of TOD in MMSP

Sectional Perspective

Draft as of April 10

JICA Study Team for MMSP

3. Basic Study on the Application of TOD in MMSP

Perspective

Draft as of April 10

Draft as of April 10

JICA Study Team for MMSP

3. Basic Study on the Application of TOD in MMSP

Rough Layout Plan of Ground Floor of Multi-modal Transit Terminal Building

Draft as of April 10

SM Aura

JICA Study Team for MMSP

3. Basic Study on the Application of TOD in MMSP

Multi-modal Transit Terminal

Draft as of April 10

Draft as of April 10

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3. Basic Study on the Application of TOD in MMSP

Multi-modal Transit Terminal

Draft as of April 10

Draft as of April 10

JICA Study Team for MMSP

4. Basis of Economic Analysis

Procedure of Economic Evaluation

- (1) Setup of "With Project Case" and "Without Project Case"
- (2) Calculation of Cost
- (3) Calculation of Benefit
- (4) Conversion from financial price to economic price
- (5) Calculation and Evaluation of indicators of economic evaluation
 - Calculation of Present Discount Value
 - EIRR, NPV, B/C Ratio
 - Evaluation for calculation results of each indicator

JICA Study Team for MMSP

4. Basis of Economic Analysis

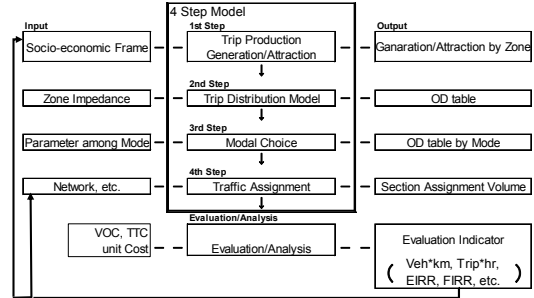
Relationship and Evaluation of NPV, B/C Ratio and EIRR

NPV > 0	B/C Ratio > 1	EIRR > r	Project is feasible
NPV < 0	B/C Ratio < 1	EIRR < r	Project is not feasible
NPV = 0	B/C Ratio = 1	EIRR = r	Project is feasible, is not rejected

**
r : Social Discount Rate (15%)

5. Initial Result of Demand Forecast Study

(1) Demand Forecast Flowchart



5. Initial Result of Demand Forecast Study

(2) Network Setting

- Fare Setting – Base Fare (PHP/ride) and Distance Fare (PHP/km)

Line	2025	2035	2045
Subway	37.5 + 2.8/km	56.2 + 4.25/km	73.4 + 5.55/km

- Number of Car per Train

Line	2025	2035	2045
Subway	6 cars/train	8 cars/train	10 cars/train

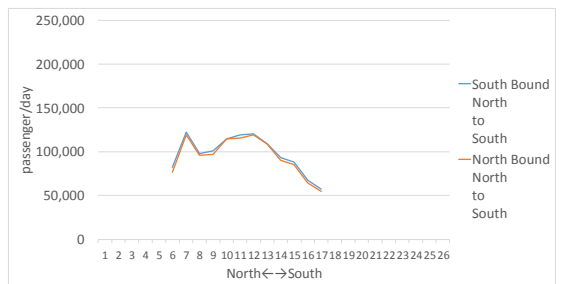
- Train Frequency on Peak Hour

Line	2025	2035	2045
Subway	12 Trains/hour	15 Trains/hour	15 Trains/hour

5. Initial Result of Demand Forecast Study

(3) Demand Forecast of Option A1 (Tentative)

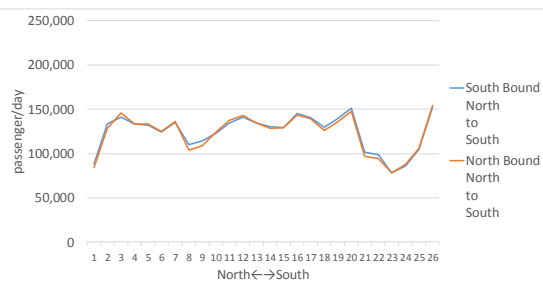
- Section Demand on 2025



5. Initial Result of Demand Forecast Study

(3) Demand Forecast of Option A1 (Tentative)

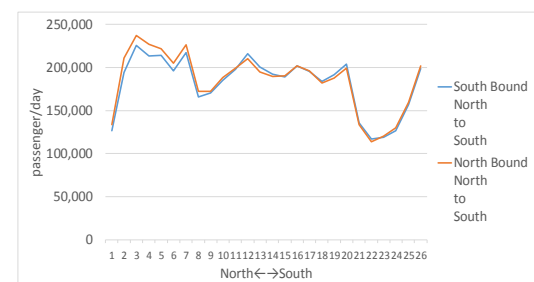
- Section Demand on 2035



5. Initial Result of Demand Forecast Study

(3) Demand Forecast of Option A1 (Tentative)

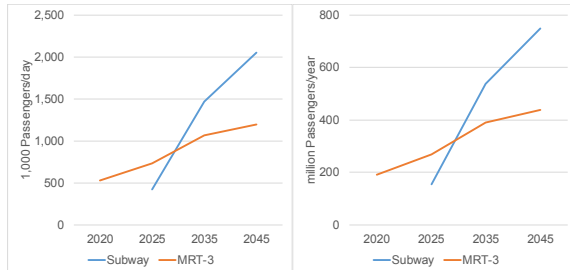
- Section Demand on 2045



5. Initial Result of Demand Forecast Study

(3) Demand Forecast of Option A1 (Tentative)

4) Number of Passenger at Station



6. Next Step of the Study

- Route Selection Study – Chainage of all options
- Demand Forecast (2025/2035/2045) of all options
- Rough Cost Estimate of all options
- Financial / Economic Analysis of all options
- Social/Environmental consideration
- Study on typical Civil / Station Structures (basic)
- Depot planning (basic)
- Rolling Stock and Railway Systems planning (basic)
- Train Operation Plan (basic)
- TOD Scenario for each station

6. Next Step of the Study

Inter-Agency Working Group Meeting No.3

Week of 18 May or
Week of 25 May

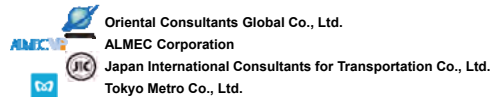
Agenda (draft)

- Update on Demand Forecast Study
- Update on Rough Cost Estimate
- Update on Economic and Financial Analysis
- Preliminary report on Typical Civil / Station Structures
- Preliminary report on Implementation Scheme Plans
- Preliminary report on Operation and Maintenance Plan



Thank you for your kind attention

JICA Study Team





**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



Minutes of Meeting

Project	Information Collection Survey for the Mega Manila Subway Project
Subject	Inter-Agency Working Group Meeting No.3
Date and Time	1:00 PM – 3:10 PM on Thursday, 21 May 2015
Venue	Room No. 156 on 15 th floor of the Columbia Tower
Attendees	DOTC: Mr. Deo Leo Manalo, Mr. Rafael E. Peñafiel, Mr. Mirick Paala, Mr. Jonas Cruz, Ms. Gina M. Zapata MMDA: Mr. Danneedee Bobadkla, Mr. Michael Gison, Ms. Luisa Angangan, DPWH: Mr. Elmo F. Atillano, Ms. Rochelle Anne A. Garcia JICA: Mr. Nozomu Yamashita, Mr. Yuya Takagi, Mr. Floro Moviento, Ms. Leah Penarroyo JICA ST: Mr. Shinya Nakamura, Mr. Takayuki Isaka, Dr. Tetsuji Masujima, Mr. Tetsuo Horie, Mr. Yasukazu Tsubouchi, Mr. Hiroshi Imaizumi, Dr. Jorge Muller Others: Mr. Yuji Asano (OCG Manila Office)

The JICA Study Team explained the selected route options (total of 12 options), including route alignment in each of North, Central and South Zones, locations of stations and depot, as well as results of updating demand forecast for each option, preliminary project cost estimate for each option and preliminary economic and financial analysis. In addition, typical civil structures for railways, preliminary implementation schemes for the MMSP and proposal on the operation and maintenance plan were presented. Discussions and exchange of opinions were made among DOTC, DPWH, MMDA and JICA Study Team, which can be summarized as follows:

- It was noted and understood by all parties that existing infrastructures and plans for construction of new infrastructures (railways, BRTs, expressways, etc.) along the proposed routes were taken into consideration as much as possible in determining route options. At the same time, it was explained that some infrastructure plans are yet to be approved and status of each project varies from one another, thus it is too early to definitely determine duplication with all infrastructure projects. It was therefore understood that further study to avoid conflict with existing plans should be carefully undertaken during the Feasibility Study stage in determining final route for the MMSP.
- All parties agreed to proceed with the Study with the 12 options proposed by the JICA Study Team and prepare the Interim Report planned to be submitted to JICA at the end of June 2015 accordingly.
- There was an opinion if the phasing could be changed to include either North Zone or South Zone in Phase 1 together with Central Zone since there is high potential in these areas to commute to the Central Zone areas, i.e. Metro Manila. It was explained that although it was the main objective of the MMSP to connect the suburban areas of both north and south areas and the central area of Manila, the initial investment cost would be significantly high if either South Zone or North Zone is included in Phase 1, and thus it would be not practical. All parties agreed that phasing of the MMSP would be further considered and finalized at the Feasibility Study stage and thus the phasing plan proposed by the JICA Study Team could be as it is.
- There was a suggestion to consider political sensitivity in naming stations, which was duly taken note by JICA Study Team.

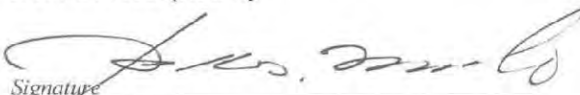


**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**




- A question was raised if the EIRR (Economic Internal Rate of Return) would be higher if other benefit item (economic factor) was also considered in the calculation, referring to other project (MRT 7) in which other factor, i.e. health benefit (note: post meeting information), was considered in the calculation of the EIRR. The JICA Study Team responded that only time saving cost and vehicle operating cost (VOC) are considered as of now and further refining of calculation method of EIRR should be explored during the Feasibility Study stage, which all other parties agreed.
- It was confirmed that there is no duplication with the alignment of MRT 7.
- A question was raised if the mass transit system would be at-grade, not either elevated or underground. The JICA Study Team responded that at-grade railway is applicable for freight trains and long distance trains, but it is not recommended for urban rail in populated area as its operation blocks the road traffic.
- A question was raised if the alignment of the Central Zone overlaps with Ortigas-Angono-Taytay line, which was proposed by METI study. It was explained that DOTC decided to proceed with the East part of the alignment (from EDSA to eastward), hence there is no duplication with that line.
- A question was raised if demand forecast also consider intra-province (such as Bulacan and Cavite) OD data in addition to inter-province OD data since it may be the case that some people only travel within provinces. The JICA study Team responded that intra-province OD data was not necessarily available and the demand forecast is still conservative.
- JICA and the JICA Study Team (JST) explained about the "Overseas Training – Trip to Japan" to be carried out as a part of the Study and tentatively planned in August 2015. JICA/JST have already received candidates from DPWH through DOTC and requested DOTC and MMDA to nominate their candidates and inform JICA/JST.
- DOTC shared that NEDA just recommended that this project should be presented to NEDA InfraCom, hence DOTC will prepare for the presentation as soon as possible.
- JICA requested DOTC/DPWH/MMDA that decision making persons of each agency attend the next meeting, i.e. 2nd Steering Committee Meeting planned in the week of 22 June 2015.


DOTC: Accepted by


Signature
Name in block:
(Danilo Mandado)

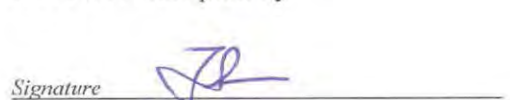
DPWH: Accepted by


Signature
Name in block:
(Elmo F. Atullano)

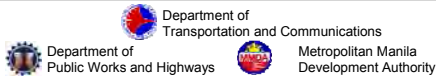
MMDA: Accepted by


Signature
Name in block:
(Luisa P. Angenya)

JICA ST: Accepted by


Signature
Name in block:
(Takayuki Isaka)

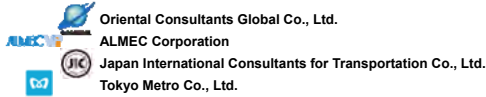
JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)



Inter-Agency Working Group Meeting No.3

21 May 2015

JICA Study Team



Contents

1. Review of Selected Route Options
2. Update on Demand Forecast Study
3. Update on Rough Cost Estimate
4. Update on Economic and Financial Analysis
5. Preliminary report on Typical Civil / Station Structures
6. Preliminary report on Implementation Scheme Plans
7. Preliminary report on Operation and Maintenance Plan
8. Next Step of the Study

JICA Study Team for MMSP

1. Review of Selected Route Options

Initial Phase

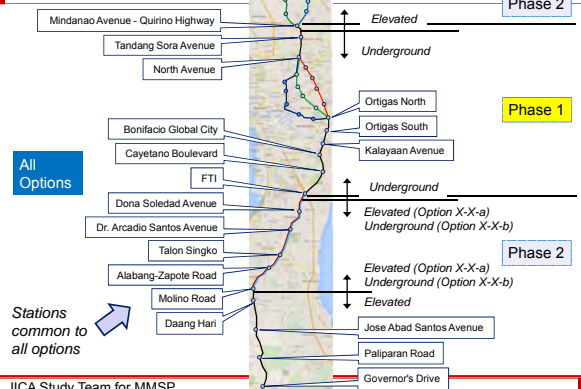
- Total distance : 22.7 / 23.7 / 27.0 km
- No. of stations : 13 / 15
- Average distance between stations : approx. 1.9 – 2.0 km
- No. of depot : 1

Entire Project

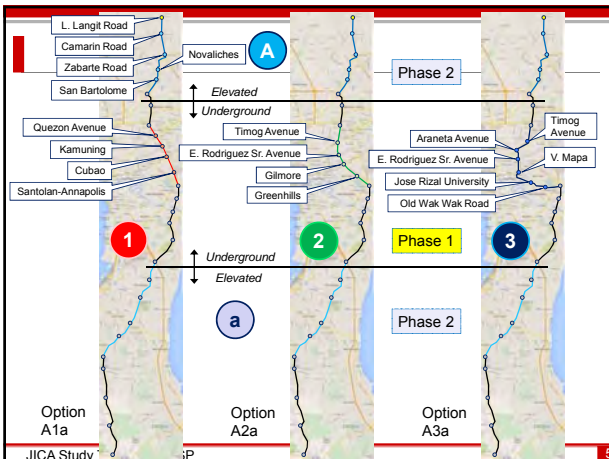
- Total distance : 59.1 / 60.2 / 63.4 km
- No. of stations : 27 / 29
- Average distance between stations : approx. 2.3 km
- No. of depot : 2

JICA Study Team for MMSP

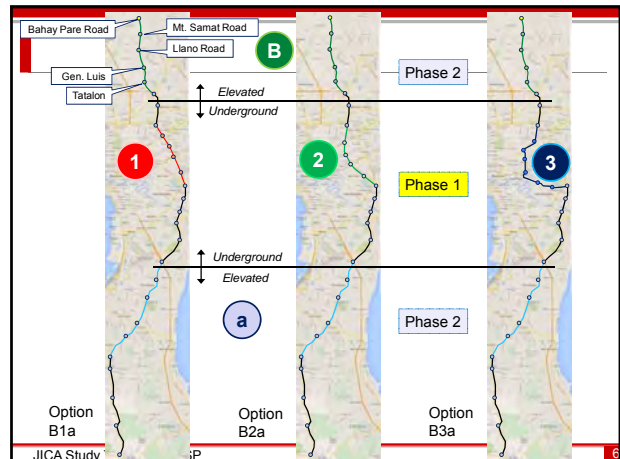
1. Review of Selected Route Options



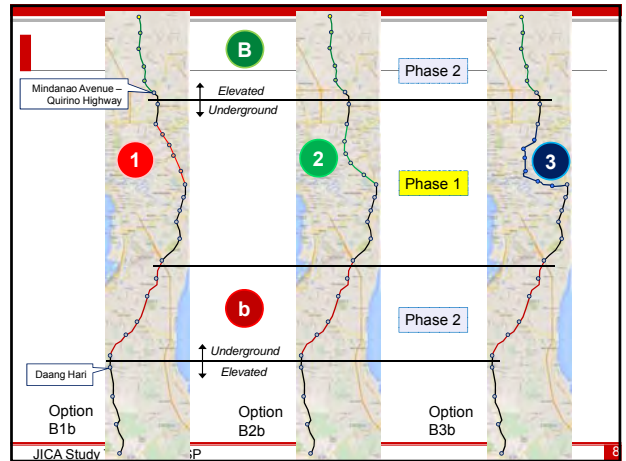
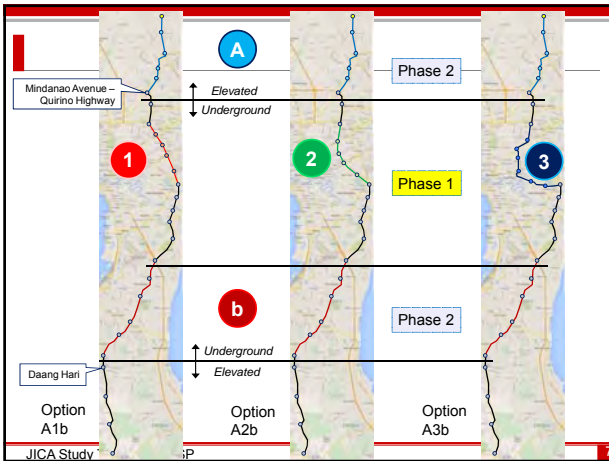
JICA Study Team for MMSP



JICA Study



JICA Study



1. Review of Selected

Tables showing chainage of each station, distance between stations, structure type, distances by structure type, station type and distance by Phase have been prepared for all of 12 options. (Table shown at the right is the sample for Option A1a.)

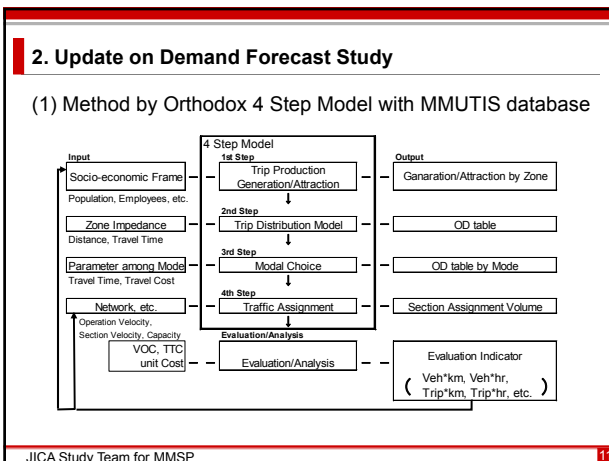
Note:
 High ELV (Elevated) for higher than 15m from GL
 D-UDG (Deep Underground) for deeper than 23m below GL, but only for stations

Option A1a									
Station	Chainage	Distance	Structure Type	Station Type	Phase	Height	Depth	Structure	Station
1	0+00	0+00	Elevated	Station	Phase 1	15.00			1
2	0+15	0+15	Underground	Station	Phase 2		23.00		2
3	0+30	0+30	Elevated	Station	Phase 1	15.00			3

1. Review of Selected Route Options

Summary of All Options

Length of Structure by Type (km)	Option											
	A1a	A2a	A3a	B1a	B2a	B3a	A1b	A2b	A3b	B1b	B2b	B3b
Phase 1 - Elevated	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Phase 1 - Underground	19.81	20.51	23.80	19.40	20.51	23.40	19.46	20.51	23.40	19.46	20.51	23.40
Phase 2 - Elevated	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46	29.46
Phase 2 - Underground	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09	4.09
Total	53.96	54.96	57.84	53.92	54.97	57.95	53.96	54.96	57.84	53.92	54.97	57.95



2. Update on Demand Forecast Study

(2) Target Year of Demand Forecast

- 2025 for Phase 1 Implementation (Options 1, 2 and 3 only)
- 2035 for Phase 2 Implementation (Options A1-A3, B1-B3)
- 2045 for Input of IRR estimation

(3) Subway Precondition for Demand Forecast

Item	2025		2035		2045		
	Fix	/km	Fix	/km	Fix	/km	
Railway Fare	LRT1	18.75	1.40	28.10	2.13	36.70	2.78
	MRT3	18.75	1.40	28.10	2.13	36.70	2.78
	PNR	-	-	-	-	-	-
	NSCR	37.50	2.80	56.20	4.25	73.40	5.55
	Subway	37.50	2.80	56.20	4.25	73.40	5.55
Others	18.75	1.40	28.10	2.13	36.70	2.78	
Frequency	Subway	min.	5	4	4		
No. of Cars	Subway	Cars/Train	6	8	10		

2. Update on Demand Forecast Study (Output)

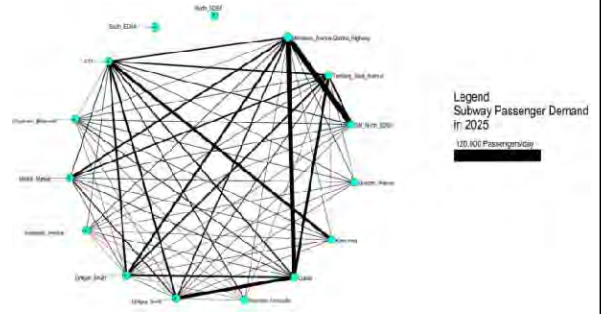
(4) Number of Subway Passengers by each Options

Unit: 1,000 Passengers/day

Option	2025	2035	2045
A1	421	1,470	2,049
A2	386	1,476	2,059
A3	478	1,568	2,205
B1	421	1,652	2,185
B2	386	1,666	2,257
B3	478	1,776	2,385

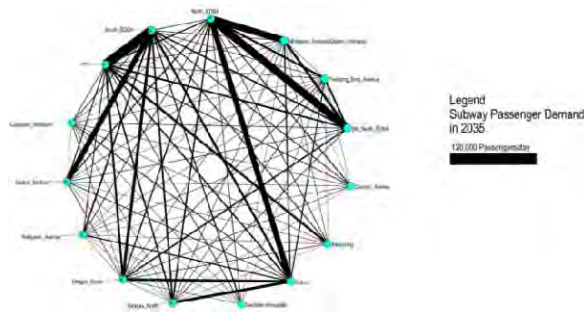
2. Update on Demand Forecast Study (Output)

(5)-1 Passenger Pattern by Desired Line in 2025 by Option 1



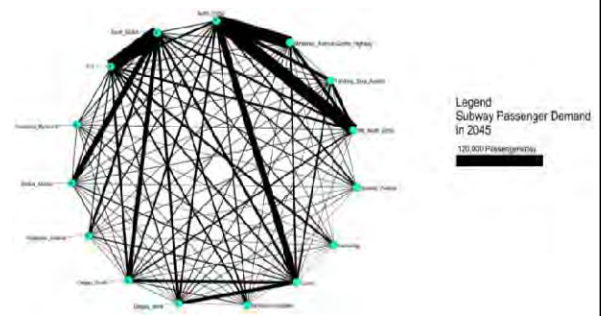
2. Update on Demand Forecast Study (Output)

(5)-2 Passenger Pattern by Desired Line in 2035 by Option A1



2. Update on Demand Forecast Study (Output)

(5)-3 Passenger Pattern by Desired Line in 2045 by Option A1



2. Update on Demand Forecast Study (Output)

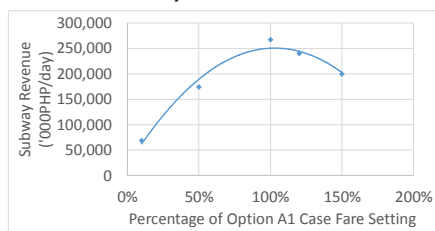
(6) Subway Fare Revenue

Item	Unit	Option	2025	2034	2035	2045
Fare Revenue	1,000PhP/day	A1	27,277	42,606	143,666	267,421
		A2	25,411	40,257	143,366	270,344
		A3	29,464	47,060	155,694	294,724
		B1	27,277	42,606	155,112	276,865
		B2	25,411	40,257	156,469	284,738
		B3	29,464	47,060	168,527	307,441

2. Update on Demand Forecast Study (Output)

(7) Subway Fare Sensitivity Analysis

100 %: Set Value of Subway Fare = 73.40 PhP/ride & 5.55 PhP/km



= Set Value "100 %" of Subway Fare is reasonable.

The JICA Study Team understands that further consideration is necessary to determine the appropriate fare structure for MMSP in the next phase, i.e. Feasibility Study.

3. Update on Rough Cost Estimate

Based on the preliminary study on various aspects, rough Project Costs of each option were estimated with the breakdown of the following items:

Direct Project Cost

- Construction Cost (Civil, Trackwork, Rolling Stock, Railway Systems)
- Utility Relocation Cost
- Tax (Import Tax, VAT)
- Consultants Cost
- Physical Contingency

Indirect Project Cost

- Land Acquisition / Compensation
- Ancillary Road Construction Cost (new road construction necessary for elevated structures of new railway)

3. Update on Rough Cost Estimate

Basis of Unit Cost of Civil Works and Trackwork

- (1) Elevated Structures (mainline) :
Standard (GL+15m) and Higher, per km
- (2) Elevated Stations :
Standard (GL+15m) and Higher, per station
- (3) Underground Structures (mainline) :
Same regardless of the depth, per km
- (4) Underground Stations :
Standard (GL-23m) and Deeper, per station
- (5) Depot and Workshop (Civil) :
At-grade, per square-meters
- (6) Trackwork :
Elevated, Underground and At-grade (Depot), per km

3. Update on Rough Cost Estimate

Basis of Unit Cost of Rolling Stock and Railway Systems:

- (1) Rolling Stock:
Standard Mass Transit trains, per car, based on PHPDT (Peak Hour Peak Direction Traffic) of the results of the Updated Demand Forecast plus reserve cars
- (2) Railway Systems:
Signalling System, Telecommunications System, Power Supply System, Automatic Fare Collection (AFC) System, Depot Workshop Equipment and Platform Screen Doors, per km (with variance by structure type for some systems) or per complete set for each phase

3. Update on Rough Cost Estimate

Assumptions of Other Direct Project Costs:

- (1) Utility Relocation Cost:
2% of Construction Cost
- (2) Tax:
Import Tax at 10% of FC portion of Construction Cost, VAT at 12% of Construction Cost
- (3) Consultants Cost:
10% of Construction Cost with VAT (12%)
- (4) Physical Contingency:
7.5% of Construction Cost, Tax and Consultants Cost

3. Update on Rough Cost Estimate

Calculations of Indirect Project Costs:

- (1) Land Acquisition / Compensation:
Land required to be acquired for the construction of elevated structures where there is currently no road
Road widening required for the construction of elevated structures on the route with existing roads
Land required to construct station entrances for underground stations
Compensation required for the relocation due to land acquisition as well as for the usage of subterranean space (for underground section only)
- (2) Ancillary Road Construction Cost:
Cost of construction of roads on the route where there is currently no road

3. Update on Rough Cost Estimate

Example of Estimated Rough Project Cost with Breakdown:

Option A/a	Item	FC	LC	Phase 1 (Year 2025)			Phase 2 (Year 2038)			Total
				FC	LC	Total	FC	LC	Total	
Construction Cost	Civil Works	10	90	239.84	2,158.96	2,398.80	152.41	1,161.69	1,224.10	3,622.90
	Trackwork	79	39	58.61	24.18	82.79	73.45	11.82	104.83	187.62
	Rolling Stock	90	5	301.09	15.89	317.57	854.50	42.34	946.85	1,264.41
	RAM Systems	90	10	272.99	30.33	303.32	339.00	37.67	376.67	679.99
	Subtotal			870.63	2,238.95	1,059.67	1,709.36	1,233.17	2,643.53	3,852.41
Utility Relocation				62.00	62.00		11.05	11.05	73.05	135.05
Tax	Import Tax			63.11		63.11	151.89		151.89	315.00
	VAT					371.68			371.68	743.36
Consultants Cost		80	40	308.01	138.01	446.02	347.59	177.53	525.12	971.14
Physical Contingency				231.16		231.16			231.16	462.32
Total of Direct Project Cost						4,235.31			3,682.45	7,917.76
Land Acquisition/ Compensation				238.51	2,369.97	2,608.48		84.00	84.00	3,192.47
Ancillary Road Construction				0.00	0.00	0.00		4.29	4.29	4.29
Total of Indirect Project Cost						238.51			88.29	326.80
Total Project Cost						4,473.82			3,770.74	8,244.56

Exchange Rate: JPY/USD 119.03 JPY/INR 2.70 JICA Design Rate for March 2013

Import Tax: 10% of FC Portion VAT: 12% of Construction Cost Utility Relocation: 2% of Construction Cost

Consultants: 10% of Construction Cost with VAT (12%) Physical Contingency: 7.5% of Construction Cost, Tax and Consultants Cost

3. Update on Rough Cost Estimate

Summary of Estimated Rough Project Cost of All Options:

		New Million USD											
Option		A1a	A2a	A3a	B1a	B2a	B3a	A1b	A2b	A3b	B1b	B2b	B3b
Phase 1	Direct Project Cost	4,235.51	4,288.51	9,895.22	4,235.51	4,378.22	4,695.22	4,235.51	4,288.51	9,895.22	4,235.51	4,288.51	4,895.22
	Indirect Project Cost	235.91	241.12	258.65	235.91	241.12	258.65	235.91	241.12	258.65	235.91	241.12	258.65
	Sub-total	4,471.42	4,529.63	10,153.87	4,471.42	4,619.34	5,153.87	4,471.42	4,529.63	10,153.87	4,471.42	4,529.63	5,153.87
Phase 2	Direct Project Cost	1,952.45	3,589.18	3,635.84	3,972.78	3,129.51	3,770.88	4,011.51	4,648.26	4,688.01	4,771.52	4,758.57	4,825.94
	Indirect Project Cost	88.29	88.29	88.29	82.48	82.48	82.48	79.85	79.85	76.68	72.78	72.78	72.78
	Sub-total	2,040.74	3,677.47	3,724.13	4,055.26	3,211.99	3,853.36	4,091.36	4,728.11	4,764.69	4,844.30	4,831.35	4,900.72
Overall	Direct Project Cost	7,787.76	8,887.70	13,531.06	8,447.79	7,808.73	8,464.10	8,247.02	8,936.77	9,553.23	9,527.13	9,047.08	9,681.17
	Indirect Project Cost	319.20	329.41	346.94	318.39	320.60	341.13	315.76	318.72	327.33	308.69	313.94	331.43
	Total	8,106.96	9,217.11	13,878.00	8,766.18	8,129.33	8,805.23	8,562.78	9,255.49	9,880.56	9,835.82	9,361.02	10,012.60

JICA Study Team for MMSP

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4. Update on Economic and Financial Analysis

MMSP is economically viable or not?

$$EIRR \geq SDR(15\%)$$



Viable

$$EIRR \leq SDR(15\%)$$



Not Viable

JICA Study Team for MMSP

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4. Update on Economic and Financial Analysis

Results of Economic Evaluation(EIRR)

Option	EIRR	Option	EIRR
A1a	17.3%	A1b	17.3%
A2a	17.1%	A2b	16.7%
A3a	17.2%	A3b	16.9%
B1a	17.6%	B1b	17.2%
B2a	16.9%	B2b	16.6%
B3a	17.3%	B3b	16.9%

JICA Study Team for MMSP

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4. Update on Economic and Financial Analysis

Sensitivity Analysis

Option B1a		Benefit/Cost			Change in Economic Cost (%)		
		Base Case		+10%	-20%		
Change in Economic Benefit (%)	Base Case	17.6%	16.9%	16.2%			
	+10%	16.8%	16.1%	15.5%			
	-20%	15.9%	15.2%	14.6%			
Option B2b		Benefit/Cost			Change in Economic Cost (%)		
		Base Case		+10%	-20%		
Change in Economic Benefit (%)	Base Case	16.6%	15.9%	15.3%			
	+10%	15.8%	15.1%	14.5%			
	-20%	14.9%	14.3%	13.7%			

JICA Study Team for MMSP

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4. Update on Economic and Financial Analysis

MMSP is Commercially viable or not

$$FIRR \geq PHBOR + \text{Spread}$$

(7~8%) (2~3%)



Viable

$$FIRR \leq PHBOR + \text{Spread}$$

(7~8%) (2~3%)



Not Viable

* * PHBOR: Philippine Inter Bank Offered rate

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4. Update on Economic and Financial Analysis

FIRR of MMSP

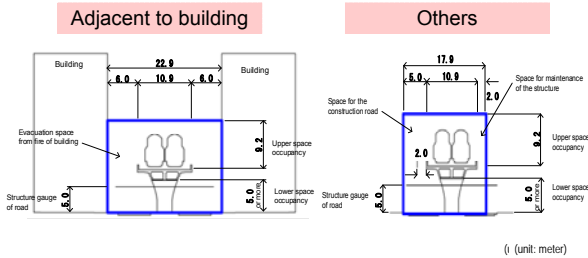
Option	FIRR (%)
A1a	9.20%
A2a	9.08%
A3a	9.11%
B1a	9.39%
B2a	9.38%
B3a	9.35%
A1b	9.13%
A2b	8.64%
A3b	8.71%
B1b	8.97%
B2b	8.95%
B3b	9.22%

JICA Study Team for MMSP

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5. Preliminary Report on Typical Civil / Station Structures

(1) Typical Elevated Structure in Main Line



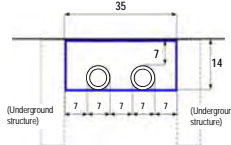
JICA Study Team for MMSP

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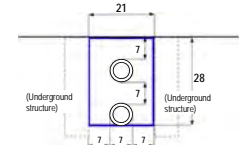
5. Preliminary Report on Typical Civil / Station Structures

(2) Typical Underground Tunnel in Main Line

Single Track Shield Tunnel (Horizontal Configuration)



Single Track Shield Tunnel (Vertical Configuration)



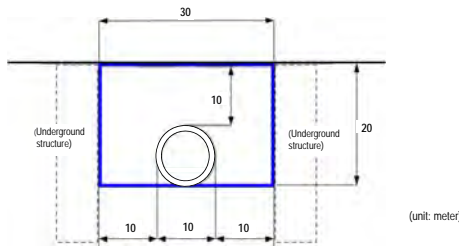
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5. Preliminary Report on Typical Civil / Station Structures

(2) Typical Underground Tunnel in Main Line

Double Track Shield Tunnel



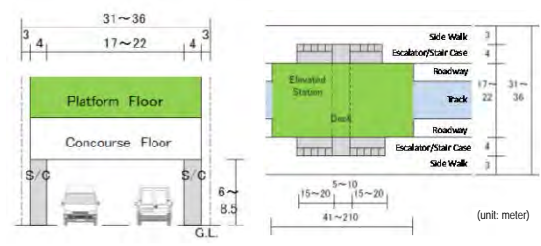
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5. Preliminary Report on Typical Civil / Station Structures

(3) Typical Station Structure

Elevated Station



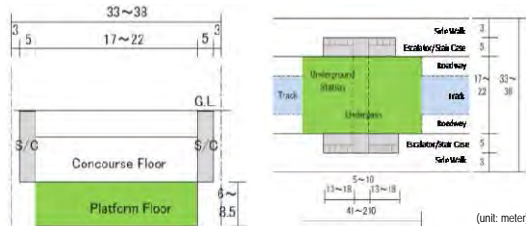
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5. Preliminary Report on Typical Civil / Station Structures

(3) Typical Station Structure

Underground Station



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6. Preliminary Report on Implementation Scheme Plans

How do we implement this MMSP ?

EIRR of MMSP is greater than 15 % SDR set by NEDA

MMSP should be implemented in terms of national economy

How do we implement this MMSP ?

- How do we raise funds to implement the MMSP ?
- Who is responsible for implementing the MMSP ?

JICA Study Team for MMSP

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6. Preliminary Report on Implementation Scheme Plans

How do we raise funds to implement the MMSP ?

- **Viability by Private Funds**
 - FIRR (9%) ≤ PHBOR+Spread (9%-11%)
 - Project Cost: Approximately 9,200 million US\$
 - ➔ Private sector ????
- **Viability by Government budget of Philippine**
 - Spending for infrastructure in Philippine has not gone beyond 2.2% of GDP since 1995.
 - Estimated budget for Infrastructure in 2014 (5,699 M\$) is less than project cost (9,200 M\$)
 - ➔ Government budget ????

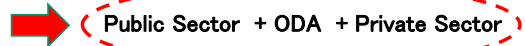
6. Preliminary Report on Implementation Scheme Plans

- **How do we fund raising ? (Funding Opportunities)**
Implementation by private funds or government budget



????

One possible funding strategy:



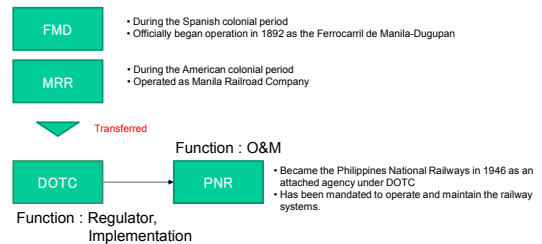
7. Preliminary Report on Operation and Maintenance Plan

- Functions upon Railway Construction and O&M

Functions	Details	Responsibility
Project Owner or Regulator	<ul style="list-style-type: none"> • Planning • Budgeting • Bidding • Contract 	<ul style="list-style-type: none"> • Preparation for the project <ul style="list-style-type: none"> • Devising new railway network plans • Railway construction plan • Managing Contract
Implementation	<ul style="list-style-type: none"> • Supervising • Training 	<ul style="list-style-type: none"> • Project Management Office <ul style="list-style-type: none"> • Supervising <ul style="list-style-type: none"> • Construction • Facilities installation • Preparation for the commencement <ul style="list-style-type: none"> • Training staff
O&M	<ul style="list-style-type: none"> • Operation • Maintenance • Outsourcing 	<ul style="list-style-type: none"> • Operating & Maintaining • Outsourcing some of the maintenance works • Supervising contractors

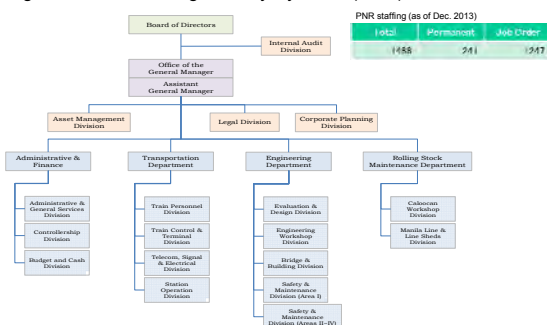
7. Preliminary Report on Operation and Maintenance Plan

- Organization of Existing Railway Systems (PNR)



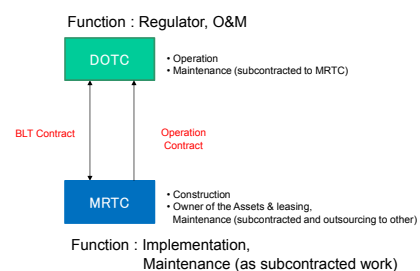
7. Preliminary Report on Operation and Maintenance Plan

- Organization of Existing Railway Systems (PNR)



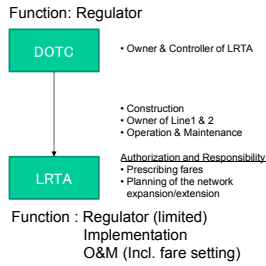
7. Preliminary Report on Operation and Maintenance Plan

- Organization of Existing Railway Systems (MRT3)



7. Preliminary Report on Operation and Maintenance Plan

Organization of Existing Railway Systems (LRTA)

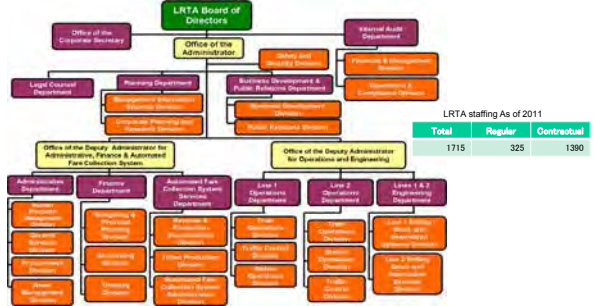


JICA Study Team for MMSP

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7. Preliminary Report on Operation and Maintenance Plan

Organization of Existing Railway Systems (LRTA)

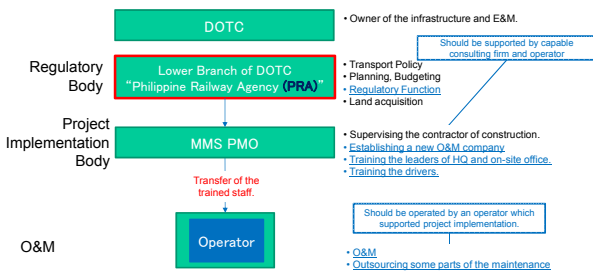


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7. Preliminary Report on Operation and Maintenance Plan

Organization of Mega Manila Subway Project (Long term)



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7. Preliminary Report on Operation and Maintenance Plan

Organization of Mega Manila Subway Project (Long term)

"Philippines Railway Agency (PRA)" contribute to

- Smooth implementation of railway projects
 - ✓ Consistency
 - ✓ Clarified roles and responsibilities
- Accumulation of know-how of railway projects
 - ✓ supervising all the railway projects
- Reliable regulatory functions

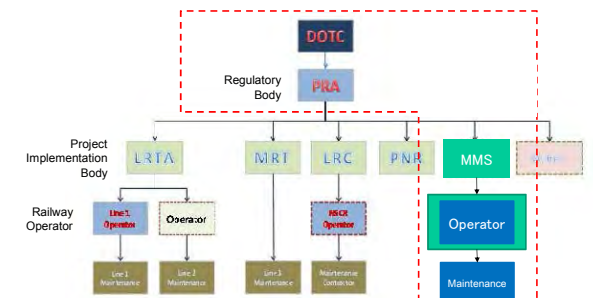
Being the only one agency which owns and manages all railway projects in the Philippines

JICA Study Team for MMSP

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7. Preliminary Report on Operation and Maintenance Plan

Organization of Mega Manila Subway Project (Long term)

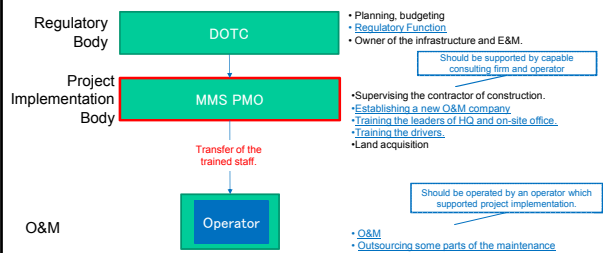


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7. Preliminary Report on Operation and Maintenance Plan

Organization of Mega Manila Subway Project (Short term)



JICA Study Team for MMSP

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7. Preliminary Report on Operation and Maintenance Plan

Organization of Mega Manila Subway Project (Short term)

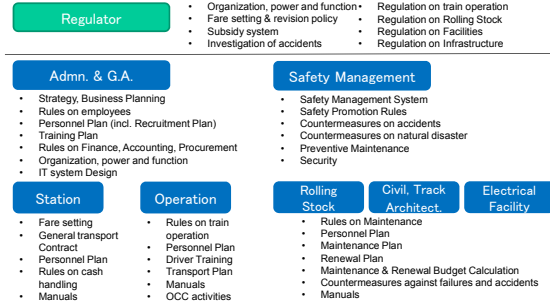
- There are two options to establish MMS PMO

	Advantages	Disadvantages	Evaluation
Attached Agency under DOTC	<ul style="list-style-type: none"> Able to rebuild the railway administration Under the governance of one governmental department, DOTC 	<ul style="list-style-type: none"> No experience and know-how 	<ul style="list-style-type: none"> Capable with full-support by experienced consultants and operators
Department of LRTA	<ul style="list-style-type: none"> Experiences and know-how (However they might lose their accumulation with the progress of O&M outsourcing .) 	<ul style="list-style-type: none"> Plural related governmental department (DOTC, DPWH,DBM, DOF, NEDA, MMDA, LTRFB) 	<ul style="list-style-type: none"> Capable but still need to be supported by experienced consultants or operators Possibility of Slow decision making

7. Preliminary Report on Operation and Maintenance Plan

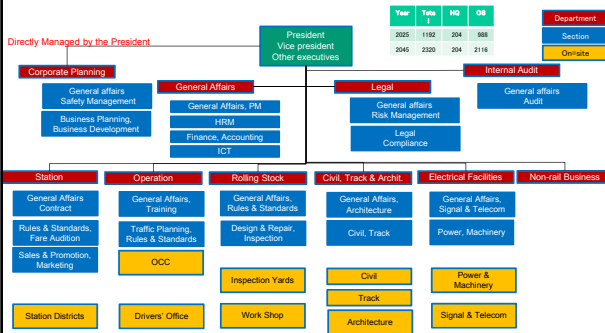
Organization of Mega Manila Subway Project (Short term)

Major contents of Technical Assistance for Staff Training



7. Preliminary Report on Operation and Maintenance Plan

Proposed O&M Organization of Mega Manila Subway



7. Preliminary Report on Operation and Maintenance Plan

Proposed O&M Organization of Mega Manila Subway

Department	Major Functions
Corporate Planning	<ul style="list-style-type: none"> Safety Management Corporate Vision, Strategy, Business Planning, Business Development Supervising the other departments (except Internal Audit Dept.)
General Affairs	<ul style="list-style-type: none"> General affairs, Document Management, Property Management, Human Resource Management, Finance, Accounting, ICT planning & implementation
Legal	<ul style="list-style-type: none"> Legal Consultation, Lawsuits, Compliance Activity Risk Management, Business Continuity Plan
Internal Audit	<ul style="list-style-type: none"> Financial Audit Safety & Operation Audit
HQs of O&M	<ul style="list-style-type: none"> Managing on-site offices, Setting rules and standards, Managing Contracts Staff training, Other unique activities
OCC	<ul style="list-style-type: none"> Controlling and supervising operational & maintenance activities.
On-site offices (Operational)	<ul style="list-style-type: none"> Operational Activities Supervising Contractors (Security, cleaning etc.)
On-site offices (Maintenance)	<ul style="list-style-type: none"> Inspection Supervising maintenance contractors Parts replacement, light repair, depend on offices (These activities can be outsourced in the future.)

7. Preliminary Report on Operation and Maintenance Plan

Proposed O&M Organization of Mega Manila Subway

Advantages

- Strong leadership** by Corporate Planning Department
 - Corporate Planning Department is especially expected to be responsible for the business plan and the safety management.
 - The possibility of problems caused by sectionalism will be still high, however, directly managed by the president, Corporate Planning Department is expected to adjust the opinions of other departments.
- Strong leadership** by Operation Control Center against on-site divisions
 - To secure the operational safety, OCC is expected to strongly lead the other on-site divisions.

Disadvantages

- Heavy responsibility** of Corporate Planning and General affairs
 - Directors and managers need to have comprehensive knowledge and strong mind.
 - Directors and managers have to be carefully chosen and assigned.
- Few posts** in non-engineering departments
 - It should be important to provide some other incentive systems of HRM.

8. Next Step of the Study

Preparation and finalization of Interim Report, covering all the results of studies for all options in every aspects, with the table of contents as follows:

- Ch.1 Introduction
- Ch.2 Current Situation and Issues of Transport Sector in the Target Area
- Ch.3 Current Status and Review of Issues of Legal Frame for Usage of Subterranean Space
- Ch.4 Criteria in Selection of Route Alignment Options
- Ch.5 Demand Forecast
- Ch.6 Preliminary Route Alignment Plans
- Ch.7 Railway Systems
- Ch.8 Preliminary Implementation Plan and Project Cost
- Ch.9 Preliminary TOD Concept for MMSP
- Ch.10 Project Implementation Structure and Operation and Maintenance Structure
- Ch.11 Review of Natural Conditions
- Ch.12 Social and Environmental Consideration
- Ch.13 Project Evaluation
- Ch.14 Project Implementation Scheme and Financial Plans

8. Next Step of the Study

Steering Committee Meeting No.2

Week of 22 June (proposed)

Agenda (draft)

- Result of the Study to date
- Summary of Interim Report

8. Next Step of the Study

Overseas Training – Trip to Japan

Tentative Plan

- Period : 23 (Sun) – 29 (Sat) August 2015 (proposed)
- Attendance : DOTC, DPWH, MMDA, NEDA, BCDA
- Places to Visit : Tokyo Metro, Tokyo Monorail, Yurikamome, Kyoto Station (+ ride on Shinkansen)

Report Submission Schedule (to JICA)

- Interim Report : End of June 2015
- Draft Final Report : Beginning of August 2015
- Final Report : Beginning of October 2015



Thank you for your kind attention

JICA Study Team





**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



Minutes of Meeting

Project	Information Collection Survey for the Mega Manila Subway Project
Subject	Steering Committee Meeting No.2
Date and Time	1:00 PM – 3:15 PM on Wednesday, 24 June 2015 (A separate meeting was made with Mr. Jaime Fortunato A. Carigal, Assistant Secretary for Project Development and PPP, between 10:00 AM and 11:00 AM on Thursday, 25 June 2015.)
Venue	Room No. 156 on 15 th floor of the Columbia Tower
Attendees	<p>DOTC: Mr. Deo Leo Manalo, Mr. Ronald Rung R. Tuy, Mr. Jonas Cruz, Ms. Mikaela Eloisa D. Mendoza</p> <p>MMDA: Mr. Michael G. Gison, Mr. Emilio M. Llavor,</p> <p>DPWH: Mr. Alex G. Bote, Mr. Elmo F. Atillano, Mr. Franco D. Del Cano</p> <p>NEDA: Mr. Guada Elvira B. Salamat, Marc Antonio Q. Miranda, Ms. Kathleen Perez, Mr. Pablito Abellera</p> <p>BCDA: Mr. Tomas Macrohon</p> <p>JICA: Mr. Jin Wakabayashi, Mr. Nozomu Yamashita, Mr. Yuya Takagi, Mr. Floro Moviento</p> <p>JICA ST: Mr. Shinya Nakamura, Mr. Takayuki Isaka, Dr. Tetsuji Masujima, Mr. Shinsuke Mogi</p> <p>Others: Mr. Yuji Asano (OCG Manila Office)</p>

The JICA Study Team explained the summary of the result of the study which started in February, which include:

- 1) route options (total of 12 options) with stations, length, etc.,
- 2) preliminary demand forecast, project cost estimate and economic & financial analysis for each option,
- 3) recommendations for project implementation scheme as well as operation and maintenance plan,
- 4) result of study on legal framework in the Philippines for the use of subterranean space and the suggestion by the JICA Study Team,
- 5) perspective images of a station and its surrounding area at Bonifacio Global City as an example of the TOD (Transit Oriented Development), and
- 6) various Japanese advanced technologies, methods and equipment in Civil Works, Rolling Stock and Railway Systems, which can be utilized in the implementation of the MMSP.

Discussions and exchange of opinions were made among DOTC, DPWH, MMDA, NEDA, BCDA and JICA / JICA Study Team, which can be summarized as follows:

- Route alignment options (total of 12 options) proposed by the JICA Study Team as well as the results of preliminary demand forecast, project cost and economic & financial analysis, all of which will be included in the Interim Report, were understood and accepted by all parties.
- A suggestion was made to look into the conditions of the concession agreement for MRT Line 7, if any condition was included either to guarantee no railway would be constructed near MRT Line 7 so that the potential passengers for MRT Line 7 residing near and along MRT Line 7 would not be decreased from the estimate at the time of the signing of the



**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



concession agreement, or to compensate the concessionaire if a new railway was to be build and the passenger volume would be reduced due to such new railway. It was agreed that such study to clarify legal implications in terms of relation with MRT Line 7 should be carried out during the Feasibility Study.

- The JICA Study Team was asked if the planned EDSA BRT was considered in the demand forecast exercise. The Team replied that the EDSA BRT had not been considered since it was not in the DOTC's pipeline projects yet. All parties agreed that the EDSA BRT should be considered in the selection of the route for the MMSP during the Feasibility Study, if the EDSA BRT is to be acknowledged as the "planned future project" at the time of the Feasibility Study.
- A comment was made that the data of substructures of existing buildings might not be available if the buildings were constructed long time ago. The JICA Study Team replied that the route should deviate such buildings if the data is not available, or should be constructed deep enough to avoid interference with the existing substructures, however such consideration could be done during the design stage.
- There was an opinion that considering Philippine condition, a compensation might be required in case there is any impact or damage to the houses/buildings at the ground level due to the construction work in "deep underground space" even if the government establishes the "deep underground law" similar to Japan, where compensation to the land owner is not required in case of Japan. The JICA Study Team explained that a careful monitoring during construction could be made in order to assess if there is any impact to the houses/buildings at the ground level and an instruction could be given to the contractor to stop the construction work in case any negative affect becomes apparent. It is assumed that, in case of Japan, the law was established with careful consideration how deep should a "deep underground" be, in order not to have any impact to the ground level when undertaking construction work in deep underground space. In case of Japan it is considered that impact to buildings at the ground level due to construction at defined "deep underground space", would not happen. However, this comment should be noted and taken into consideration if the Government of Philippines is to consider establishing a similar law in the Philippines.
- It was pointed out that the sections currently planned as elevated ^{in the station comments} would need to be underground since the suburban areas ^{may be} would be developed at the time those sections are constructed and the construction of elevated structures could be difficult. The JICA Study Team noted and commented that such change of structural type could be made during the design stage. (In fact, the design of those sections will be made later as they are in the second phase, but necessary consideration needs to be made for the terminal station of the first phase.)
- It was suggested that the DPWH might be fit to take part in the Project Management Office (Implementing Body) for the Mega Manila Subway Project as the DPWH would be constructing underground structures in the future and there would be common interest and benefit between the DOTC and the DPWH.
- A comment was made if the procurement of rolling stock and railway systems could be done by the private sector. The JICA Study Team replied that such scheme was also possible, but considering the magnitude of the project, the JICA Study Team suggested that the procurement of rolling stock and railway systems be also made by the public together with the construction of civil works for smooth implementation of the project as well as ensuring sufficient quality. However, the JICA Study Team stated that the scheme should be finalized during the Feasibility Study with due consultation with DOTC as well as other



**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**




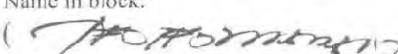
relevant agencies in the Philippines, and the scheme would need to be finally determined by the government of the Philippines.


- There was a question how the preliminary cost estimate was made and whether the cost of tunnel boring machine was included in the cost or not. The JICA Study Team replied that the preliminary cost estimate was made referring to similar project in the Philippines for the elevated section and similar projects in other countries for underground structures/stations, and that the cost of tunnel boring machine was included as a unit price.
- Representative from NEDA informed that the Inter-Agency Technical Committee on Transport Planning (IATCTP) scheduled on 25 June 2015 to present the MMSP prior to NEDA InfraCom Meeting has been postponed, however he stated that NEDA will arrange the IATCTP before the next NEDA InfraCom meeting scheduled on 15 July 2015. JICA noted the situation and thanked NEDA for providing a chance to present the MMSP to an important forum that NEDA hosts.
- It was announced that JICA is planning a study tour for those concerned in the MMSP, specifically DOTC, DPWH, MMDA, NEDA, BCDA and DOF, from 23 August to 29 August 2015. The program of the study tour will include introduction of Japanese subway and metro technologies by visiting a subway operator, rolling stock component manufacture, Kyoto station, etc. JICA underlined that the study tour will be a good opportunity for those concerned in the MMSP to know the advanced technologies in Japan than can contribute to the successful implementation of the MMSP.
- All parties agreed that the JICA Study Team finalize the Interim Report as presented in the meeting. The JICA Study Team confirmed to submit the Interim Report to DOTC, DPWH, MMDA and JICA Philippines Office (in accordance with the contract between JICA and the JICA Study Team) on 26 June (Friday) or on 29 June (Monday) at the latest.
- The JICA Study Team explained that the contents of the Interim Report covered all studies required and thus the contents of the Draft Final Report as well as Final Report would be almost same to those of the Interim Report, with addition of summary of route options and recommendations for the next step (i.e. Feasibility Study).
- DOTC informed that the RFF for the implementation of the Feasibility Study by JICA was already approved by DOF, and thus DOTC is intending to issue a request letter to JICA shortly. JICA responded that they are committed to prepare for the F/S that will build on the result of the Study as soon as possible upon receiving the request letter.
- It was confirmed that a same arrangement such as IAWG and SC will be installed in the F/S phase involving all stakeholders. NEDA noted that in order to avoid conflict of interest as oversight agency, they prefer to be invited to only SC. It was further understood that more outreach work is needed to involve local authorities in the F/S phase.

DOTC: Accepted by

DPWH: Accepted by



 Signature
 Name in block:
 ()



 Signature
 Name in block:
 (ALEX G. BOTE)



**Information Collection Survey for Mega Manila Subway
Project in the Republic of the Philippines**



MMDA: Accepted by

NEDA: Accepted by

Signature *Michael M. Gison*
Name in block:
(MICHAEL M. GISON)

Signature *Pablo Abellera*
Name in block:
(PABLO ABELLERA)

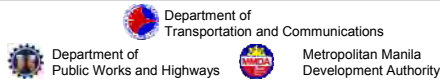
BCDA: Accepted by

JICA ST: Accepted by

Signature *Tomas Y. Madarot*
Name in block:

Signature *Takayuki Isaka*
Name in block:
Takayuki Isaka

JICA Study: Information Collection Survey for the Mega Manila Subway Project (MMSP)



Steering Committee Meeting No.2

24 June 2015

JICA Study Team



Contents

Key Findings

1. Background
2. Route Consideration
3. Result of Preliminary Demand Forecast Study
4. Result of Preliminary Cost Estimate
5. Result of Preliminary Economic & Financial Analysis
6. Prelim. Study on Project Implementation Scheme
7. Prelim. Study on Operation and Maintenance Plan
8. Example of Application of TOD in MMSP (BGC)
9. Proposal on Necessary Legal Framework for MMSP
10. Utilization of Japanese Experience and Technology

JICA Study Team for MMSP

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Key Findings

Route Alignment of All 12 Options

Route Distance

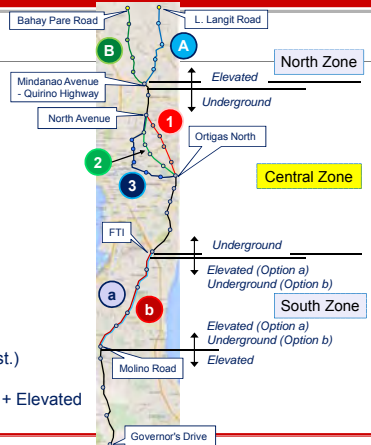
Central: 22.7 – 27.0km
Overall: 59.1 – 63.4km

No. of Stations

Central: 13 - 15
Overall: 27 - 29

Structure Type

Central: Underground (except M-Q st.)
North and Elevated, or
South: Underground + Elevated



JICA Study Team for MMSP

3

Key Findings

Project Schedule

Construction: 2020 - 2025
Operation: end 2025 or early 2026

Preliminary Demand Forecast

Year	Zone	Daily Pass Volume
2025	Central	386,000 - 478,000
2035	All	1,470,000 - 1,776,000
2045	All	2,049,000 - 2,385,000

Preliminary Cost Estimate

Year	Zone	Cost (Million USD)
2020-2025	Central	4,486 - 5,125
2030-2035	North + South	3,651 - 4,999
Total	All	8,117 - 10,024

Preliminary EIRR / FIRR

EIRR	16.6% - 17.6%
FIRR	8.64% - 9.39%

Funding Strategy

Public: Land Acquisition, Resettlement Civil / E&M
Private: O&M, Non-rail Business

Legal Framework

Present: No subterranean law
Recommendation: Establishment of **Deep Underground Law** allowing use of subterranean space without compensation (similar to Japan's case) for **smooth and fast implementation** of the MMSP

JICA Study Team for MMSP

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Key Findings

Further Added Value for MMSP



Application of TOD (example at BGC)

Non-rail Business



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Key Findings

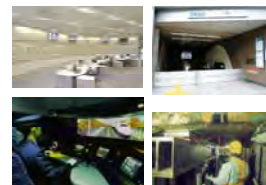
Utilization of Japanese Technologies in Subway/Metro can contribute to Success in Mega Manila Subway Project

Smoothness



3S

Safety



Saving



JICA Study Team for MMSP

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1. Background

(1) Urbanization and Traffic Problems

- > A rapid increase in population and expansion of Manila to Greater Capital Region (GCR)*
- *: 3 regions of the National Capital Region or Metro Manila, Regions III and IV-A
- > Heavy traffic congestion due to insufficient and undeveloped transport network

(2) Ideal Transport Network in Roadmap Study

- > Approx. 300 km of railway and 500 km of highways are proposed in JICA's Roadmap Study (Mar. 2014)


(3) Development of North-South Transport Backbones

- > A subway connecting San Jose del Monte and Dasmariñas via EDSA (C4) was proposed in JICA's Roadmap Study

JICA Study Team for MMSP

1. Background

- > The NSRP and MMSP (Subway) are anticipated to form the **north-south transport backbone** in Metro Manila / GCR.
- > MMSP will be planned to avoid conflict with other planned lines that mutually complement each other.



NSRP: North-South Railway Project
MMSP: Mega Manila Subway Project

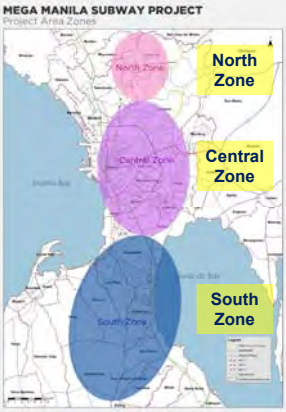
JICA Study Team for MMSP

1. Background

Main Objective

Propose **several potential subway routes** with:

Conceptual Alignment for each route, including tentative station and depot locations, considering and based on various **criteria**, e.g. geological condition, population density and growth, flood impact, earthquake, connectivity, functionality of the rail network, etc.



JICA Study Team for MMSP

2. Route Consideration

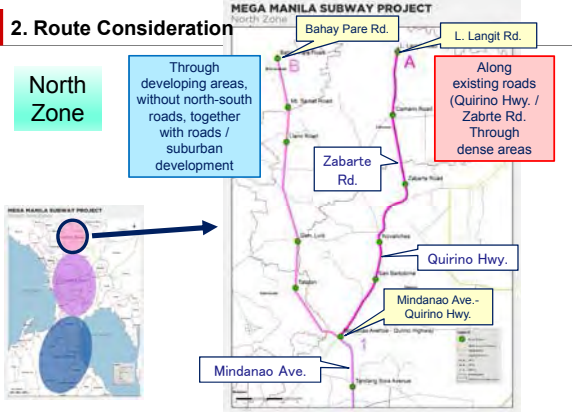
Summary of Major Criteria in Route Consideration

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2. Route Consideration

North Zone

- Through developing areas, without north-south roads, together with roads / suburban development
- Along existing roads (Quirino Hwy. / Zabarte Rd. Through dense areas)




JICA Study Team for MMSP

2. Route Consideration

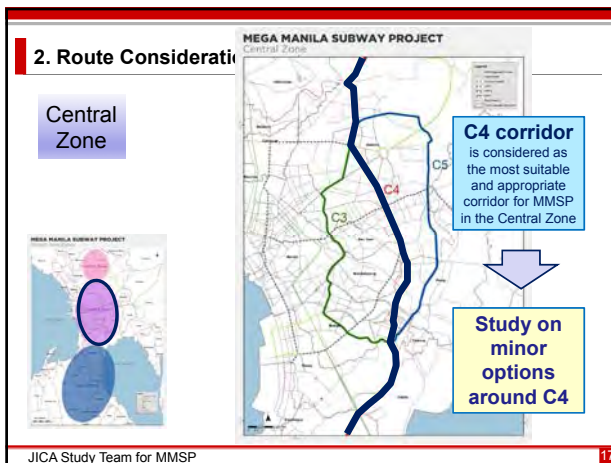
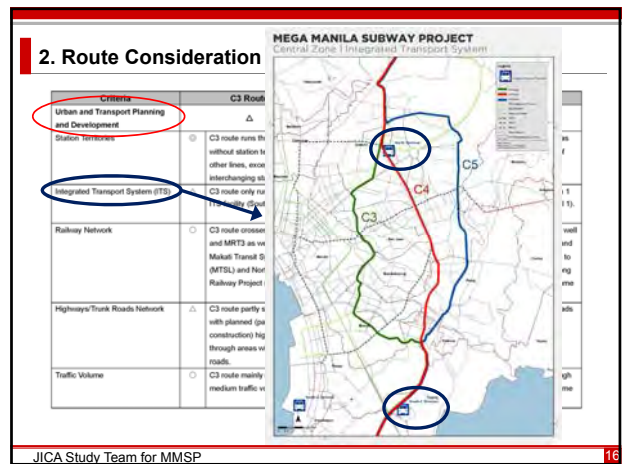
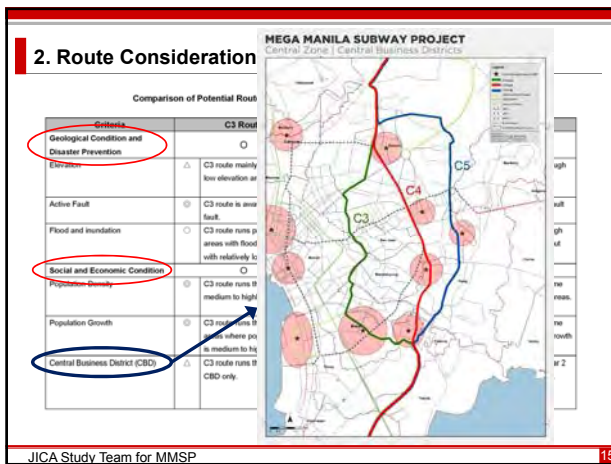
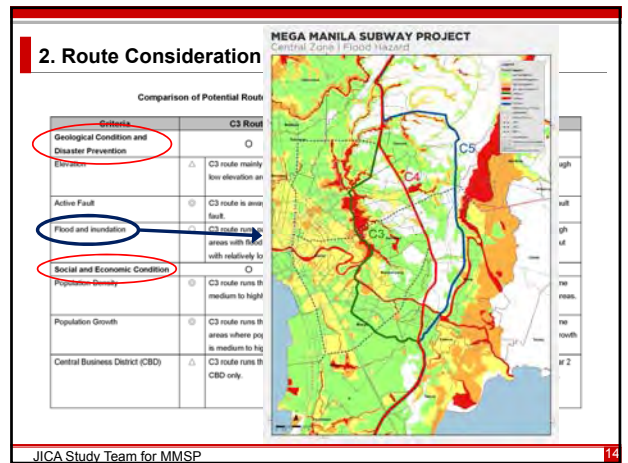
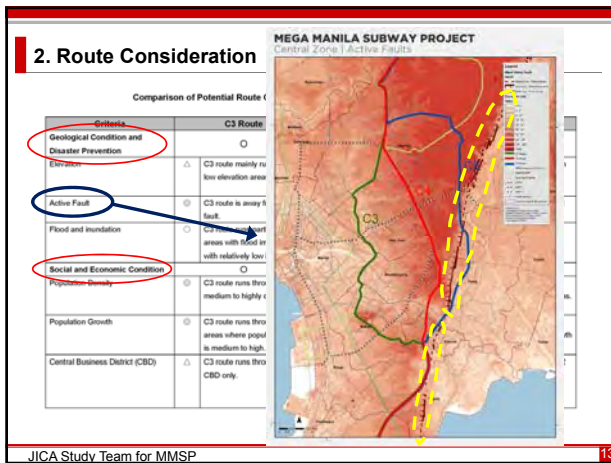
Central Zone

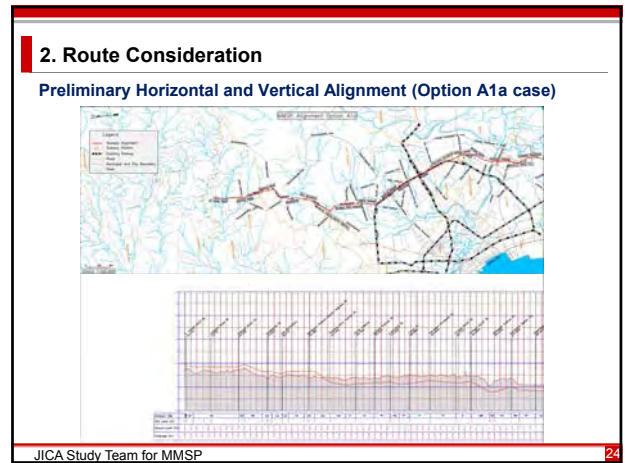
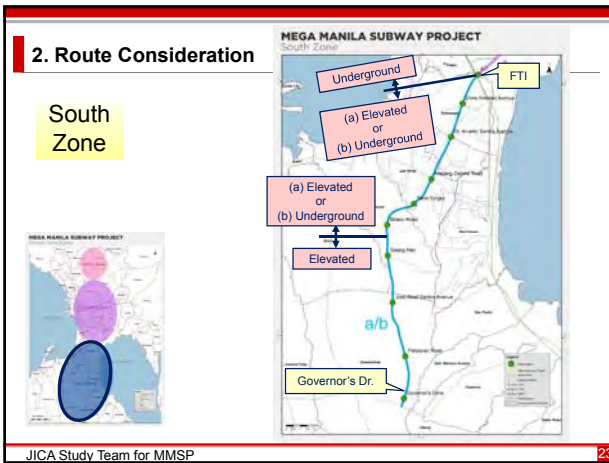
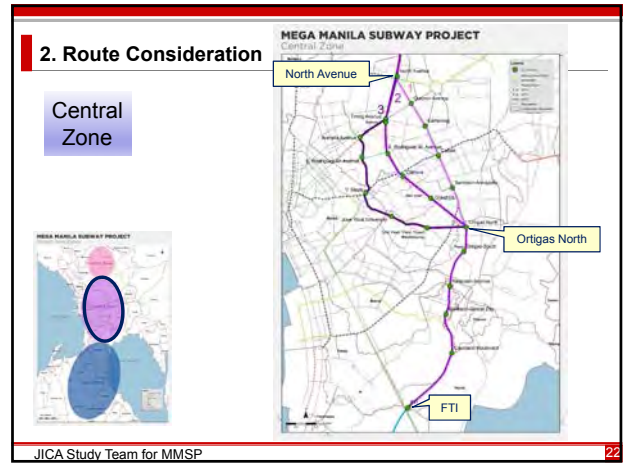
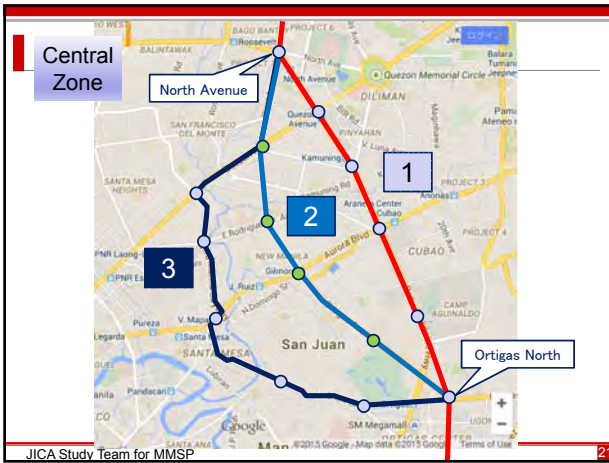
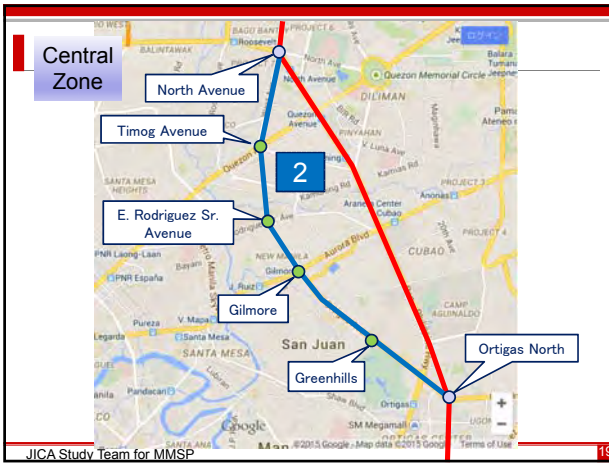
Detailed investigation on practicality and appropriateness of 3 potential corridors (C3/C4/C5) for Central Zone with reference to:

- ◆ Geological Condition and Disaster Prevention
- ◆ Social and Economic Condition
- ◆ Urban and Transport Planning and Development
- ◆ Construction and Cost



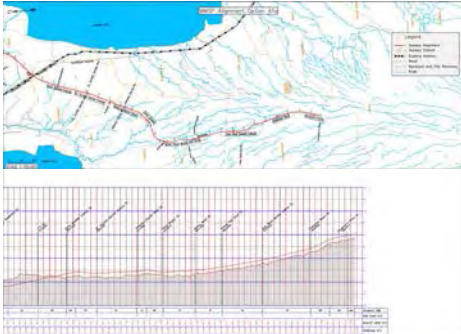
JICA Study Team for MMSP





2. Route Consideration

Preliminary Horizontal and Vertical Alignment (Option A1a case)



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2. Route Consideration

Summary of Route Options

- | | |
|---|--|
| North Zone
2 Options | (A) Along Quirino Hwy. and Zabarte Rd.
(B) Passing Quirino Hwy. along Mindanao Rd. then going up to north of Bahay Pare Rd. |
| Central Zone
3 Options | (1) Along C4 (EDSA) up to Santolan-Annapolis, then going to Ortigas North
(2) Along West Ave. and Ortigas Ave., then going to Ortigas North
(3) Along West Ave., Quezon Ave., G. Araneta Ave., Shaw Blvd., then going to Ortigas North |
| South Zone
2 Options
(by structure type) | (a) The change from underground to elevated occurs after passing FTI.
(b) The change from underground to elevated occurs after entering Molino Rd. |

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2. Route Consideration

Initial Phase

- Total distance : 22.7 - 27.0 km
- No. of stations : 13 or 15
- Average distance between stations : approx. 1.9 – 2.0 km
- No. of depot : 1

Entire Project

- Total distance : 59.1 - 63.4 km
- No. of stations : 27 or 29
- Average distance between stations : approx. 2.3 km
- No. of depot : 2

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2. Route Consideration

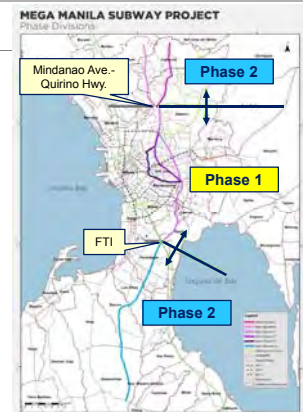
Project Phasing

Planned Opening Year

Phase 1: 2025

Phase 2: 2035

Note:
Subject to further consideration during Feasibility Study



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2. Route Consideration

Candidate Location for Depot for Phase 1

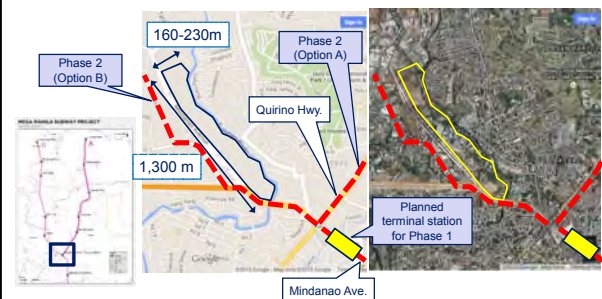


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2. Route Consideration

Candidate Location for Depot for Phase 1



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3. Result of Preliminary Demand Forecast Study

(1) Basis: Updating Database of MMUTIS incorporating latest available information

(2) Network Setting

- Fare Setting – Base Fare (PHP/ride) and Distance Fare (PHP/km)

Line	2025	2035	2045
Subway	37.5 + 2.8/km	56.2 + 4.25/km	73.4 + 5.55/km

- Number of Cars per Train

Line	2025	2035	2045
Subway	6 cars/train	8 cars/train	10 cars/train

- Train Frequency at Peak Hour

Line	2025	2035	2045
Subway	12 Trains/hour	15 Trains/hour	15 Trains/hour

3. Result of Preliminary Demand Forecast Study

(3) Number of Subway Passengers

Unit: 1,000 Passengers/day

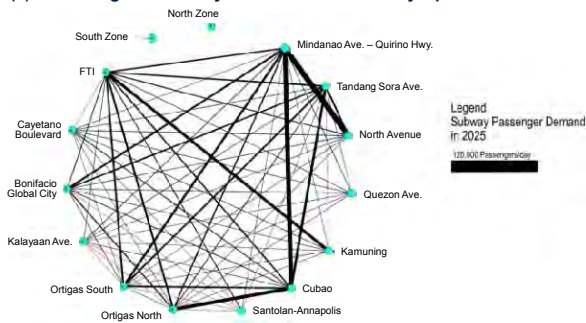
Option	2025	2035	2045
A1	421	1,470	2,049
A2	386	1,476	2,059
A3	478	1,568	2,205
B1	421	1,652	2,185
B2	386	1,666	2,257
B3	478	1,776	2,385

Note 1: Co-existence of MRT3 and MMSP along EDSA (in case of Options A1/B1) was justified by the demand forecast of MRT3, including future capacity expansion, and MMSP that the operation of MMSP has little impact on the demand of MRT3. However, further detailed justification needs to be made with the updated database for the demand forecast incorporating the latest road/rail networks.

Note 2: The above figures for 2035 and 2045 include passenger volumes in South Zone, where there is no difference in passenger volumes between Options "a" and "b".

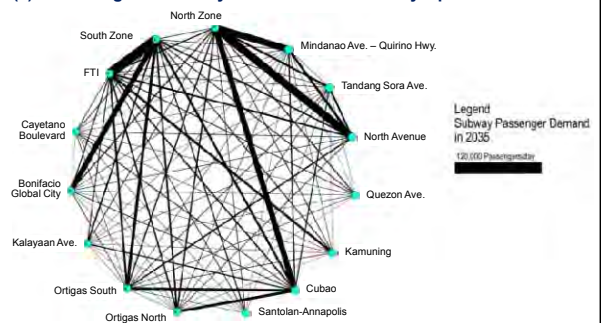
3. Result of Preliminary Demand Forecast Study

(4)-1 Passenger Pattern by Desired Line in 2025 by Option 1



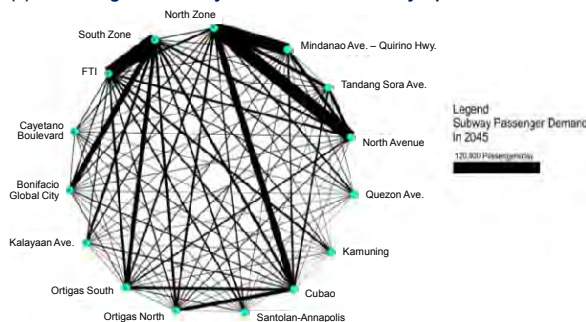
3. Result of Preliminary Demand Forecast Study

(4)-2 Passenger Pattern by Desired Line in 2035 by Option A1



3. Result of Preliminary Demand Forecast Study

(4)-3 Passenger Pattern by Desired Line in 2045 by Option A1



4. Result of Preliminary Cost Estimate

The preliminary study examined multiple factors to estimate Project Costs of each option with a breakdown of the following items:

Direct Project Cost

- > Construction Cost (Civil, Trackwork, Rolling Stock, Railway Systems)
- > Utility Relocation Cost
- > Tax (Import Tax, VAT)
- > Consultants Cost
- > Physical Contingency

Indirect Project Cost

- > Land Acquisition / Compensation
- > Ancillary Road Construction Cost (new road construction necessary for elevated structures of new railway)

4. Result of Preliminary Cost Estimate

Example: Preliminary Project Cost Breakdown (Option A1a)

Option A1a	Item	FC	Phase 1 (Year 2025)			Phase 2 (Year 2026)			Total
			FC	LC	Total	FC	LC	Total	
Construction Cost	Clear Works	10.00	239.84	2,159.56	2,399.40	132.41	1,161.69	1,294.10	3,622.50
	Trackwork	75.00	50.41	24.18	89.59	73.45	-31.88	41.57	185.52
	Rolling Stock	90.00	301.68	15.89	317.57	404.50	42.34	846.84	1,164.41
	EMU Systems	90.00	272.99	30.33	303.32	129.00	52.67	181.67	484.99
	Sub-total	265.00	870.91	2,239.95	3,110.37	1,709.36	1,233.17	2,942.53	6,052.91
Utility Relocation			42.00	52.00		-13.05	38.95	113.95	
Tax	Import Tax		63.11		63.11	131.69		131.69	194.80
	VAT			371.68			206.30	577.98	
Consultants Cost		80.00	208.31	138.81	347.12	177.53	144.28	226.81	623.07
Physical Contingency				291.16			249.89	541.05	
Total of Direct Project Cost				4,235.31			3,962.48	7,797.79	
Land Acquisition / Compensation			233.31	233.31		84.00	84.00	317.31	
Auxiliary Road Construction			0.00	0.00		4.29	4.29	4.29	
Total of Indirect Project Cost				233.31			88.29	321.60	
Total Project Cost				4,468.62			4,050.77	8,119.39	

Exchange Rate: JPY/USD 119.03 JPY/PHP 2.708 JICA Design Rate for March 2023

Import Tax: 10% of FC Portion VAT: 12% of Construction Cost (Utility Relocation): 2% of Construction Cost

Consultants: 10% of Construction Cost with VAT (12%) Physical Contingency: 7.8% of Construction Cost, Tax and Consultants Cost

4. Result of Preliminary Cost Estimate

Summary of Preliminary Project Cost of All Options:

Option	A1a	A2a	A3a	B1a	B2a	B3a	A1b	A2b	A3b	B1b	B2b	B3b	(Unit: Million USD)		
													Total	Direct	Indirect
Phase 1															
Direct Project Cost	4,235.31	4,269.51	4,866.22	4,235.31	4,298.51	4,866.22	4,235.31	4,269.51	4,866.22	4,235.31	4,269.51	4,866.22			
Indirect Project Cost	233.31	241.12	258.65	230.91	241.12	258.65	230.91	241.12	258.65	230.91	241.12	258.65			
Sub-total	4,468.62	4,510.63	5,124.87	4,466.22	4,539.63	5,124.87	4,466.22	4,510.63	5,124.87	4,466.22	4,510.63	5,124.87			
Phase 2															
Direct Project Cost	1,502.45	3,596.19	3,835.94	1,872.76	3,700.51	3,776.86	1,811.51	4,848.26	4,845.01	4,721.82	3,758.57	4,825.94			
Indirect Project Cost	88.29	88.29	88.29	82.48	82.48	82.48	78.60	78.60	78.60	72.78	72.78	72.78			
Sub-total	1,590.74	3,684.48	3,924.24	1,955.24	3,782.99	3,859.34	1,890.11	5,626.86	5,623.61	4,794.60	4,531.35	5,598.72			
Overall															
Direct Project Cost	1,797.76	7,865.70	8,702.17	7,908.07	7,999.01	8,643.10	6,046.82	9,696.76	9,691.23	9,557.13	8,587.14	9,692.17			
Indirect Project Cost	319.20	329.42	346.94	313.39	323.60	341.13	309.50	319.72	317.25	303.69	313.91	331.43			
Total	2,116.96	8,195.12	9,049.11	8,221.46	8,322.61	8,984.24	6,356.32	10,016.48	10,008.48	9,860.82	8,901.05	10,023.60			

5. Result of Preliminary Economic & Financial Analysis

Relationship and Evaluation of NPV, B/C Ratio and EIRR

NPV > 0	B/C Ratio > 1	EIRR > r	Project is feasible
NPV < 0	B/C Ratio < 1	EIRR < r	Project is not feasible
NPV = 0	B/C Ratio = 1	EIRR = r	Project is marginally feasible and is not rejected

r : Social Discount Rate (15%)

Main Economic Benefits Considered in Economic Analysis

- Vehicle Operating Cost (VOC)
- Travel Time Cost (TTC)

Note: "Disruption Cost" and "Health Benefit Cost" will be also considered in the Feasibility Study phase.

5. Result of Preliminary Economic / Financial Analysis

Results of Economic Evaluation (EIRR)

Option	EIRR	Option	EIRR
A1a	17.3%	A1b	17.3%
A2a	17.1%	A2b	16.7%
A3a	17.2%	A3b	16.9%
B1a	17.6%	B1b	17.2%
B2a	16.9%	B2b	16.6%
B3a	17.3%	B3b	16.9%

5. Result of Preliminary Economic / Financial Analysis

Sensitivity Analysis

Option B1a		Change in Economic Cost (%)		
Benefit/Cost		Base Case	+10%	+20%
Change in Economic Benefit (%)	Base Case	17.6%	16.9%	16.2%
	- 10%	16.8%	16.1%	15.5%
	- 20%	15.9%	15.2%	14.6%

Option B2b		Change in Economic Cost (%)		
Benefit/Cost		Base Case	+10%	+20%
Change in Economic Benefit (%)	Base Case	16.6%	15.9%	15.3%
	- 10%	15.8%	15.1%	14.5%
	- 20%	14.9%	14.3%	13.7%

5. Result of Preliminary Economic / Financial Analysis

Evaluation of MMSP from Commercial (Financial) Point of View

$$FIRR \geq PHBOR + \text{Spread} \quad (7 \sim 8\%) \quad (2 \sim 3\%)$$

$$FIRR \leq PHBOR + \text{Spread} \quad (7 \sim 8\%) \quad (2 \sim 3\%)$$

↓
Viable

↓
Not Viable

PHBOR: Philippine Inter Bank Offered Rate

5. Result of Preliminary Economic / Financial Analysis

FIRR of MMSP

Option	FIRR (%)
A1a	9.20%
A2a	9.08%
A3a	9.11%
B1a	9.39%
B2a	9.38%
B3a	9.35%
A1b	9.13%
A2b	8.64%
A3b	8.71%
B1b	8.97%
B2b	8.95%
B3b	9.22%

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6. Preliminary Study on Project Implementation Scheme

How do we raise funds to implement the MMSP ?

■ Viability by Private Funds

- > FIRR (9%) \leq PHBOR + Spread = 9% ~ 11%
- > Project Cost: Approx. 8.1 to 10.0 Bil. USD

➔ Private sector ?????

■ Viability by Government budget of the Philippines

- > Spending for infrastructure in the Philippines has not gone beyond **2.3% of GDP** since 1995 until 2013. (based on "cash disbursement" for "infrastructure and other capital outlays" of Department of Budget and Management against GDP)
- > Estimated budget for infrastructure development in 2014 (**5.7 Bil. USD**) is less than the roughly estimated project cost (**8.1 to 10.0 Bil. USD**)

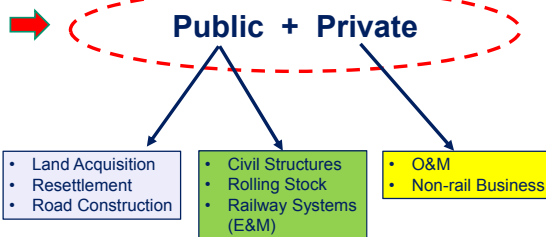
➔ Government budget ?????

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6. Preliminary Study on Project Implementation Scheme

Proposed "Funding Strategy"

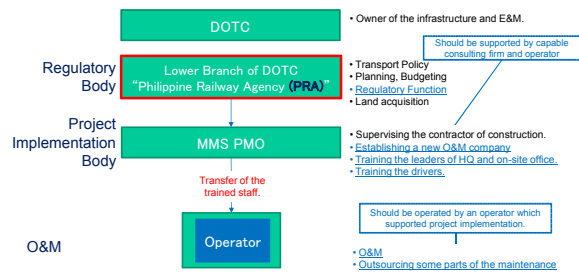


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7. Preliminary Study on O&M Plan

■ Organization of Mega Manila Subway Project (Long term)



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7. Preliminary Study on O&M Plan

■ Organization of Mega Manila Subway Project (Long term)

"Philippines Railway Agency (PRA)" contributes to

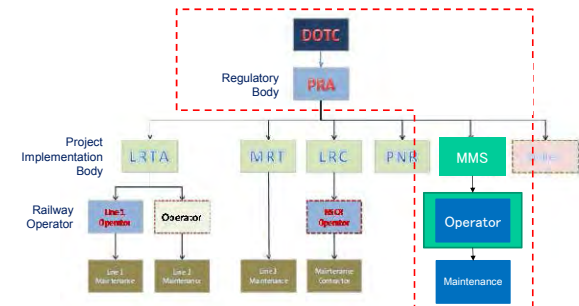
- > Smooth implementation of railway projects
 - ✓ Consistency
 - ✓ Clearly defined roles and responsibilities
- > Accumulation of know-how of railway projects
 - ✓ supervising all railway projects
- > Reliable regulatory functions

Being the only agency which owns and manages all railway projects in the Philippines

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7. Preliminary Study on O&M Plan

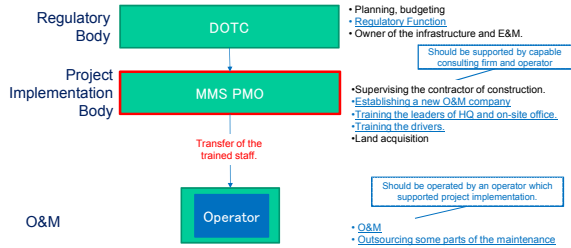


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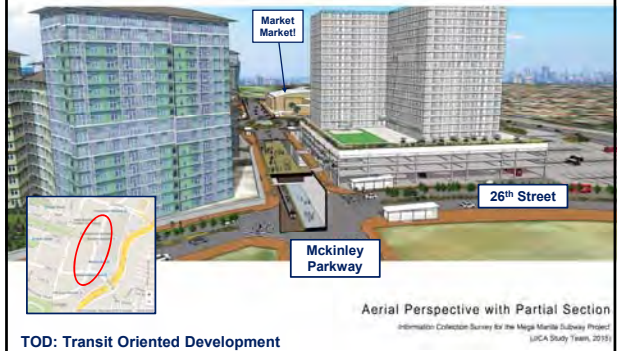
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7. Preliminary Study on O&M Plan

Organization of Mega Manila Subway Project (Short term)



8. Example of Application of TOD in MMSP (BGC)



8. Example of Application of TOD in MMSP (BGC)

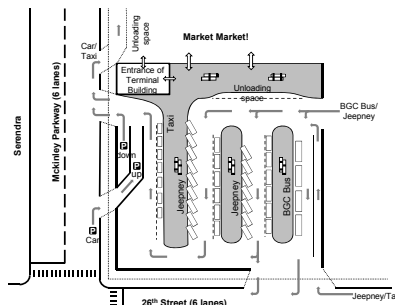


8. Example of Application of TOD in MMSP (BGC)



8. Example of Application of TOD in MMSP (BGC)

Preliminary Layout Plan of Ground Floor of Multi-modal Transit Terminal Building



8. Example of Application of TOD in MMSP (BGC)

Multi-modal Transit Terminal



8. Example of Application of TOD in MMSP (BGC)

Multi-modal Transit Terminal



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9. Proposal on Necessary Legal Framework for MMSP

Present Legal Framework: Subterranean Space and Right of Way

If the current Philippine expropriation standards are applied to the Mega Manila Subway Project, the proponent can expect:

- ◆ for the portions that are directly **under the government-owned property**, such as roads or highways, "just compensation" for the use of the property is **not required**,
- ◆ for **private property** of any kind or form needed for the completion of the project, the proponent may rely on the existing rules to appropriate the land, subject to the payment of "just compensation" according to the past court cases.
- ◆ the **subsurface entrance** to the private property, whether clandestine or overt, the land owner is entitled to the **full value of his property as compensation**.

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9. Proposal on Necessary Legal Framework for MMSP

Law on Special Measures for the Public Use of Deep Underground Space in Japan (established in 2001)

Background:

- ◆ Although underground space of public roads were congested by underground facilities, underground use of private land was not fully developed.
- ◆ Meanwhile it was possible to develop underground space without impacting on-ground facilities by means of technological advances.

Purpose:

- ◆ Encourage the utilization of deep underground space **without compensation to land owner**.

Coverage Area:

- ◆ 3 major metropolitan spheres (Tokyo Capital Region, Kinki Region, and Chubu Region)

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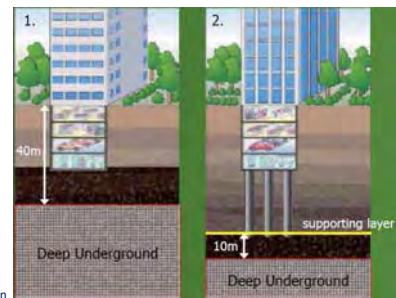
9. Proposal on Necessary Legal Framework for MMSP

Law on Special Measures for the Public Use of Deep Underground in Japan (established in 2001)

Definitions of Deep

Underground

- ◆ Deep underground space unutilized for basement floor (-40m in depth)
- ◆ Deep underground space unutilized for building foundation (-10m below the supporting layer)



Source: MLIT of Japan

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9. Proposal on Necessary Legal Framework for MMSP

In the Philippines – Senate Bill 2447 Salient Points

- ◆ It provides and offers a **more comprehensive computation** of the proper amount to be deposited to the court, which again facilitates a **faster resolution** of any issue.
- ◆ It gives the project implementing agency even more ways to compel the court to issue the Writ of Possession once the proper amount has been deposited.
- ◆ The proposed amendments remove much of the discretion on the part of the court, and enables a **smoother and quicker end of expropriation proceedings** for covered projects.

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9. Proposal on Necessary Legal Framework for MMSP

Senate Bill 2447 Section 10: Being amended

Section 10. Entry into Private Lands for Subsurface or Subterranean Works. – Whenever necessary for a government infrastructure and development project to construct or install underground works like railroads or tunnels in the subsurface or subterranean portion of lands owned, occupied or leased by other persons, **the government or any of its authorized representatives may not be prevented from entering into the subsurface or subterranean portions** of such private lands by the surface owners or occupants if such entry is made more than **fifteen (15) meters from the surface**.

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9. Proposal on Necessary Legal Framework for MMSP

Implication of Senate Bill 2447 Section 10

- ◆ It would appear that this new provision exempts any government works more than fifteen (15) meters underground from the payment of just compensation to the owners of the surface property;
- ◆ However, seeing as the provision merely prohibits the "prevention" of entering subsurface portions of private property in order to implement works, it is possible that **payment of "just compensation" for an easement may still be required.**
- ◆ The hearings on the proposed Bill shall likely shed further light on this issue once they have commenced

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9. Proposal on Necessary Legal Framework for MMSP

Recommendations / Next Steps

- To actively monitor the progress of SB 2447 amendment and to support efforts on the speedy passage and approval of the legislation
- To provide data and research input to further improve on the bill, possibly giving consideration to the **use of deep underground space without compensation** (similar to Japan's case) for smooth and fast implementation of the MMSP

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10. Utilization of Japanese Experience and Technology

What's Japan's Advantage?

- **100 years** experience in MRT operation
- **2,400km of MRT Network** in Tokyo, through services between lines under different ownership (operator)
- **Advanced technology, experience and services** go beyond railway technology to include a variety of non-rail businesses



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

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10. Utilization of Japanese Experience and Technology

Know-how on Non-rail Business

- JR West's non-rail revenue reached 34% of total income
- Private railway company business extends to development, real estate, retail & food services, etc.



Source: Metro Properties, Japan

Source: JR West

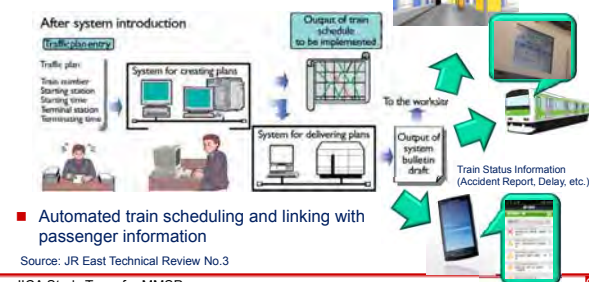
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10. Utilization of Japanese Experience and Technology

Advanced Operation Management

Integration of Plan, Output and Delivering System



- Automated train scheduling and linking with passenger information

Source: JR East Technical Review No.3

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10. Utilization of Japanese Experience and Technology

Civil Structures (Elevated) – Seismic Design

Merits of Japanese Seismic Design Standards

- Extensive past (actual) records compared with other international seismic design standards as well as proven minimization of damage and casualties
- Ensuring safety of railway structural facilities and passengers during major earthquakes, yet securing economical design
- Providing aesthetic and slim cross sections for structural components

3S
(Safety)

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10. Utilization of Japanese Experience and Technology

Seismic Design Procedure

3S (Safety)

The diagram illustrates a five-step seismic design procedure:

- Step1: Setting Input Earthquake Motion
- Step2: Evaluation of Surface Ground
- Step3: Setting Seismic Performance
- Step4: Calculation of Seismal Response Values
- Step5: Verification of Seismic Performance

Repeated Computations are indicated between steps 1-2, 2-3, and 4-5.

Seismic Performance Level	Damage Level	Damage Level	Damage Level
Seismic Performance I	Damage Level 1	Damage Level 1	Damage Level 1
Seismic Performance II	Damage Level 2	Damage Level 2	Damage Level 2

Damage Level

Damage Level	Damage Level	Damage Level
Damage Level 1	Damage Level 2	Damage Level 3
Damage Level 1	Damage Level 2	Damage Level 3
Damage Level 1	Damage Level 2	Damage Level 3

Seismic Performance

Seismic Performance	Seismic Performance	Seismic Performance
Seismic Performance I	Seismic Performance II	Seismic Performance III
Seismic Performance I	Seismic Performance II	Seismic Performance III
Seismic Performance I	Seismic Performance II	Seismic Performance III

Method of Repair

Method of Repair	Method of Repair	Method of Repair
Method of Repair I	Method of Repair II	Method of Repair III
Method of Repair I	Method of Repair II	Method of Repair III
Method of Repair I	Method of Repair II	Method of Repair III

Seismic Performance is applied to all members. Seismic Performance is applied to structural members and members with special attention to members with special attention.

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10. Utilization of Japanese Experience and Technology

Civil Structures (Elevated)

Cast-in-place piling method beneath limited clearance

In big cities of Japan, civil engineering works are often performed in small and limited working places. Effective construction methods have therefore been established along with advanced machines and equipment.

3S (Smoothness)

Sheet Piling

Cast-in-place Piling

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10. Utilization of Japanese Experience and Technology

Civil Structures (Underground) - Underpinning

Enables construction of new underground structures beneath existing underground structures without impact (Right figure shows cross-section of Shibuya station with Fukutoshin line constructed beneath Hanzoumon line)

Flat jack inserted between building frame and beam

Shibuya station, Hanzoumon Line

Shibuya station, Fukutoshin Line

3S (Safety)

Source: Kajima

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10. Utilization of Japanese Experience and Technology

Civil Structures (Underground)

TBM (Tunnel Boring Machine) / Shield Machines

Through long and diverse experience, various construction methods and equipment have been developed and applied in Japan to suit the specific geological conditions and to overcome difficulties in construction with limited space or in restricted conditions. Optimum methods can be proposed from various options.

3S (Smoothness)

H&V (Horizontal Variation & Vertical Variation) Shield Machine with 4-circles

Spiral Boring by H&V Shield Machine

Source: Hazama Ando Corp.

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10. Utilization of Japanese Experience and Technology

Subway – Flood Protection Measures

Water-stop Panels

Water-stop Door

Water-stop Door and High-level entrance to station areas

3S (Safety)

Source: Tokyo Metro

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10. Utilization of Japanese Experience and Technology

Civil Structures

- Seismic Design
- Sheet Piling / Cast-in-place Piling
- Underpinning
- Various Types of TBMs / Shield Machines
- Physical Measures against Natural Disasters
- etc.

Various advanced Japanese technologies in construction of elevated and underground structures enable constructions in **limited space** with existing buildings / structures above and below ground **safely** and **smoothly**.

Most fit in the current Metro Manila conditions for **safe and smooth** implementation of the MMSP

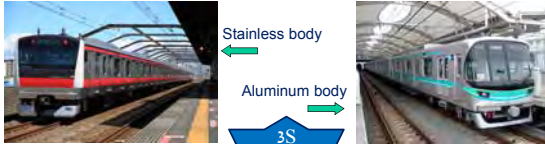
3S (Smoothness) 3S (Safety)

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10. Utilization of Japanese Experience and Technology

Light-weight Technology

The weight of rolling stock directly affects the power consumption and construction and maintenance of tracks. Japanese rolling stock is achieved by used of stainless steel or aluminum bodies.



High Reliability

Japanese railways are well known for their punctual operations. This is supported by the high reliability of rolling stock. This derives not only from the reliability of each unit, but from the optimization of the rolling stock as a whole.

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10. Utilization of Japanese Experience and Technology

Efficient Propulsion System

Induction motor and VVVF control with IGBT module is the most popular propulsion system for Electrical Multiple Unit (EMU) rolling stock. It contributes to the energy efficiency, weight reduction and maintenance reduction. The system is still developed for better control logic, better semiconductor module, and better type of motor. PMSM (Permanent Magnet Synchronous Motor) is one of the latest technologies for traction motors.



3S
(Saving)

Air Conditioning System

The heat and humidity of the Japanese summer are similar to those in Southeast Asian countries. Humidity poses a severe demand on air conditioning unit. All the rolling stock in Japan are air conditioned and various types of air conditioning systems are installed in various types of rolling stock.



Air conditioning unit (2/car)



Air conditioning unit (concentrated type)

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10. Utilization of Japanese Experience and Technology

Rolling Stock Inspection Facilities



Monitoring Device for On-roof Equipment



Flat-spot Detection Device for Wheel

3S
(Safety)

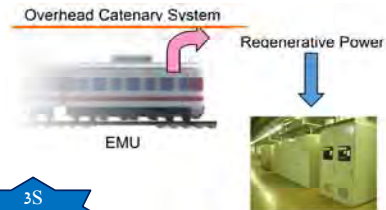
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10. Utilization of Japanese Experience and Technology

Effective Utilization of Re-power by Regenerative Brake

Energy released during deceleration is returned to provide traction power for other trains for effective utilization of **recycled power**.



3S
(Saving)

Regenerative Energy Storage System with Lithium ion Battery

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10. Utilization of Japanese Experience and Technology

Reliable and Integrated Train Operation and Control System



Operation Control Center (OCC)



3S
(Safety)

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10. Utilization of Japanese Experience and Technology

Maintenance Management System

Adoption of comprehensive **Maintenance Management System (MMS)** enabling timely maintenance activities as well as efficient spare parts procurement planning, together with monitoring of rolling stock conditions by onboard **TIMS (Train Information and Management System)**

Automated warehouse for precise data inventory data interfacing with MMS



3S
(Safety)

Warehouse for Wheel Set

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10. Utilization of Japanese Experience and Technology

Earthquake Detection and Train Stop System

- Japan-originated system to detect earthquakes and to stop trains before the arrival of an earthquake
- Seismometers are installed as a network in seismogenic zones and coast lines to detect earthquakes by primary and secondary waves and to stop traction power being supplied to trains
- The system was proved effective during the Great East Japan Earthquake.

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10. Utilization of Japanese Experience and Technology

Prompt Actions after obtaining Weather Information

Obtaining weather information is important not only for prompt actions but also for system establishment in advance.

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10. Utilization of Japanese Experience and Technology

Measures for heavy rain, strong wind and earthquake

<h5>Heavy Rain</h5> <p>Water stop panel Installed at station entrances</p>	<h5>Earthquake</h5> <p>Indication of seismometer in real time in OCC OCC staff issues command to reduce driving speed or stop trains.</p>	<h5>Strong Wind</h5> <p>Anemometer OCC gives order to stop operation or reduce speed.</p>
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Rules and equipment are necessary to mitigate risks associated with adverse weather.

3S (Safety)

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10. Utilization of Japanese Experience and Technology

Rolling Stock and Railway Systems

Light weight and reliable / efficient Rolling Stock	Various advanced Japanese technologies in rolling stock and railway systems enable reliable and efficient train operation and control, provides safe, punctual and friendly services to passengers, and achieves minimum life cycle cost in operation and maintenance.
Energy Saving System and Equipment	
Integrated Train Operation and Control System	
Maintenance Management System and Equipment	
Operational Measures against Natural Disasters	
etc.	

Japanese "state of the art" railway technologies can contribute to **sophisticated railway operation** highly demanded by Philippines' people.

3S (Smoothness) 3S (Safety) 3S (Saving)

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<p>High Potential of its People and Further Economic Development</p>	X	<p>Extensive Experience and Technology in Railway</p>
↓		
<p>Optimal Formula for success in Mega Manila Subway Project</p>		

JICA Study Team for MMSP 83

Thank you for your kind attention

JICA Study Team

Oriental Consultants Global Co., Ltd.
 ALMEC Corporation
 Japan International Consultants for Transportation Co., Ltd.
 Tokyo Metro Co., Ltd.

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