



# METRO MANILA SUBWAY PROJECT (MMSP): Phase 1



## ENVIRONMENTAL IMPACT STATEMENT EXECUTIVE SUMMARY



## The Proposed Metro Manila Subway Project (MMSP)

The Metro Manila Subway Project (MMSP) is the first ever subway project in Metro Manila that will connect North Caloocan or Meycauayan in Bulacan and Dasmariñas in Cavite through the National Capital Region. This is a project proposed by the Department of Transportation or DOTr.

### PHASE 1: THE ROUTE

The proposed route of the MMSP Phase I or the Central Zone starts at Mindanao Avenue - Quirino Highway in Quezon City and ends in FTI, Taguig City, with a proposed depot in Brgy. Ugong, Valenzuela City.

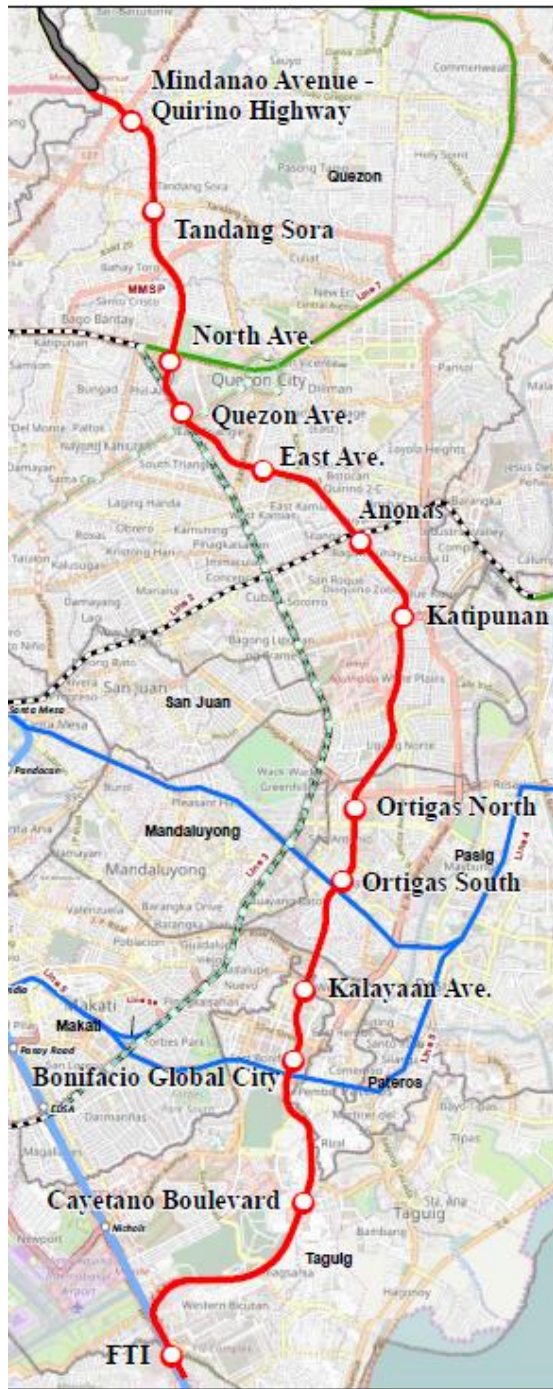
There will be 13 underground stations traversing six cities in NCR namely: Valenzuela City (for the depot), Quezon City, Pasig City, Makati City, Taguig City and a small portion of Parañaque City. The Depot for trains covers about 28.8 hectares of land area above ground.



Outline of the Entire MMSP Plan

### BASIC DESIGN

<b>Length</b>	28.3 kilometer (km)
<b>Tunnel Structure</b>	Double Tube Single Track (Standard diameter: 6.8 meters)
<b>Travel Time (Mindanao Ave. - FTI)</b>	31 min 5 sec (Express), 42 min 20 sec (Local)
<b>Scheduled Speed</b>	48.5 km/h (Express), 35.6 km/h (Local)
<b>Gauge</b>	1,435 mm (Standard gauge)
<b>Number of Stations</b>	13 (Underground)
<b>Station Platform Length</b>	210 meters
<b>Depot for Trains</b>	1 site (25.5 hectares, aboveground)
<b>No. of Passengers:</b>	Year 2025: 365,000/ day Year 2030: 669,000/ day Year 2035: 973,000/ day



*Alignment of the MMSP Central Zone*

	Tentative Station Name	LGU
1	Mindanao Av - Quirino HW	Quezon City
2	Tandang Sora	Quezon City
3	North Av	Quezon City
4	Quezon Avenue	Quezon City
5	East Avenue	Quezon City
6	Anonas	Quezon City
7	Katipunan	Quezon City
8	Ortigas North	Pasig City
9	Ortigas South	Pasig City
↓ Makati: traverse within the city		
10	Kalayaan Avenue	Taguig City
11	BGC	Taguig City
12	Cayetano Boulevard	Taguig City
13	FTI	Taguig City
↓ Parañaque: traverse within the city		

**PROJECT PROPONENT**

MMSP is a project proposed by the Department of Transportation (DOTr), the primary government agency that provides the policy, planning, implementation, promotion, development and regulation of the country’s network of transportation.

The Environmental Impact Assessment (EIA) Study was commissioned through Japan International Cooperation Agency (JICA).

**SUBWAY: A NECESSARY INVESTMENT FOR OUR FUTURE**

- ✓ Eases traffic congestion in EDSA and expansion of transport network eastward
- ✓ Reliable, safe and comfortable transportation for commuters using cutting-edge technology
- ✓ Encourages more socio-economic activities and balanced urban development in nearby station areas
- ✓ Provides better connectivity via a north-south backbone for the Greater Capital Region



# Designing the MMSP: Options Considered

## ROUTE OPTIONS

Three route alternatives for MMSP were studied in the planning stage:

- Option 1: EDSA Route
- Option 2: Greenhills Route
- Option 3: Katipunan Route

Route options were evaluated based on the following criteria:

Estimated project cost	Flood risk
Demand forecast	Earthquake risk
Fare revenue	Required project area
Economic loss due to traffic jams	Estimated Project Affected Persons
Connectivity with Central Business Districts (CBDs)	Noise and vibration
Intermodal connectivity	

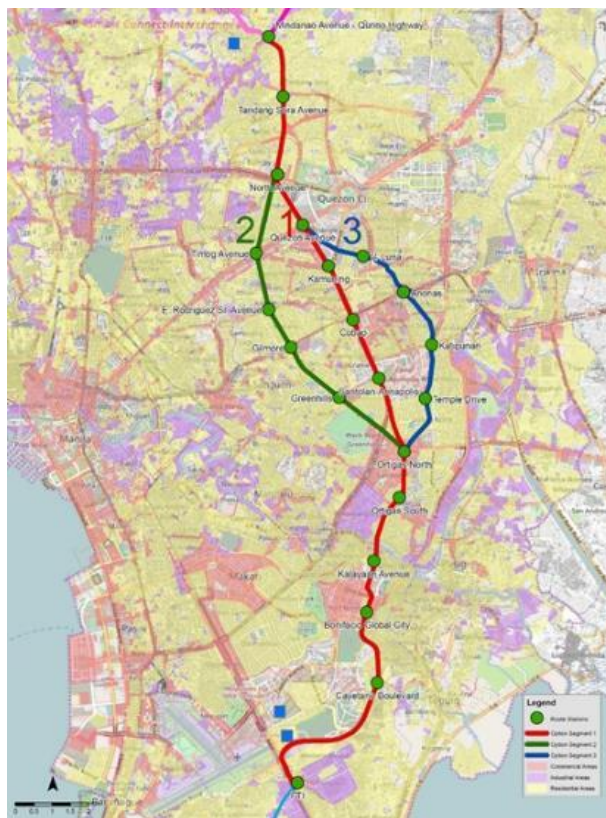
After evaluation of the JICA Study Team and discussions among relevant organizations including DOTr, Department of Public Works and Highways (DPWH), Metro Manila Development Authority (MMDA), and Philippine Bases Conversion and Development Authority (BCDA), Option 3 was evaluated to achieve most of the objectives and was selected.

## DEPOT LOCATION OPTIONS

Two candidate sites of the depot location, one in Mindanao Avenue in Valenzuela City, and one in General Luis in Caloocan City, were studied in the planning stage. Mindanao Avenue was selected based on discussions among the relevant organizations in the same manner as the route alternatives.

The following criteria were used in the selection of depot location:

Construction cost	Number of affected structures
Existing and planned land use	Flood risk
Land acquisition area and cost	



*Route Alignment Options*

## OPTIONS FOR CONSTRUCTION METHOD

For the underground structure, two methods of construction were compared: (1) cut & cover methods, in which excavation starts on the ground level and forms spaces from there down, and (2) the non-cut & cover methods, which includes the shield tunneling method and the New Australian Tunneling Method (NATM), both of which involve an excavation machine that goes through the earth to form spaces.

For stations, the cut and cover method was selected based on cost, construction period, and social and environmental considerations. For the excavation method between stations or along the project line, the non-cut & cover tunneling method, specifically the “shielded tunneling method”, is recommended, based on the same evaluation criteria used for the construction at the station sections.

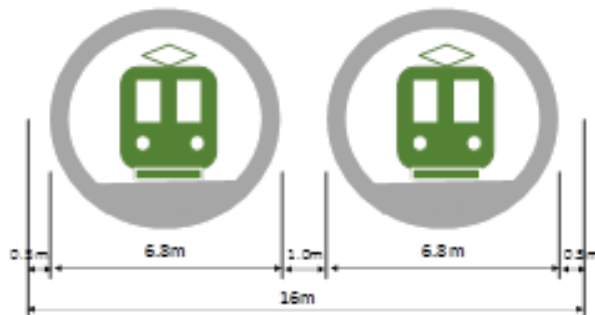
Excavation method will be finalized in the Detailed Engineering Design Phase based on the results of geotechnical survey.



*Shield Tunneling Method*

## OPTIONS FOR TUNNEL STRUCTURES

For the tunnel structures, Double Tube Single Track (DTST) and Single Tube Double Track (STDT) were compared in the tunnel structure plan with respect to construction cost, construction period, occupying width of platform and ventilation requirements. DTST was found more favorable to a shielded tunnel in the line.



*Double Tube Single Track Tunnel Structure*

## PROJECT IMPLEMENTATION TIMELINE

MMSP is estimated to start operation by 2025.

- Detailed engineering design phase (2018 to 2020)
- Land acquisition and resettlement (2018 to 2020)
- Construction(2020 to 2025)

## Assessing and Minimizing Impacts

### WHAT ARE ENVIRONMENTAL IMPACTS?

The environmental impacts of the MMSP were studied for the different phases of the project:

- Pre-construction Impacts, which refers to changes to the existing environment resulting from clearing of construction sites and land acquisition
- Construction Impacts, which refer to short-term potential impacts directly during construction
- Operational Impacts, which describe long-term effects from the operation and maintenance of the subway.

The project will avoid or find ways of lessening permanent impacts wherever possible, and plans will be made to minimize the disruption caused by temporary impacts.

A summary of the major environmental impacts is provided in the following table.

## ENVIRONMENTAL IMPACTS DURING PRE-CONSTRUCTION AND CONSTRUCTION

Activities that may cause impacts	Potential Impacts
<b><i>Impacts on Natural Environment</i></b>	
Generation of demolition and construction wastes	Soil pollution
Earthwork activities (tunneling, excavation, backfilling and stockpiling)	Soil erosion, slope failures, landslides and ground subsidence
Leaks and accidental spills on soil	Soil contamination
Generation of excavated soil (approximately 4.4M m <sup>3</sup> ) from excavation/ tunneling	<ul style="list-style-type: none"> <li>• Increased siltation of water bodies</li> <li>• Aesthetic impacts</li> </ul>
Generation of solid wastes from the construction workforce	<ul style="list-style-type: none"> <li>• Land and water contamination</li> <li>• Aesthetic impacts</li> <li>• Spread of diseases</li> </ul>
Liquefaction	Damage to underground structures and overlying structures in the event of an earthquake
Ground shaking/ground rupture	Damage to components of the construction work
Clearing and excavation activities	Increase in suspended sediments in the receiving water
Clearing and excavation activities	Flooding and inundation due to clogged waterways because of construction debris
Excavation works	Lowering of groundwater level due to inflow of groundwater into underground tunnel
Generation of dusts and particulates from earthmoving, demolition and stockpiling	Temporary increase of dusts
Emission from vehicles and gensets	Temporary increase of air pollutant emissions
Movement and operation of construction machinery	Increase noise level and ground vibration during construction
Clearing and removal of trees	Loss of threatened and other tree species within the project site
<b><i>Impacts on People</i></b>	
Involuntary Resettlement	Displacement of residents, commercial and industrial establishments along the proposed alignment
Land use and utilization of local resources	Potential conflict with other government infrastructure projects (e.g. DPWH's C6 Project)

Activities that may cause impacts	Potential Impacts
Service utilities	Service utilities interruption
Employment/ Livelihood	<ul style="list-style-type: none"> <li>• Temporary disturbance of commercial establishments</li> <li>• Decline or eventual loss of businesses in affected areas</li> <li>• Generation of temporary employment</li> </ul>
Traffic condition	Increase in traffic congestion; Threat to availability of health services
Health and safety	Increased risk of accidents due to improper work ethics which may threaten health and safety of workers and local residents.

#### ENVIRONMENTAL IMPACTS DURING OPERATIONS

Activities that may cause impacts	Potential Impacts
<b><i>Impacts on Natural Environment</i></b>	
Leaks and accidental spills of chemicals, especially at the depot area	Soil contamination
Solid waste generation	<ul style="list-style-type: none"> <li>• Land and water contamination</li> <li>• Aesthetic impacts</li> <li>• Spread of diseases</li> </ul>
Geological hazards (liquefaction, Ground shaking/ground rupture)	Damage to underground structures and overlying structures
Domestic wastewater generation	Pollution of receiving water bodies
Maintenance and repair activities in the depot	Pollution of receiving water body, specifically Tullahan River
Heavy rainfall	Flooding and inundation of subway facilities
Changes in groundwater flow	Ground subsidence due to lowering of groundwater level
Operation of service vehicles and standby generator set	Air Pollution
Increase in air pollutants from increased vehicles along stations	Air Pollution
Generation of low frequency noise from structure-borne noise and ground vibration	May cause mental stress to residence
Climate change	Accelerated structural fatigue and materials failure
	Greater demands on the construction, operation and maintenance of flood control and drainage structures.
	Increase Greenhouse Gas emissions due to increased

Activities that may cause impacts	Potential Impacts
	demand for cooling system of passenger cars, building offices and ticket booths
Climate change	Indirect impact -Increased vulnerability of passengers to spread of communicable disease via a mass transportation system.
Employment and livelihood	<ul style="list-style-type: none"> <li>• Enhanced commuters mobility</li> <li>• Better physical and psychological state of commuters resulting from shorter and more comfortable travel time</li> <li>• Increase economic activity around the stations</li> <li>• Employment of skilled personnel to operate and maintain the railway system</li> </ul>
Traffic Condition	Easement of traffic congestion
	Increased vehicular flow in areas adjacent to stations
Health and safety	Risk of accidents due to improper work ethics

## Engaging Stakeholders in Public Dialogue

A core part of the MMSP environmental impact assessment is the consultation with the people who will be directly and indirectly affected by the project during construction and operation, such as people who will use the subway, live or own businesses/structures near the alignment. Relevant government agencies such as DENR, DPWH, MMDA, BCDA, PHIVOLCS, Presidential Commission for the Urban Poor, specific barangays and local government departments were involved in the consultation meetings.

Stakeholders' consultation meetings and public scoping were conducted for the six (6) cities along the MMSP alignment from March to August 2017. The public consultation has allowed the proponent to give the community a better understanding of the planning of the Project and site-specific factors and constraints that have to be taken into account of in selecting the preferred alignment and design of the Project.

## Commitments to Mitigate Negative Impacts

As part of the Environmental Impact Assessment Process, DOTr and the JICA Study Team worked closely together with key stakeholders to address issues and develop workable solutions.

DOTr shall submit the necessary requirements to obtain an Environmental Compliance Certificate (ECC) from the Environmental Management Bureau Central Office of the DENR. DOTr is committed to implement an Environmental Management and Monitoring Plan in order to mitigate the major environmental impacts of the project from pre-construction to operation stages.

DOTr shall also implement a Resettlement Action Plan in accordance to the law to ensure that affected households and establishments are provided a proper relocation area and/or justly compensated.

**A copy of the full Environmental Impact Statement (EIS) Report and further information can be obtained through the DOTr Railways (632 7908300 local 285).**