

# METRO CUBE



**MMRC**

ADDING NEW DIMENSIONS

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## MD SPEAKS

Ms. Ashwini Bhide, IAS

It gives me immense pleasure to announce that the implementation of the Metro line 3 is underway. A key challenge in an underground metro is the range of geological surfaces that has to be "broken through", and investigation across the route has now begun. In Mumbai, most utility lines are underground.



*A joint collaborative effort from other stakeholders and citizen support can lay the path for seamless project execution.*

Contractors have begun the process of mapping these underground utilities lines. The metro tracks will be laid 25 meters below the land surface, to minimize the impact on structures on the ground. We are carrying out surveys to assess building conditions before beginning of construction activities to ensure no damage is caused to them. Some trees will have to be cut and some transplanted. A detailed proposal on the number of trees to be felled and planted has been submitted to MCGM.

We have submitted traffic diversion plans to the relevant departments, including barricading of the project site, with minimum disruptions to the existing traffic movement.

## PROJECT TIMELINE

### 2012-2014

- Central Cabinet Approval
- Gazette Notification by MoUD, GoI
- State Cabinet Approval
- Pre-Qualification of Civil Contractors
- Constitution of MMRC as JV/SPV (50:50) of GoI & GoM

### 2015-2016

- Appointment of General Consultants
- Award of Civil Contracts
- Bhoomipujan of Various Civil work contracts
- Site Investigations & Pre-construction
- Tendering/Bidding of Systems & Electrical Packages

### 2017-2018

- TBM launching
- Starting of tunnelling work
- P-Way works starts

### 2019-2020

- Completion of Tunnelling works & Retrieval of TBM's
- Station & Architectural Finishing
- Installation of Signalling & Telecommunication and Security Systems

### 2021

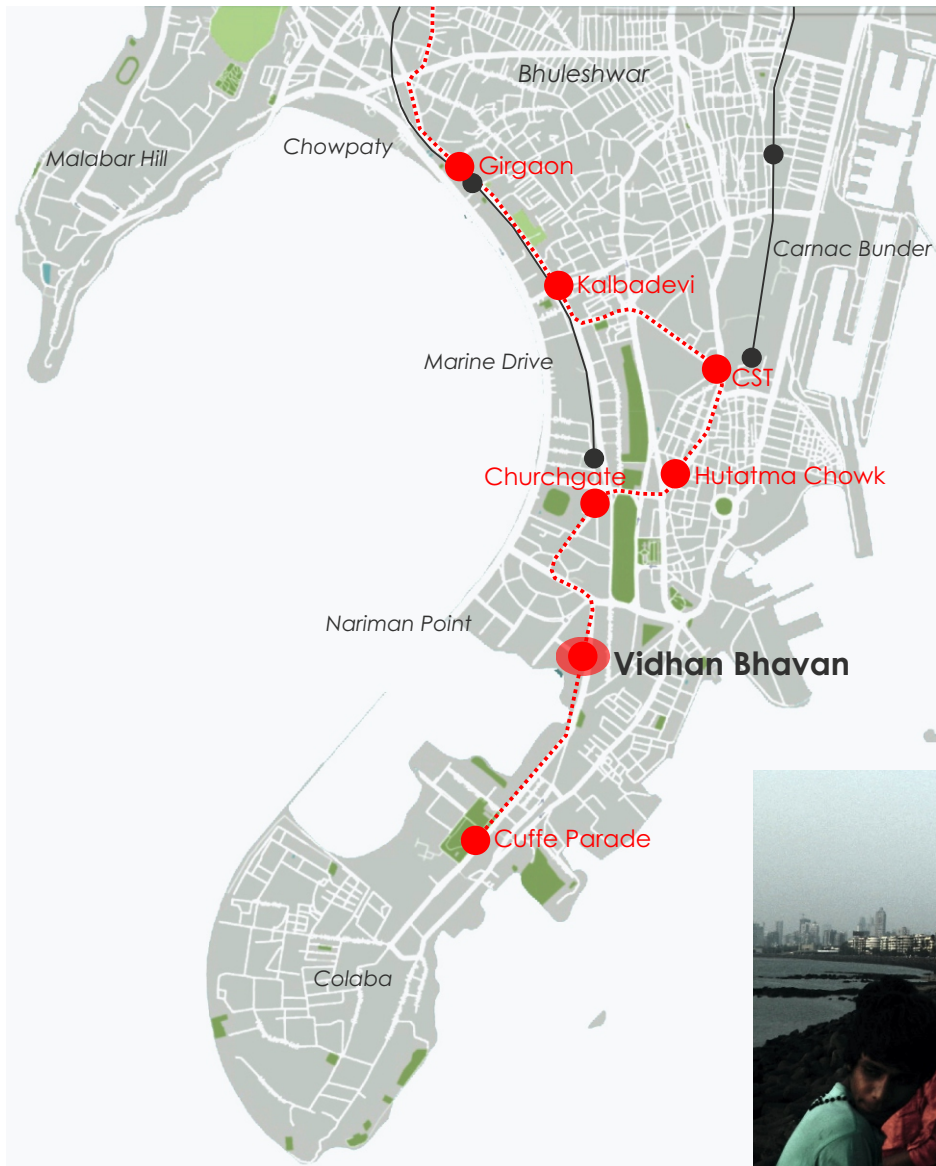
- Testing & Commissioning
- Commercial Operations





## VIDHAN BHAVAN Gateway Station To Mumbai's Business World

The second station of Metro-3, at Vidhan Bhawan is nestled in the bustling business district of Nariman Point in South Mumbai. Nariman Point, one of the most expensive office locations in the world, is home to some of the biggest business establishments such as Air India, Central Bank of India, American Express, State Bank of India, and many others.



Station locations in South Mumbai

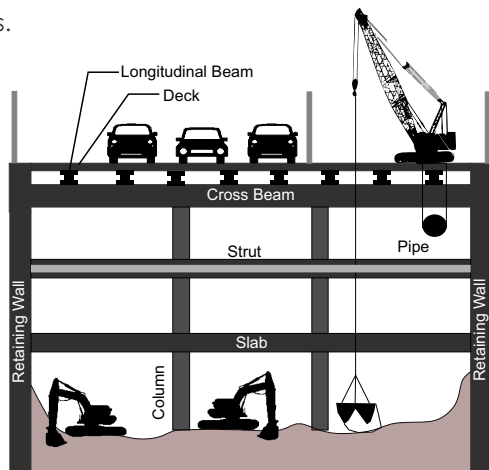
Situated on the extreme southern gradient of Marine Drive, it boasts of a breathtaking view of Arabian Sea. Metro 3 will make it convenient for people to approach Vidhan Bhawan directly as well as connect to Mantralaya.

The strategic location of the metro station in one of the popular evening destinations of Mumbai, The Marine Drive will favour the bustling crowd that commute from all parts of the city and beyond to enjoy the sunset and take a brisk walk along 'the necklace'.



## CUT AND COVER METRO STRUCTURE

Cut and cover construction method is primarily used for the construction of the underground metro stations. Based on the construction sequence, cut and cover structures are classified in to two categories namely bottom up and top down. Construction starts at base level and will end at the top, whereas in the top down approach, station box is constructed top-down. During construction, safety is ensured through material testing, monitoring through proper geotechnical instrumentation and non-destructive tests such as sonic logging, inclinometers and crack meter tests.



Cut & Cover Method

### Other Metro Constructions Involving Cut and Cover:

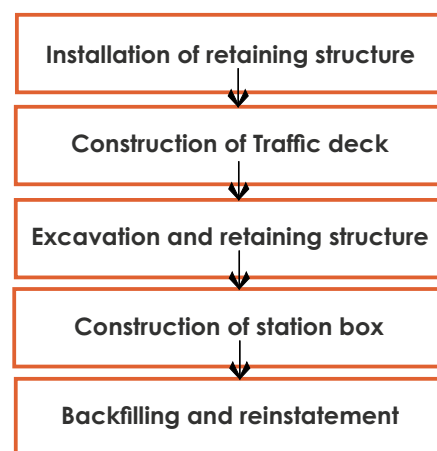
- Northern Harbour Link Project, Copenhagen
- London Underground
- Paris Underground Metro
- Bangalore Underground Metro



Cut & Cover Tunneling in Delhi International Airport Area (Phase 3)

The process of cut and cover includes excavation to make way for construction and finally by covering to reinstate the features on the surface.

Stages involved in the typical cut and cover metro structure are as follows :



## GEOLOGY-ARCHAEOLOGY EXHIBITION

### MMRC Displays Core Sample

MMRC participated in a Geology-Archaeology Exhibition conducted by Centre of Extra-Mural studies at Kalina campus of Mumbai University. MMRC exhibited core samples of rocks generated during the geo-technical investigations from Cuffe Parade and Sahar Road station sites at different depths.

MMRC is in the process of carrying out geotechnical investigations along the entire metro-3 alignment to facilitate the design of Tunnel Boring Machine and tunnel construction.

The geo-testing for the metro route began this August for the stations that form part of this 33.5 km-long metro route. These tests are being done to ascertain the strength of rock strata as well as the strain and stress due to underground station construction



Geology-Archaeology Exhibition at Mumbai University, Kalina Campus



## LIFTS AND ELEVATORS

### Smart & Energy Friendly Lifts for MML3 Stations

Efficient public transportation systems are an essential component of livable cities. Smart Elevators are included in station design to facilitate efficient public movement from streets to the underground stations.

While commuting in the metro, the commuters need to move between three main levels - from street to station concourse and concourse to platform. This movement needs to be facilitated in a seamless manner. Keeping this in mind, MML3 which is complete underground section, is planned to provide travel comfort to public while using metro and to enable senior citizens, sick persons, pregnant ladies, differently-abled passengers to travel with ease.

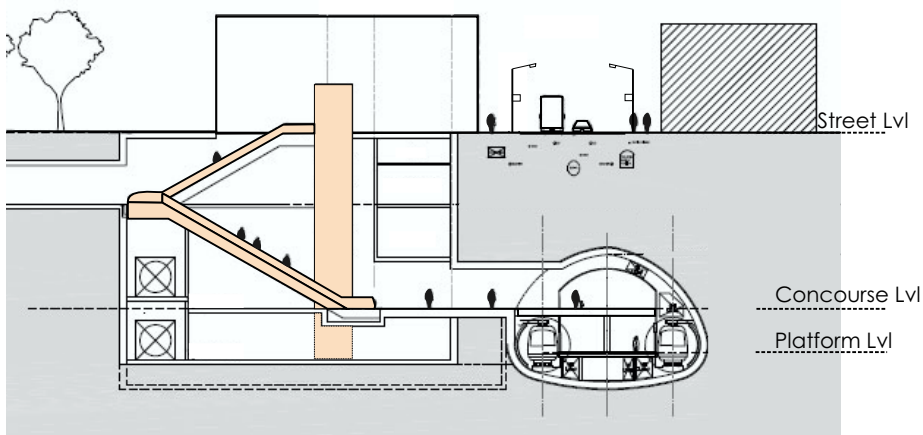
All the elevators are designed with smart innovative maintenance features to facilitate timely and cost effective maintenance.

### Unique Features of Lifts(Elevators)

**Automatic Rescue Device(ARD):** ARD feature brings the lift to the nearest landing safely and prevent any kind of accident during power failure. ARD consists of battery and inverter, which will be used to operate the lift.

**Regenerative Braking:** This feature generates the electrical energy that can be used by any other equipments in the surrounding buildings. With this re-generative feature, there will be saving of approximately 8-10% of total energy consumption.

**Variable Voltage Variable Frequency Drive(VVVF):** All the Lifts(Elevators) of MML3 will be equipped with VVVF drive system which help in smooth functioning of elevator and also help in reducing the power consumption up to 30%.



Indicative cross-section through a typical underground metro station showing vertical movement system through lifts and escalators, connecting street level, station concourse and station platform.

Apart from providing easy access to the platform, these lifts assist in faster evacuation of public in emergency.

Capacity : 13 Persons  
Speed : 1.0m/sec  
Operational Use : 20hrs/day  
Total number of lifts on the entire line : 137

Each station will have at least one emergency evacuation elevator.



Typical lift interior

### Special Features for Differently-Abled and Elderly People:

- Braille embedded information and interfaces
- Mirror glass to detect obstacle while turning around corners.
- Three sides of the lift car with handrail.
- Emergency alarm button.
- Effective audio visual passenger information display.



# AUTOMATION

## From Signalling & Train Control

The mission of any metro transportation undertaking is to provide safe, reliable, efficient, high quality service to its passengers in a cost effective fashion. To meet this business need, our metro systems are increasingly being automated. Any new metro system constructed today would almost certainly incorporate some level of automation with many modern metro systems now providing driver less or unattended train operation.

Grade of Automation	Type of Train Operation	Setting Train in Motion	Stopping Train	Door Controls	Operation In Disruption
GoA 1	ATP with driver	Driver	Driver	Driver	Driver
GoA 2	ATP & ATO with driver	Automatic	Automatic	Driver	Driver
GoA 3	Driverless	Automatic	Automatic	Train Attendant	Train Attendant
GoA 4	UTO	Automatic	Automatic	Automatic	Automatic

Automation Level Matrix

### Levels of Automation

The first step in automating any metro system is the automation of the primary safety functions through continuous, automatic train protection (ATP).

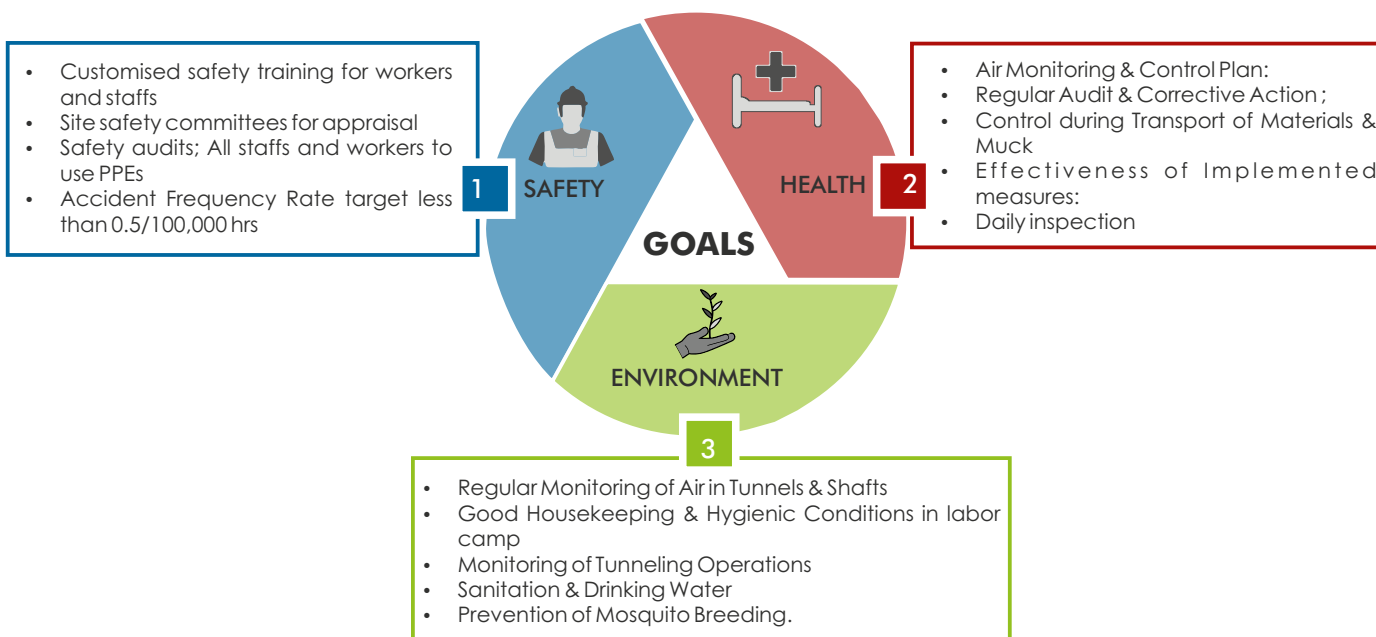
With this foundation in place, the driving functions themselves can then be automated through the provision of Automatic Train Operation (ATO). With the driving functions automated, real-time automation of the train management and train regulation functions becomes possible, through more sophisticated Automatic Train Supervision (ATS) systems.

# SAFETY HEALTH & ENVIRONMENT

## Objectives of MMRC's SHE Practices

MMRC intends to build the Mumbai Metro Line-3 in a way that will further raise the levels of health and safety measures on construction sites to the highest achievable standard. MMRC firmly believes in a "development which meets the needs of the present without compromising the ability of future generations to meet their own needs".

*Commitment towards sustainable development is manifested clearly in our corporate culture, even as we continue to build a world-class metro.*



## MMRC & JICA MEET

### Discussing Metro Line - 3

A Team of JICA officials visited MMRC recently to review overall progress of Metro-3 project.

The team of JICA visited Cuffe Parade station where they have monitored the construction activities, supervised the Colaba Woods Garden and checked the measures MMRC is taking for the building surveillance.

MMRC has barricaded the construction site and also set up a separate entry for people to access the Colaba Woods Garden, building condition survey is also on going and MMRC has ensured that the construction area is completely isolated.

## LAND ACQUISITION & COMPENSATION

Land acquisition activities for urban infrastructure projects are guided by the 'Right to Fair Compensation & Transparency in Land Acquisition Rehabilitation and Resettlement act, 2013', especially in the case of acquisition of private lands. In order to simplify and complete the acquisition within the project implementation timeline, MMRC decided to acquire lands following the negotiations route which is otherwise allowed under this legislation. The acquisition framework involves the following steps:

### Notice under MR&TP Act

Notice to the party is served as per Maharashtra Regional & Town Planning Act, 1966 Section 126, 1(A) & (B) of MR&TP Act.

### Preliminary Hearing

In preliminary hearing, suggestions & objections of party are discussed and resolved.

### Formation of Compensation Committee

Following GR are referred for formation of compensation committee

संकीर्ण- ०३ / २०१५/ प्र क्र ३४ / अ - २ दिनांक: १२ मे २०१५.

संकीर्ण- ०३ / २०१५/ प्र क्र ३४ / अ - २ दिनांक: ३० सप्टेंबर २०१५.

Also, procedure of committee formation for some other projects is also referred for this project.

### Modes of Compensation

- i) Cash Amount
- ii) TDR rights
- iii) FSI area

## Formula for Calculation of Compensation

Compensation for permanent land (Red) [Mumbai City District]:

**Area Required (Sq.mt.) x Ready Reckoner Rate x 2.5 x 1.33**

Compensation for permanent land (Red) [Mumbai Sub-urban District]

**Area Required (Sq.mt.) x Ready Reckoner Rate x 2.5 x 1**

Compensation for permanent land (Yellow)

**(Area Required (Sq.mt.) x Ready Reckoner Rate x 1.33)/2**

Compensation for permanent land (Yellow) [Sub-urban]

**(Area Required (Sq.mt.) x Ready Reckoner Rate x 1)/2**

Compensation for temp land (Green) as per MMRDA rate for year 2016

**Area Required (Sq.mt.) x 4237.65**

\*\*MMRDA rate is Rs. 11.61/day/Sqmt, therefor per year per sq.mt. rate is Rs. 4237.65;

\*\* 1.33 is the permissible FSI

## EXPERT SPEAKS

### Dr. Sreedharan Interacts with the Project Team

MMRC organized an interactive session for their officials, General Consultants Team and civil contractors with Dr. E. Sreedharan, popularly known as 'Metro Man', who is also Principal Advisor to MMRC on 17th November, 2016.

He took the engineers through various challenges of construction they may face while implementing the project, emphasizing on the importance of timely completion of the project and possible cost escalation due to project delay.

He also shared the five principles he has always followed and encouraged his team to follow namely; punctuality, integrity, project competence, social responsibility and contract management.



Talk with Dr. E. Sreedharan



## CITIZEN'S VOICE

Community involvement in the creation and management of built and natural environments is the key to sustainable development of contemporary cities. We, at MMRC value people's opinion, collaboration and participation in making the Metro Line 3 a success!! While the Metro intends to connect the North-South neighbourhoods and business districts of the city, it also impacts in nurturing the local communities and people in different ways...with enhanced opportunities and public realm...Our 'Citizen's Voice' speak about Mumbaikars' aspirations and expectations from Mumbai's first Underground Metro ...

In this issue Mr.Parag Udani,(Executive Committee Member of The Nariman Point Association & Joint Convener, The Cuffe Parade Resident Action Group - CPRAG) shares his views and suggestions on Metro-3.



### How Metro-3 will impact public transport connectivity of your locality?

Metro - 3 will be an alternate transport mode for everyone in the locality.

### Your views on Metro-3 alignment and connectivity with other place in Mumbai.

In order to achieve the goal of last mile connectivity in Metro-3, MMRC should adopt new techniques like capsule size air-conditioned travelators to connect big commercial centres, malls and Government buildings to Metro stations which will enhance the commuting experience of Mumbaikars and increase ridership. I also feel that MMRC should give its employees exposure to the best world practices and techniques through continuous training and visits.

### Your views on project implementation and expectations from MMRC.

The success of Metro-3 in achieving its objectives in terms of public transportation and ridership will depend on affordable fares. We are assured that MMRC will keep its promises and plant three times the trees it will cut for the project in the same area. The selection of the trees should depend on the potential of survival and oxygen enrichment capacity. Replanting should be done in the same one km sq area.

### How can you support and get involved on Metro-3

We are trying to have positive interaction with MMRC, General consultants of project and contractors. We can share relevant information and suggestions, so that public concerns get addressed appropriately. We can help mitigating hardships to make the project a permanent success for the city.

### Your message to citizen.

We wish MMRC all the success. We trust MMRC that they will remain committed to their promise of responsible development and deliver to the city of Mumbai a world class Metro.

## PROJECT UPDATES

### Environmental Baseline Monitoring (Completed)

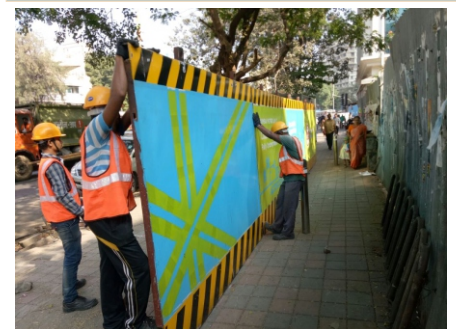
<b>Air quality -</b>	<b>7 Locations</b>
Cuffe Parade, Vidhan Bhavan, Churchgate, CST, Kalbadevi, BKC, Vidyanagari	
<b>Noise -</b>	<b>7 Locations</b>
Churchgate, Worli, Dharavi, BKC, Vidyanagari	
<b>Vibrations -</b>	<b>7 Locations</b>
Cuffe Parade, Churchgate, DN Road, CST	
<b>Ground &amp; surface water quality</b>	<b>8 Locations</b>
Azad Maidan Siddhivinayak, Dadar, Meethi River, Mahim Creek	



Air quality monitoring

### Geotechnical Investigation Locations (Completed)

Cuffe Parade to Hutatma Chowk	22
CST to Grant Road	22
Mumbai Central to Worli	8
Siddhivinayak to Shitla Devi	12
Dharavi to Vidyanagari	9
Santacruz to CSA International	5
Marol Naka to Seepz	18



Footpath barricading dadar station leaving footpath for pedestrians

### R&R Update

Total number of rehabilitated families: 500  
State Govt. has approved in-situ rehabilitation plan for PAPs at Kalbadevi and Girgaon.



## MMRC WINS SKOCH AWARDS

MMRC won SKOCH Order of Merit 2016 Award and Skotch Mobility Award in Silver category for implementing IT- Enabled Rehabilitation and Resettlement System under Innovation category at Skoch Mobility Award 2016, held at Constitution Club of India New Delhi on 16th December 2016.

R&R team made a detailed presentation explaining the technology used for PAP's and won the award competing with over 3000 nominees. Out of 3000 nominees, 537 were called for presentation while 100 projects were selected for the award. Mrs. Maya Patole, Sr. DGM, MMRC received the award on behalf of MMRC.



MMRC team wins the Skoch Award



MMRC team wins Consolation Prize at Urban Mobility India Exhibition

## URBAN MOBILITY INDIA EXHIBITION MMRC Bags Consolation Prize

MMRC has bagged the Consolation prize for its stall displayed at the 9th Urban Mobility conference-cum-exhibition held at Gandhinagar, Gujarat from November 08 to 11, 2016. The Award was presented by Shri. Rao Inderjit Singh, the Hon. Union Minister of State for Urban Development and Urban Poverty Alleviation.

Panoramic view of the proposed Airport metro station of Metro-3, was appreciated by the Chief Guest Mr.M.Venkaiah Naidu, Union Minister for the Urban Development during the exhibition.

Around 25 companies including Metro organisations and urban transport companies participated in the exhibition.MD, MMRC, Ms. Ashwini Bhide expressed her view on Institutional and Financial framework for Metro system during plenary session held during conference.

### SKOCH Awards

Skoch Group is a Gurgaon based think tank dealing with socio-economic issues with a focus on inclusive growth since 1997.

Skoch awards are aimed at the philosophy of spearheading positive socio-economic changes through recognising persons who have contributed immensely to salutary transformations in society and governance by displaying exemplary leadership abilities.

### Features of MMRC's R&R Policy for Line 3

- Complete transparency in implementing R&R policy,
- IT enabled Rehabilitation and Resettlement activities,
- Digital database for the Project Affected Families
- Computerised lottery system to ensure transparent,
- Intra-net based Rehabilitation and Resettlement portal.

### Connect With Us

 @MumbaiMetro3

 Mumbai Metro Rail Corporation, MMRC

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