

IIPA: The Late Shri B G Deshmukh Memorial Lecture 2025-26

27th November, 2025 at 3.00 pm

**Parishad Sabhagruha
6th floor, Mantralaya (Annexe)**

The Public Transport With Special Reference to Metro

Building Metro Line-3 & Mumbai Coastal Road Project (South)

Ashwini Bhide, IAS

Additional Chief Secretary to CM, GoM & MD, MMRCL

Mumbai

- The **world's sixth-largest metropolitan region**
- The main **financial hub** of India
- Represents 6.16% of India's GDP and over 33% of the country's income tax revenue
- Mumbai's ports manage one-third of India's international trade
- Accounts for 38% of international air traffic and 28% of domestic air traffic in India
- Contributes to 25% of the Nation's industrial output



Mumbai City

- Employment magnet
- Densely populated
- Linear and peninsular
- Limited landmass with little scope for expansion
- Overcrowded public transport system bursting at seams.
- 7.5 mn passengers/day.
- Compromised safety, comfort and reliability.
- Limited road network, extreme congestion and traffic snarls. Bus transport rendered inefficient.
- Unlocking of new areas, new CBDs without public transport connectivity



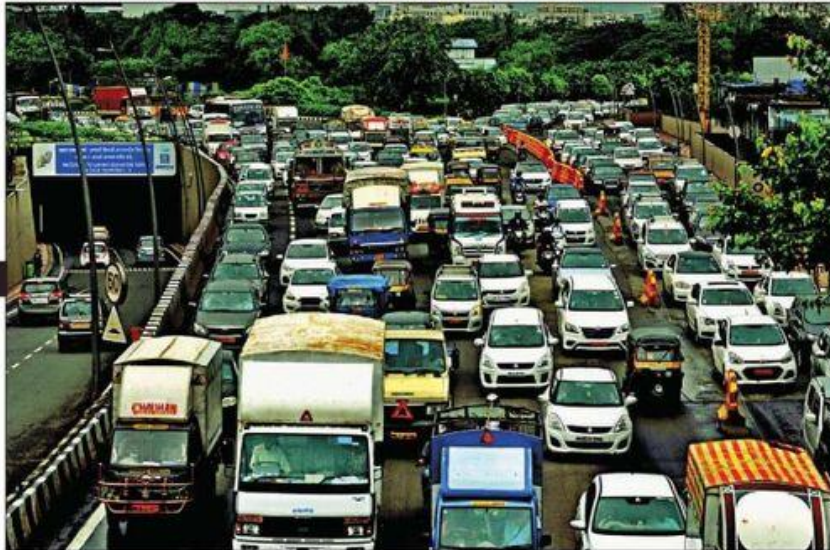
Ease of Travel Initiatives : 1990-2010

1. Capacity expansion of existing suburban rail network: MUTP (WB funded)
2. Expansion and improvement of existing road network: MUIP (road widening, flyovers, elevated roads, missing links for East West connectivity) :
 - **Road widening and Improvement**
 - **Flyovers and Elevated Roads**
 - **Eastern Freeway**
 - **Eastern and Western Expressways**
 - **Rail over bridges**
 - **Sahar Elevated Road**
 - **Andheri Ghatkopar Link Road**

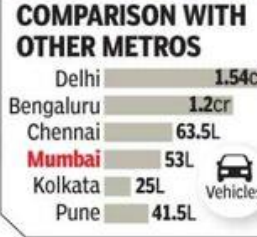
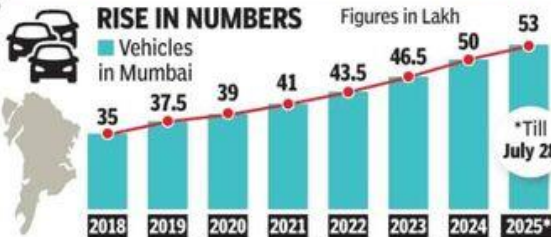
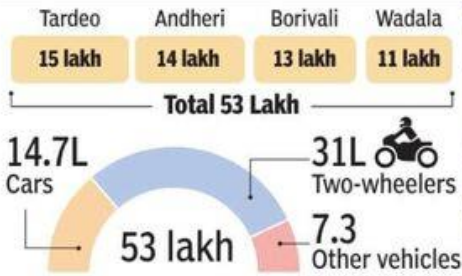
Congestion , Vehicular growth continued

MUMBAI'S VEHICLE COUNT HITS 53 LAKH DENSITY 2,648 A KM, 2-WHEELERS DOMINATE

The number of vehicles in Mumbai has reached 53 lakh this month, with a density of 2,648 vehicles per km of road. Transport department officials say that nearly 2 lakh vehicles have been added in just the last six months. Of the total vehicle count, which includes all categories, two-wheelers alone account for 31 lakh, making up 60% of the city's vehicular traffic. **Somit Sen reports**



VEHICLES REGISTERED IN THE CITY



“The car-to-road ratio was skewed for Mumbai and having more cars leads to problems such as congestion, pollution and parking woes. It is time we revamped our public transportation services. Office-goers should be dissuaded from bringing private cars on road and encouraged to switch to public transport for daily commute

Paresh Rawal | PUBLIC POLICY (TRANSPORTATION) ANALYST

- In Mumbai, an average of 193 cars and 460 new bikes were registered each day in 2024.
- The BEST, which boasted of 4,300 buses on road a few years back, **has a fleet of less than 2,591** buses for its daily ridership of 26 L.
- Rise in vehicles, at **2,648 vehicles per km** of road, totaling **53 lakh** could lead to parking woes.
- Mumbai ranks **among the world's most congested cities in 2025** at 12th globally with a Traffic Index of 257.4,
- It takes an average of **54.8 minutes to travel 10 km** during peak hours.

Ease of Travel Initiatives : 2010 Onwards

- Developing a new rail-based mass transit system: Execution of the Mumbai Metro Master Plan created in 2004.
- The first Metro line, built through PPP, was commissioned in 2014.
- Commencement of other significant metro lines from 2015 onwards.
- Construction of Monorail

Master Plan for Rail Based Transit System in MMR

Operational Lines (100 km)

- Line 1 : Versova Andheri Ghatkopar (11.4 km)
- Line 2A : Dahisar - D.N. Nagar (18.65 km)
- Line 3 : Colaba - Bandra – SEEPZ (33.5 km UG Line)
- Line 7 : Andheri (E) - Dahisar (E) (16.5 km)
- Monorail: Chembur-Wadala- Gadge Maharaj Chowk (20 km)

Under Construction Metro Lines (132.2 km)

- Line 2B : D.N. Nagar - Bandra – Mandale (23.6 km)
- Line 4 : Wadala - Ghatkopar - Mulund Thane-Kasarvadvali (32.3 km)
- Line 4A Kasarvadvali - Gaimukh (2.7 km)
- Line 5 : Thane (Kapurbawadi) - Bhiwandi – Kalyan (24.9 km)
- Line 6: Swami Samarth Nagar- Jogeshwari -Kanjurmarg–Vikhroli (15.31 km)
- Line 9 & 7A : Dahisar E - Mira Bhyandar (10.58 km) & Andheri - CSIA (3 km)
- Line 12 : Kalyan – Taloja (20.7 km)

Under Tendering Metro Lines (9.2 km)

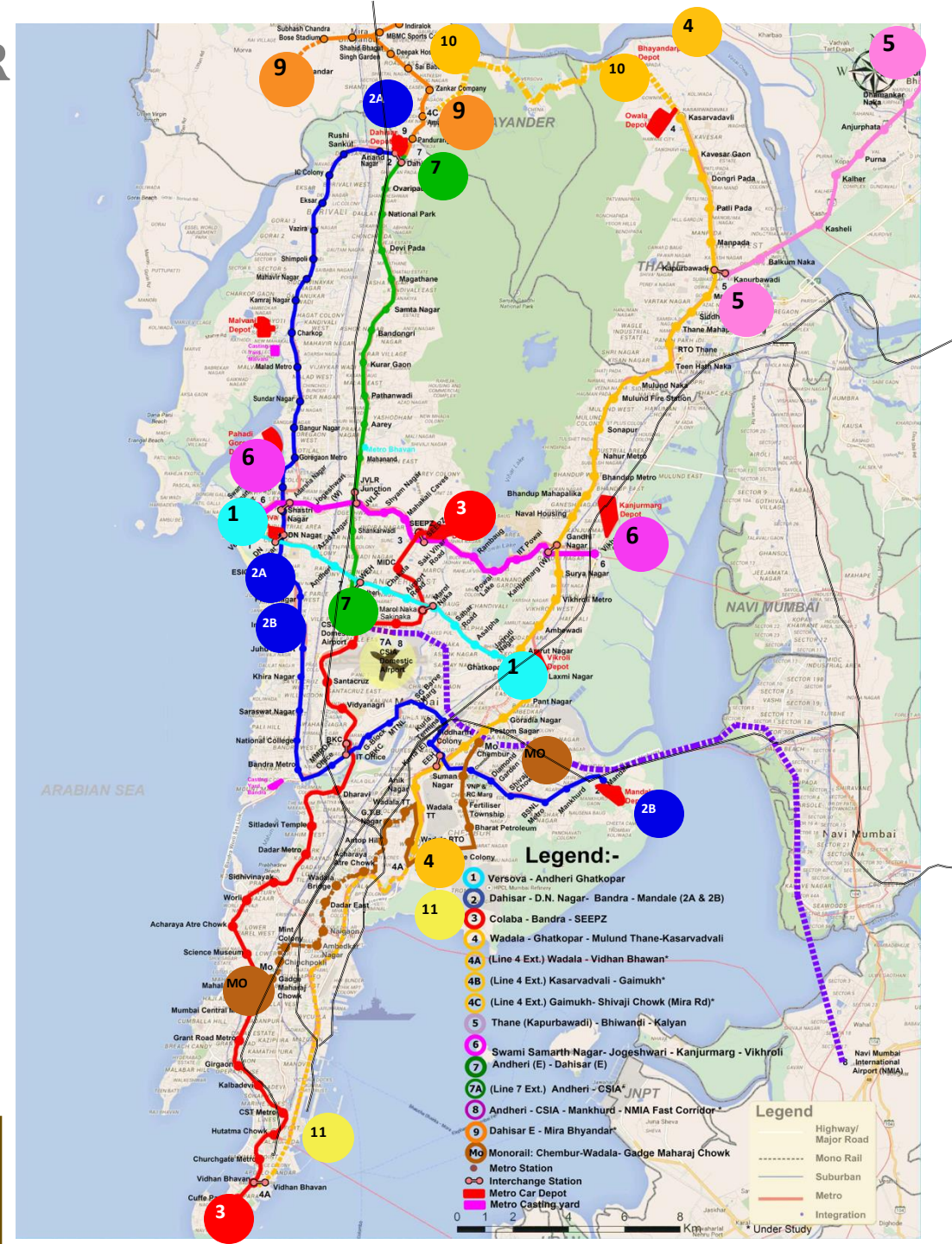
- Gaimukh- Shivaji Chowk (Mira Rd) (9.2 km)

DPR Under Preparation (115.7 km)

- Line 8 : Andheri - CSIA - Mankhurd - NMIA Fast Corridor (35 km)
- Line 11 : CSMT to Wadala (12.77 km)
- Line 13 : Shivaji Chowk (Mira Road) to Virar (23 km)
- Line 14: Kanjurmarg – Badalapur (45 km)

Planned Network: 357.1 km ; Operational: ~100 km

Under execution: 141.4 km ; Under Planning: 115.7 km



Future Transport: Modal Share

- Rail Based Mass Rapid Transport System: Suburban Rail + Metro: Predominant mode of transport
- Modal Share of Public transport expected to increase **from 65% to 71.3% by 2031 and 74.8% by 2041**

| Sr No. | Mode of Transport | 2017 | | 2031 | | 2041 | |
|--------|------------------------|-------------|------------|-------------|------------|-------------|------------|
| | | in Lakhs | % of Total | in Lakhs | % of Total | in Lakhs | % of Total |
| 1 | Sub-urban | 81.1 | 43.2% | 69.4 | 29.3% | 67.7 | 25.1% |
| 2 | Metro & Mono | 4.1 | 2.2% | 83.6 | 35.3% | 111.7 | 41.4% |
| 3 | Bus | 37.5 | 20.0% | 17.1 | 7.2% | 22.5 | 8.3% |
| 4 | Motorised Transport | 65.1 | 34.7% | 66.7 | 28.2% | 68.2 | 25.2% |
| | Total (in Crs) | 1.88 | | 2.37 | | 2.70 | |

Mega infra projects

Recently commissioned

1. Atal Setu
2. Coastal road: Marine drive to BWSL
3. New Mumbai airport

Under Construction

1. Coastal ring road:

- 1) Bandra-Versova
- 2) Versova-Dahisar-Bhayander
- 3) Uttan- Virar

2. Worli-Sewri connector

3. Elevated connectivity on EEH to Samruddhi corridor

4. Tunnel Roads

- 1) Borivali-Thane tunnel
- 2) Goregaon-Mulund Link Road
- 3) Orange gate to Marine drive

Upcoming Projects

1. Virar- Alibaug Multimodal Corridor
2. Vadhvan port



Colaba-Bandra-SEEPZ (Mumbai Metro Line-3)

Connecting The Unconnected



**Mumbai Coastal Road
Project (South)**

**Building Mumbai Metro Line-3 &
Mumbai Coastal Road Project (South)**

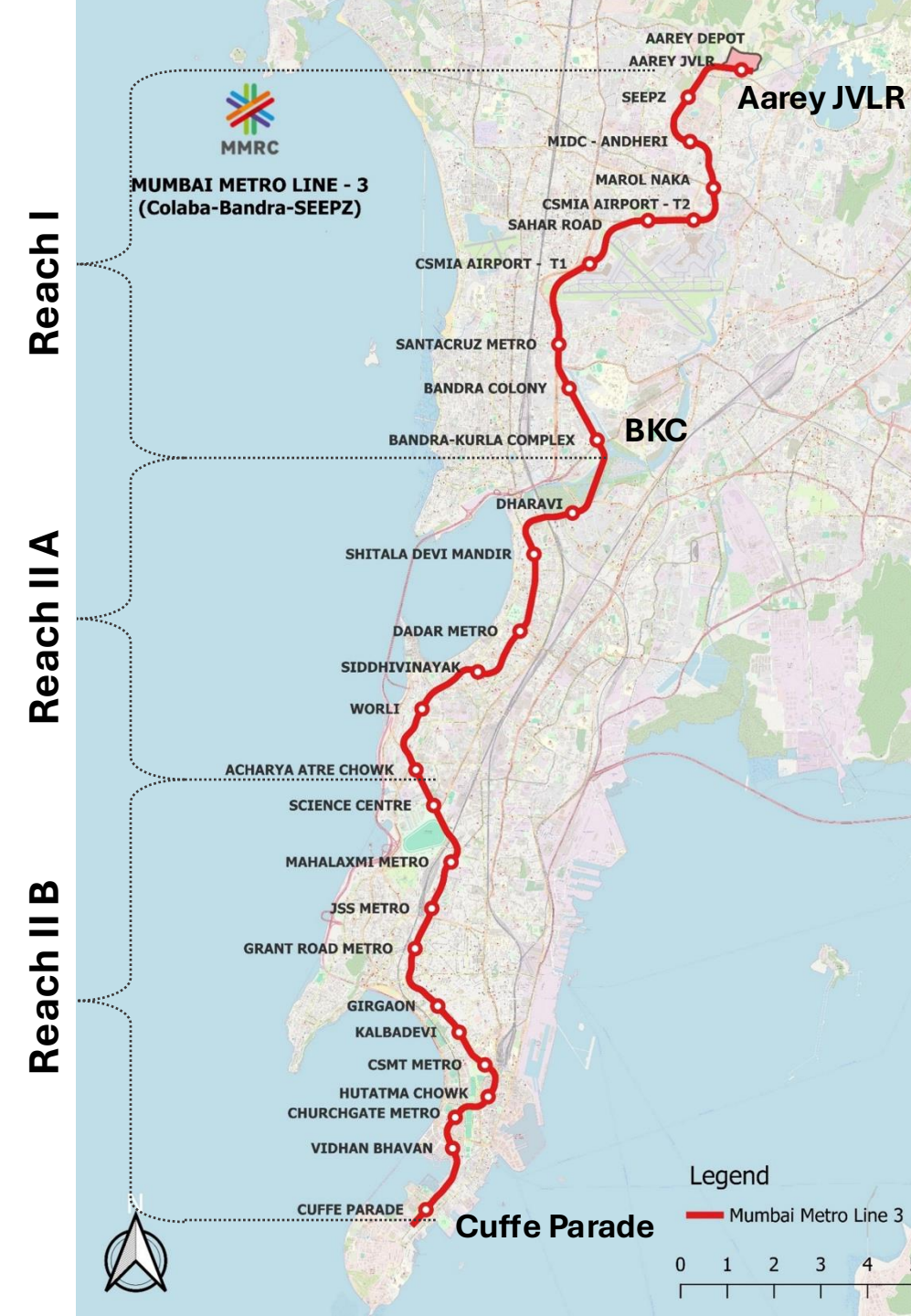
Mumbai Metro Line 3: Salient Features

Salient Features:

- Fully underground Metro Line from Cuffe Parade to Aarey JVLR
- Completion cost : Rs 37,276 Cr.
- Total length : 33.5 km
- Total no. of stations : 27
 - Underground stations : 26 (Cuffe Parade to SEEPZ)
 - At grade station : 1 (Aarey JVLR)

Operationalization :

- Reach I : 5th Oct 2024
- Reach II A : 9th May 2025
- Reach II B : 9th Oct 2025

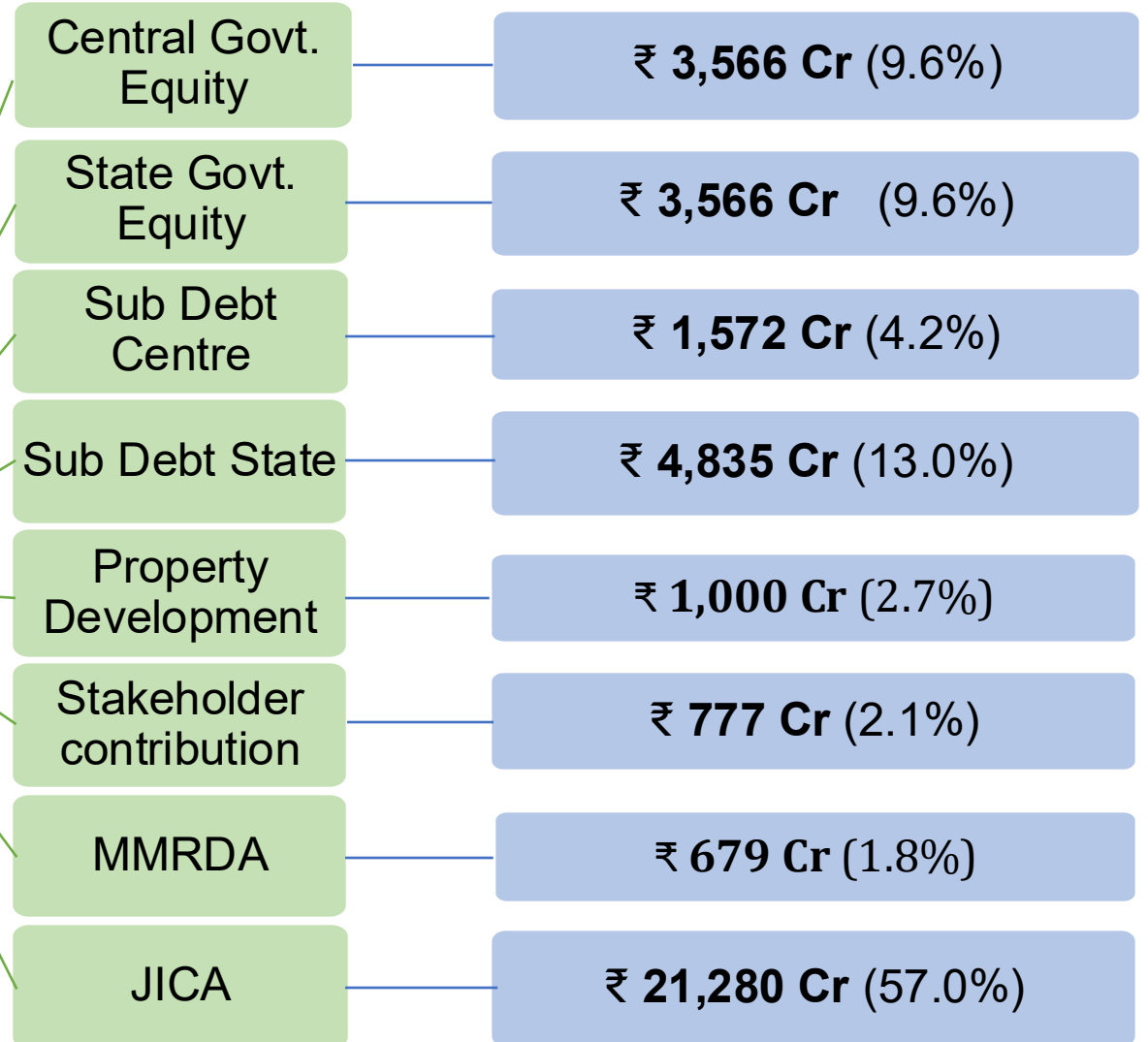


Funding

- **Gol Share (Equity+SD) : ₹ 5,138 Cr. (13.8%)**
- **GoM Share : ₹ 10,080 Cr. (27.1%)**
(Equity+SD+PD+MMRDA)
- **Stakeholder Contribution: ₹ 777 Cr. (2.1%)**
- **JICA Loan Share : ₹ 21,280 Cr. (57.0%)**

**Completion Cost:
₹ 37,276 Cr**

- **Sub Debt Gol : 50% of Central Taxes**
- **Sub Debt GoM : ₹ 4,835 Cr.**



Mumbai Metro Line 3 as seen by Wall Street Journal (2021)



'You have to actually cut open Mumbai's belly' — Inside one of the world's most audacious transit projects

More than 8,000 workers keep construction going 24 hours a day to finish the line that will speed 1.6 million riders beneath one of the world's most crowded cities

CHIRAG ANAND
Kovner

One of the most challenging projects in the world is being attempted beneath one of its most densely packed cities.

If it works, Mumbai will become the planet's most crowded metropolis to build an underground subway.

More than 8,000 workers and a fleet of 300 face-lift boring machines are working 24 hours a day — seven through someone else — to finish the 27 stations, 35-mile subway through some of the world's most densely populated neighborhoods, around the edge of one of Asia's biggest slums, below an airport and under temples and colonial buildings to end at a green-edge of homes where kowtow still reigns.

The train is also cutting a path through the country's religious traditions, legal system and every layer of its society, with halting length at each stop.

The Mumbai Metro Rail Corporation Ltd. — a joint venture between the state and central government, which is building the subway — has had to negotiate with thousands of families and businesses to get them to move and has fought residents in courts over noise, land rights and even whether the subway will only speed ground.

Despite the difficulties, the railway, which was started in 2006, is now getting built at a pace of just over one mile a month, so far, 9 miles are complete. The \$3.3-billion "Metro Line 3," Mumbai's first underground train, is on track to be finished and open by the end of 2021.

With a general election due by May, Prime Minister Narendra Modi is eager to demonstrate he is delivering among the most difficult infrastructure projects for the country's 1.3 billion citizens. Mr. Modi said in a speech last month that by 2024 the city would have 170 miles of metro lines under and above ground. The government is "making you live better and easier" with its metro plans, Mr. Modi said in his speech.

A spokesperson at the prime minister's office declined to comment on opposition to the metro.

More than seven million commuters a day roam through the city's existing, mostly above-ground railway network. Crowding is so intense Indian authorities describe it as a "supersonic crash law" — meaning trains are often carrying almost three times their capacity. Close to eight people die a day in the network, according to rail officials. In the first 11 months of 2018, 482 passengers died falling from train doors, and even more were killed crossing the tracks, rail officials said.

The new train will be the first line to cut through the heart of the city, with air-conditioned carriages spending around 90 feet underground, while carrying an estimated 1.6 million riders a day.

The unlikely driver of this stunning megaproject is a 45-year-old woman who grew up in a small town 200 miles outside Mumbai. Subodha Wade and the metro's nearly 100-year-old parent company in 1996 and rose through the ranks of Indian civil service to become one of the first women at the top. "You have to actually cut open Mumbai's belly at as many locations and then start constructing," said Ms. Wade, managing director of the Mumbai Metro Rail Corporation, the MMRC.

Skirting a deep blue hotel, a traditional Indian street — one local marketing gurus named her the city's "Most Holyth Bazaar" — Ms. Wade took calls from her desk phone and wore messages from her colleagues securely as she coordinated her mostly male team, who call her "Madam."

"There is a derogation," said Ms. Wade. "We really need to do it. I should have been done yesterday." Her office shelves are stacked with awards, a rack from the magazine and a miniature model of a boring machine. Her walls are a patchwork of maps, photos and diagrams.

The city formerly known as Bombay has always been one of India's most cosmopolitan and diverse. With a greater metro area population of 24.4 million, almost every religion, ethnic and caste community is represented and members along the peninsula. The city's stock exchange BSE Ltd. also down to observe Durgam Chhatrapati, including those observed by Hindus, Muslims and Christians.

India's 100 million community of 20,000 people — descendants of the Zoroastrian religious minority that came to India from Iran starting centuries ago — are a powerful group with property and temples across the city. At the center of each temple is the 1,300-year-old religious site that has often been kept burning since that a century. The new subway line is set to pass below two of the temple grounds. Only Parsis are allowed to enter the temples. Some worry the subway could interrupt prayers and desecrate holy ground, fearing that if not elsewhere it is in Mumbai, where women pass below while riding on it, the sanctity of the temple will be destroyed.

Others are concerned that construction work could damage the temples or drain wells on the temple sites. "I know how to construct," said Jambhed Subodha, a Parsi who has taken the subway building contract. "There should not be interference above or below."

More than 30 Parsis, including priests wearing traditional white robes and hats and women wearing headscarves, turned up at the Bombay High Court during a hearing in July. The lawyer for the MMRC wanted the tunnel could collapse if boring stopped for too long.

After a six-month pause in running near the temples, the court in November granted the MMRC permission to restart. Mr. Subodha's legal fellow petitioners appeared in the Supreme Court in New Delhi. Last month, it ruled that work could go ahead as long as measures were taken to avoid damage to the temples.

"To rethink the alignment is virtually impossible," said Uday Umesh Lall, one of the judges. Mr. Subodha, the Parsi opponent, said after the hearing, "You can give assurances, but if damage occurs" to the temples "it will be irreparable. I'm totally upset." The MMRC has faced around 60 court cases related to the construction of the metro, about half of them still open. Among the cases are petitions about land and property rights, noise, religious freedom and from people trying to protect trees along the length of the metro line.

To finish the line as fast as possible, 17 tunnel boring machines — each almost as long as a football field — are simultaneously grinding through rock below the city.

To get the machines from the port and through Mumbai's narrow roads, specialists had to divide the machines into parts and transport them on trailers. They cut off shop fronts to fit the machines down streets. The machines were assembled underground.

Only the Parsis' capital of Dhaka is more crowded than Mumbai, according to the United Nations. Dhaka is bulging an aboveground metro. Mumbai has an average of around 20,000 people per square mile, three times the population density of New York City. Ms. Wade isn't moving the line away from packed neighborhoods she's steering straight at them.

"These areas, if they really need to be maintained, they have to have metro connectivity," she said. "The city's old lines will continue to exist above ground. In addition to the new underground subway, stations are also being constructed above ground."

South Mumbai's streets are lined with poorly maintained buildings just up from colonial times. The MMRC surveyed thousands of structures before construction took place, identifying ones in danger of falling over.



Mumbaiers endure a crowded rail system that is so packed that it challenges them. At least 480 passengers died last year falling from trains on the suburban network.

neighborhood, petitioners and media were quick to blame the subway. The MMRC said construction was too far from the building to affect it. The MMRC, says teams out to convince residents the metro construction wasn't the cause, and propped up similar buildings to the area.

Ms. Wade takes overalls to work sites, places newspaper ads and writes magazine columns explaining why the city needs the metro line. He has held public meetings, met with religious groups and appeared on TV debating about the subway.

Ms. Wade has the same questions over and over from residents she meets. "How will it not flood during the monsoon?" "Will construction hurt our buildings?" "Why can't you build somewhere else?" She responds with lengthy answers, speaking slowly as the audience intakes details of the project.

During the monsoon, Mumbai gets more rain in four months than London gets in three years. The line through September runs from the city's roads and railway network and that down transport, schools and businesses for days at a time.

Tunnel construction during heavy rain is the norm, but the MMRC would be keeping up at least up more than 200 people.

An auto parked down below last summer, Ms. Wade's team got an hourly call as site managers provided live updates via the WhatsApp messaging service. The metro even has pumps to local authorities to help keep water levels down

Courts ruled in August that the building of this crucial infrastructure was more important than the inconvenience of residents. Construction is back to 24 hours a day.

At the other end of the line and the economic spectrum lies the final stop of the metro, Aarey Milk Colony, a rare remnant of green space known for its dairy business.

The stop, and a depot for trains, is being built over an area where families lived in simple brick homes, raising chickens and farming in the surrounding government lands.

Around 42% of Mumbai residents live in slums, according to 2011 census data, the most recent available, on land they don't own and sometimes in violating title towers. Relocating residents is a complex process.

Lataji Kamal Gokwad, in her 70s, lived on what was officially government land. The settlement was on land that flowed into a sprawling nature reserve, home to more than 20 leopards that occasionally attack locals. In 2007, a leopard attacked and killed a child.

When officials came to evict her to make way for the train, Ms. Gokwad said she threatened to sue herself on fire. She said security guards removed her possessions and destroyed her home. She finally agreed to relocate to a small apartment on the 12th floor of a government building.

Her bags have swelled from inactivity since moving, she says, and she feels dizzy when she looks out the window. She has always used wood fires and isn't sure how to use a gas stove to make tea. "I don't know what benefit the metro will bring," she said.

The MMRC has moved more than 2,800 families and businesses along the subway route. It says all moves are "legally done under supervision of relevant government authorities after alternative accommodations is provided." It says it helps families adjust, teaching them how to pay bills and look after their new homes.

Ms. Wade said the devout old Parsis about how infrastructure was built during the colonial era. People died to build the railway lines. Mumbaiers depend on it, she tells her train. No one has died building her subway line.

"People have taken a lot of pain, and a lot of lives were lost building the infrastructure we see today and we have been using for the past 150 years," she said. "We have to have that patience."

Source: The Wall Street Journal

- Mumbai will become worlds most crowded metropolis.
- More than 600 people a year are killed on existing at grade suburban rail network.
- Crossing the worlds largest slums.
- 8,000 workers working 24/7.
- Fleet of 17 TBMs.
- Contending multicultural and multi religious identities.
- Parsi temples are sacred and feed by fire energy emanating from the center of the earth.

Creating Connectivity

- Serves six CBDs
 - Nariman Point , Cuffe Parade (WTC), Fort, Worli/ Lower Parel, BKC & SEEPZ / MIDC
- Connects areas not served by suburban rail
 - Nariman Point, Cuffe Parade, Kalbadevi, Worli, BKC, Airport & SEEPZ/ MIDC
- Interchange with existing public transport
 - CST (CR), Churchgate, Bombay Central (WR), Marol Naka (Line 1), Mahalaxmi (Monorail), Mumbai Central (ST)
- Airport connectivity
 - Domestic Terminal(T1), International Terminal(T2)

- ~ 30 Employment clusters/Govt/Pvt. Offices
- ~ 12 Education Institutions
- ~ 11 Major Hospitals
- ~ 10 Major Transportation Hub
- ~ 25 Religious & recreations centres
- ~ 3 million Population in influence zone
- In Emergencies on Suburban Provide Evacuation

Multi Modal Integration & Transit Oriented Development

Line 3 Interchanges with Metro/MRTS and Suburban



Other Metro Lines: 4 lines at Aarey JVLR, Marol Naka, CSMT T2 and BKC



Airport Terminals- T1 (Domestic) and T2 (International)



High Speed Rail: at BKC (planned)



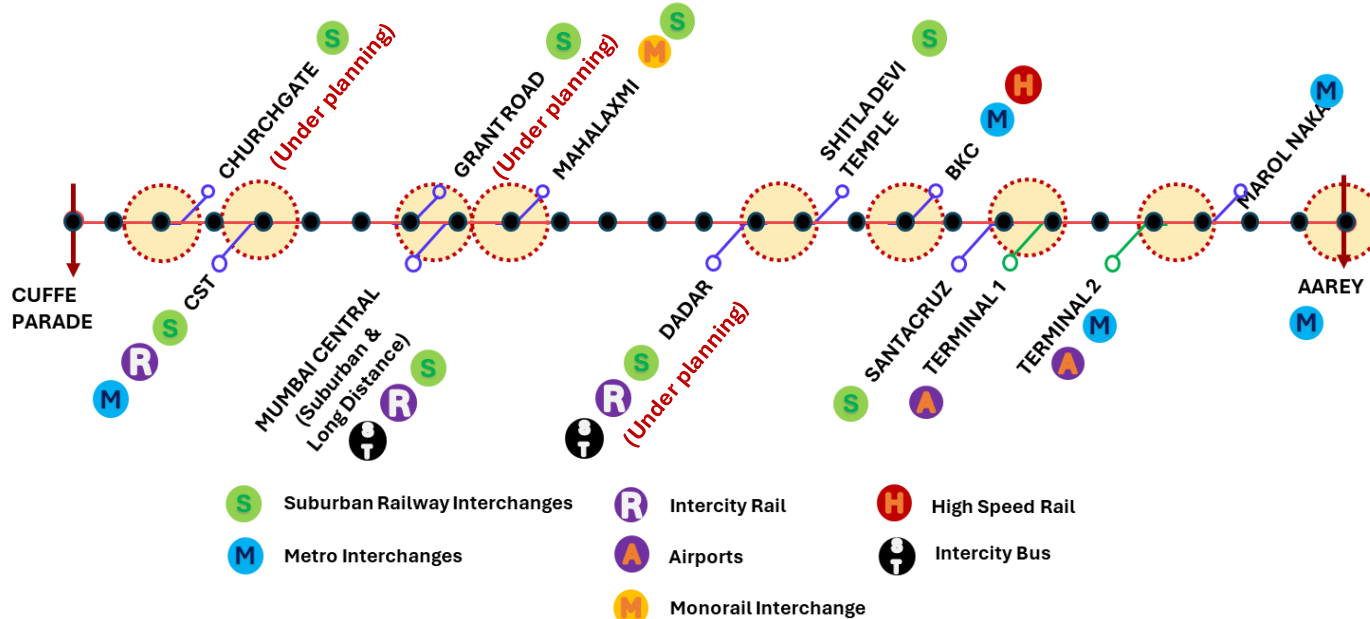
Railway Stations- CSMT, Mumbai Central (JSS), Churchgate, Dadar- for long distance and suburban rail junctions and Santacruz



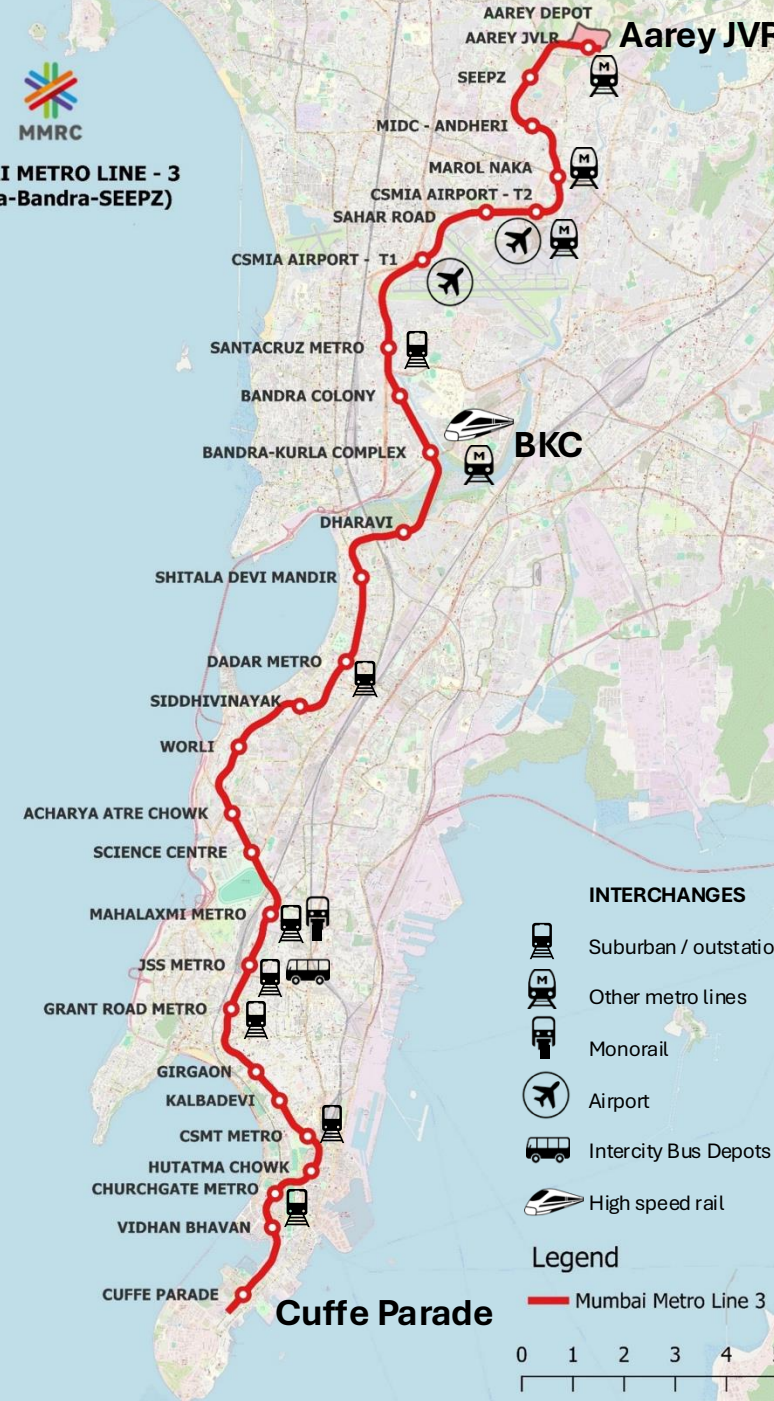
Monorail at Mahalaxmi station (connecting through skywalks) executed by MMRDA



Buses at Mumbai Central (JSS)



MUMBAI METRO LINE - 3 (Colaba-Bandra-SEEPZ)



Mumbai Metro Line 3: Project Timeline



Concept & Planning

- 1969:** Metro concept proposed in Mumbai's Development Plan
- 1991:** Feasibility study by MMPG; Mumbai Master Plan (9 corridors, 3 phases, 149 km) by DMRC

Project Milestones :

- 2011:** Project included in JICA Rolling plan, DPR for MML-3 was prepared by RITES
- 2013:** GoI approval & Loan Agreement signed by JICA
- 2014:** GoM approval, MMRC JV-SPV was formed (as per guidelines in GoI approval)
- 2015:** GC Appointed
- 2016:** LoA Issued to all Civil Bidders
- 2019 (Nov.) :** GoM Stopped Aarey car depot work
- 2022 (July) :** GoM revoked Stop Work order for Aarey Car Depot

Project Commissioning :

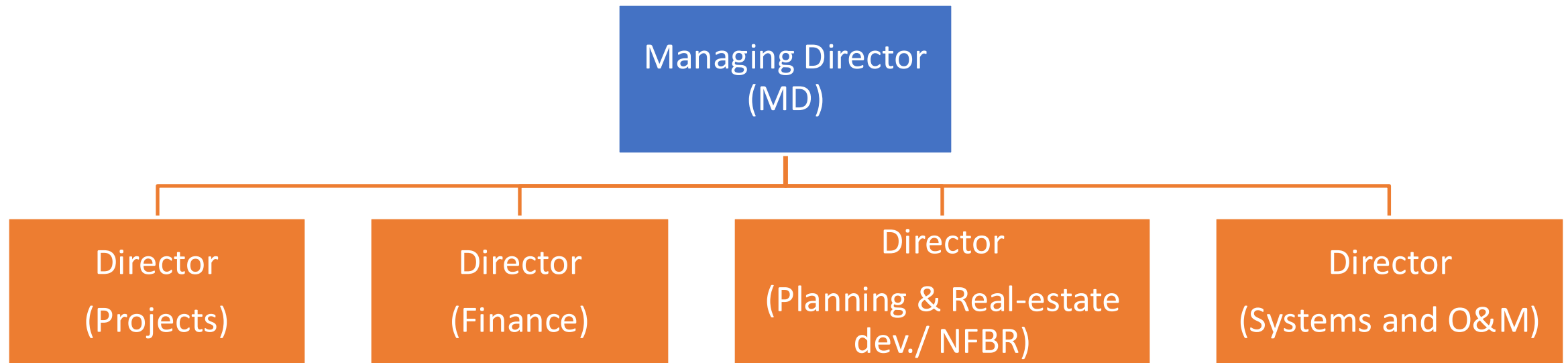
- 2024 (Oct):** Phase 1 Aarey → BKC (10 stations)
- 2025 (May):** Phase IIA BKC → Acharya Atre Chowk (Worli) (7 stations)
- 2025 (Oct):** Phase IIB Acharya Atre Chowk → Cuffe Parade (10 stations)

Mumbai Metro Rail Corporation Limited (MMRCL)



Mumbai Metro Rail Corporation Limited (MMRCL) is a 50-50 JV between GoI & GoM

- **Chairman** : Secretary, Ministry of Housing & Urban Affairs, GOI
- **Four Nominee Directors** each from State Govt & Centre Govt



Scope of Work and Project management

❖ General Consultants on board : Consortium of

- Aecom Hong Kong
- Padeco Japan
- LB USA
- Egis Rail France

❖ Civil contracts:

- 8 Civil Packages including car depot package
- **Car depot at Aarey**

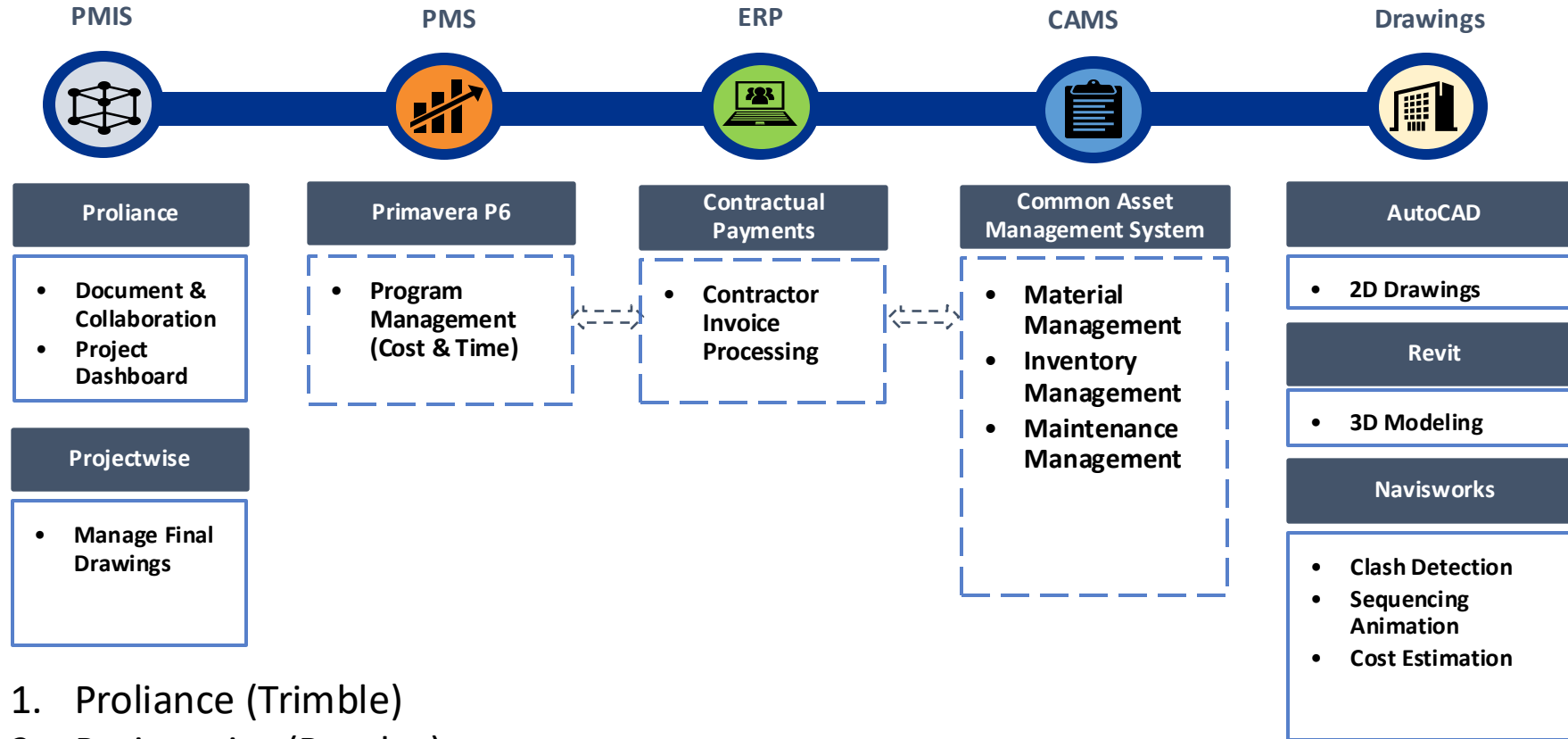
❖ System contracts: (Total 32)

MMRC's in-house team

- ❖ Consortia of Indian and International bidders
- ❖ Selection through international competitive bidding

- JICA Standard Bidding Document based on FIDIC Yellow book.
- GoI Consultancy Procurement Guidelines and evaluated using QCBS
- GoI Works Procurement Guidelines.

Innovative Digital Project Management



1. Proliance (Trimble)
2. Projectwise (Bentley)
3. Primavera P6 (Enterprise Project Portfolio Management) (EPPM) (Oracle)
4. Enterprise Resource Planning (ERP) (Oracle)
5. Common Asset Management System (CAMS) (MAXIMO) (IBM)
6. 3D BIM (Building Information Modelling) (Revit & Navisworks)

CM War room Support

CM war room mechanism for mega infrastructure projects and its effective use by MMRCL for faster decision making and resolution of inter departmental issues.

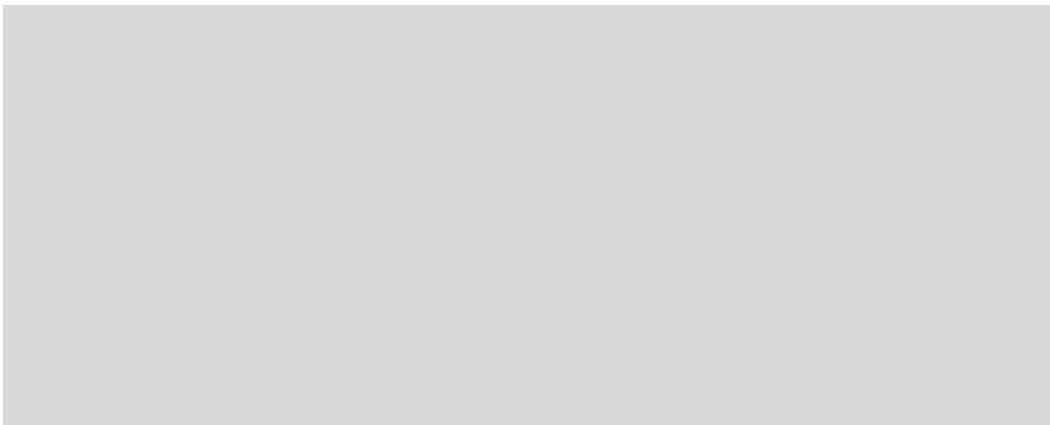


Construction Sequence and Methodology

Civil construction: techniques adopted:

- **Tunnelling** with 17 TBMs with precast RCC segmental rings.
- Bottom-Up construction in stations
- NATM tunnels in stations and sidings
- TBM tunnels widened by NATM to create platforms and crossovers



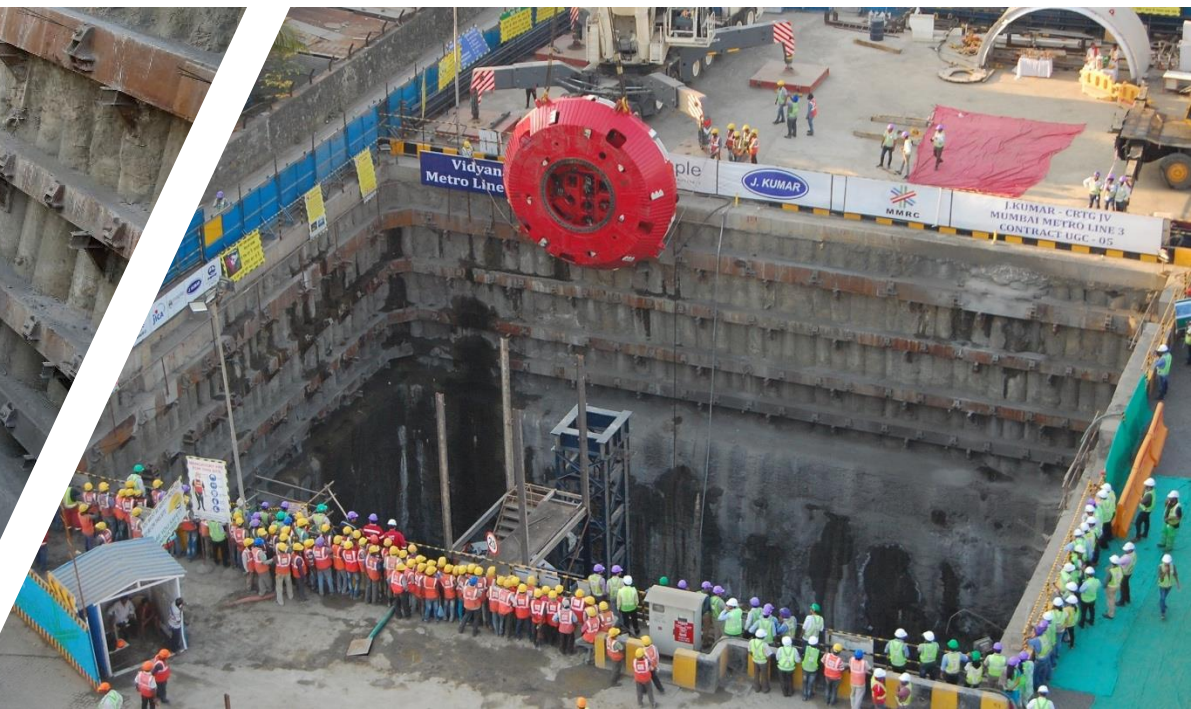
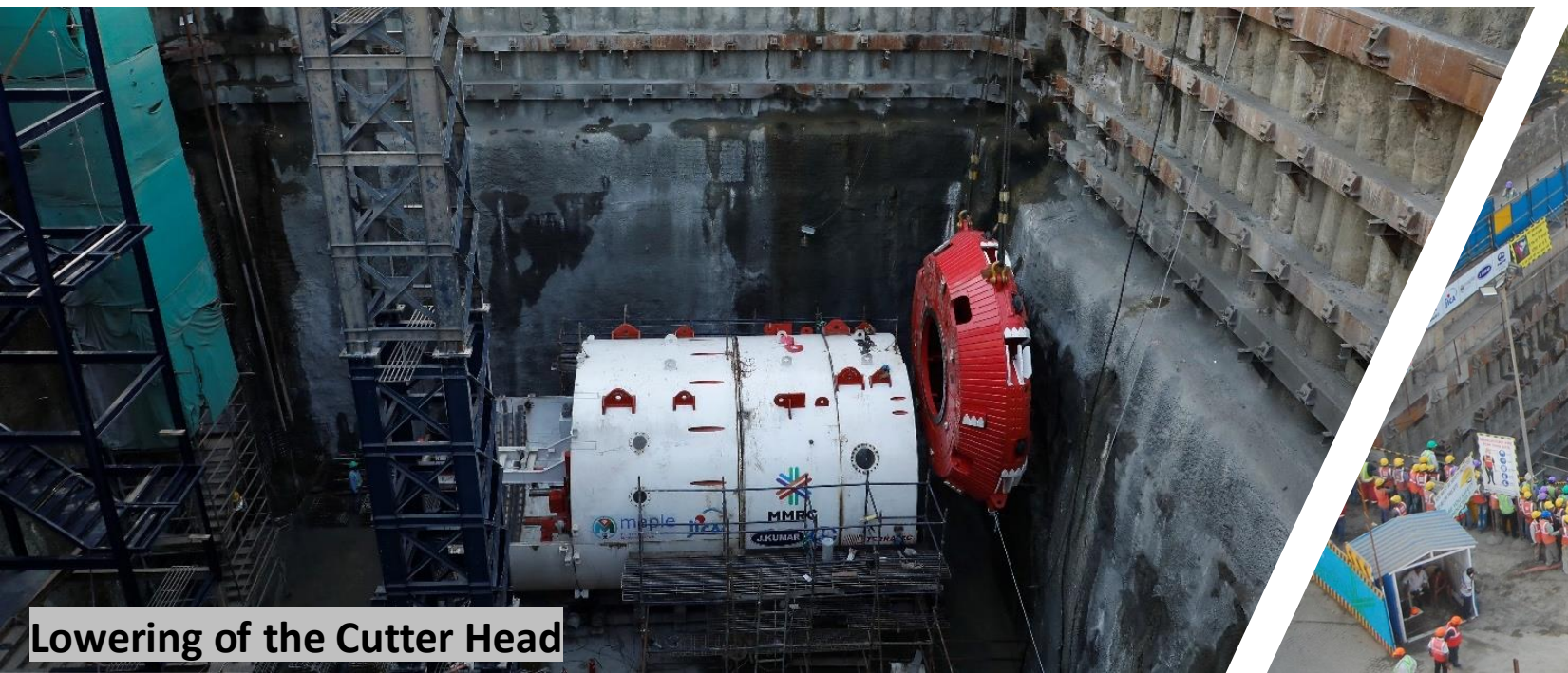


Construction Sequence and Methodology: Tunneling



TBM Launching Shaft & Lowering of TBM

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Lowering of the Cutter Head

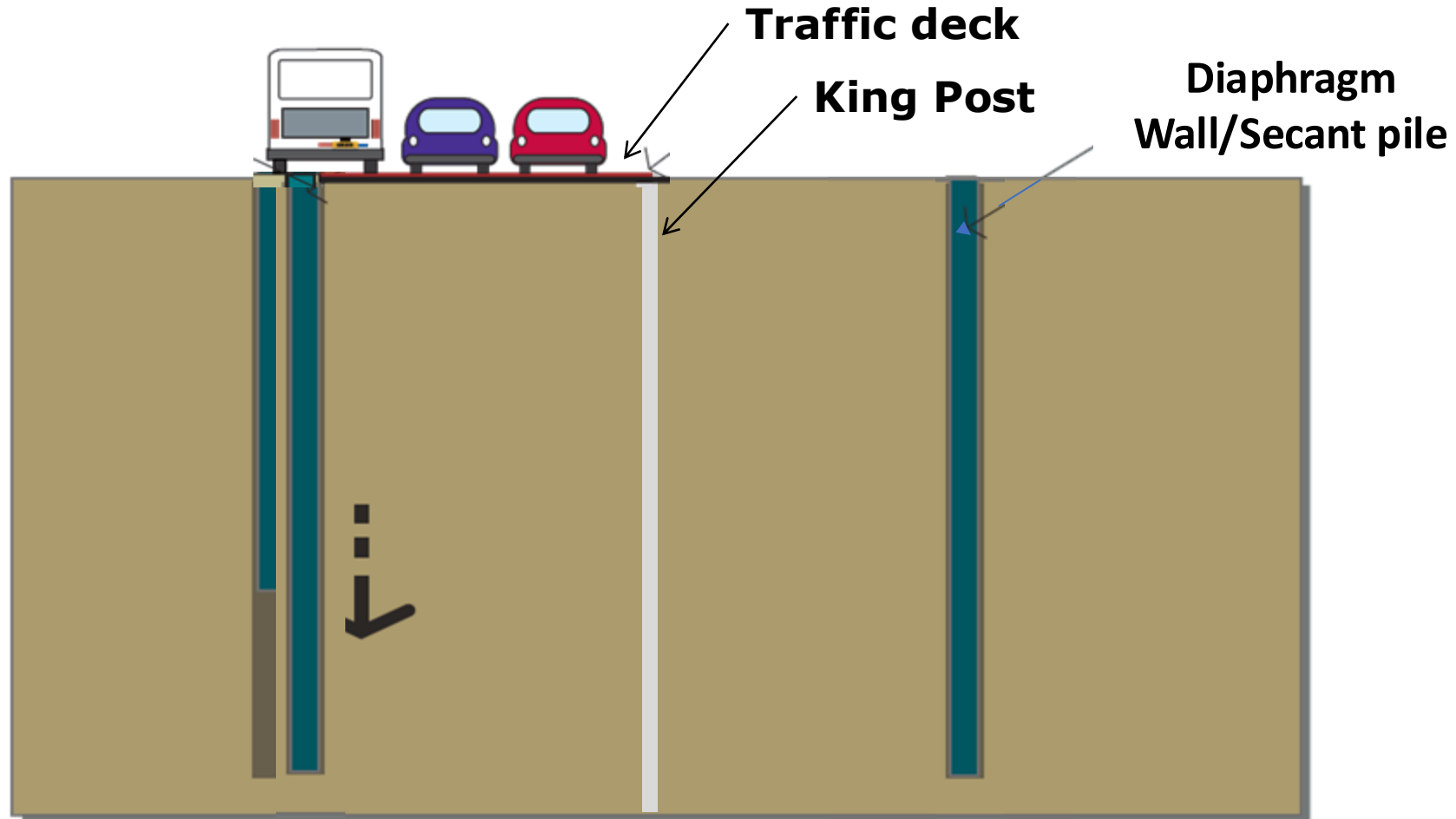


Underground Station Construction

- **Metro Line 3 has 19 Cut & Cover Stations**
- **7 station in Type A & 11 in Type B (Structural Form)**
- **Method of Construction**
 - **Bottom up construction Method**

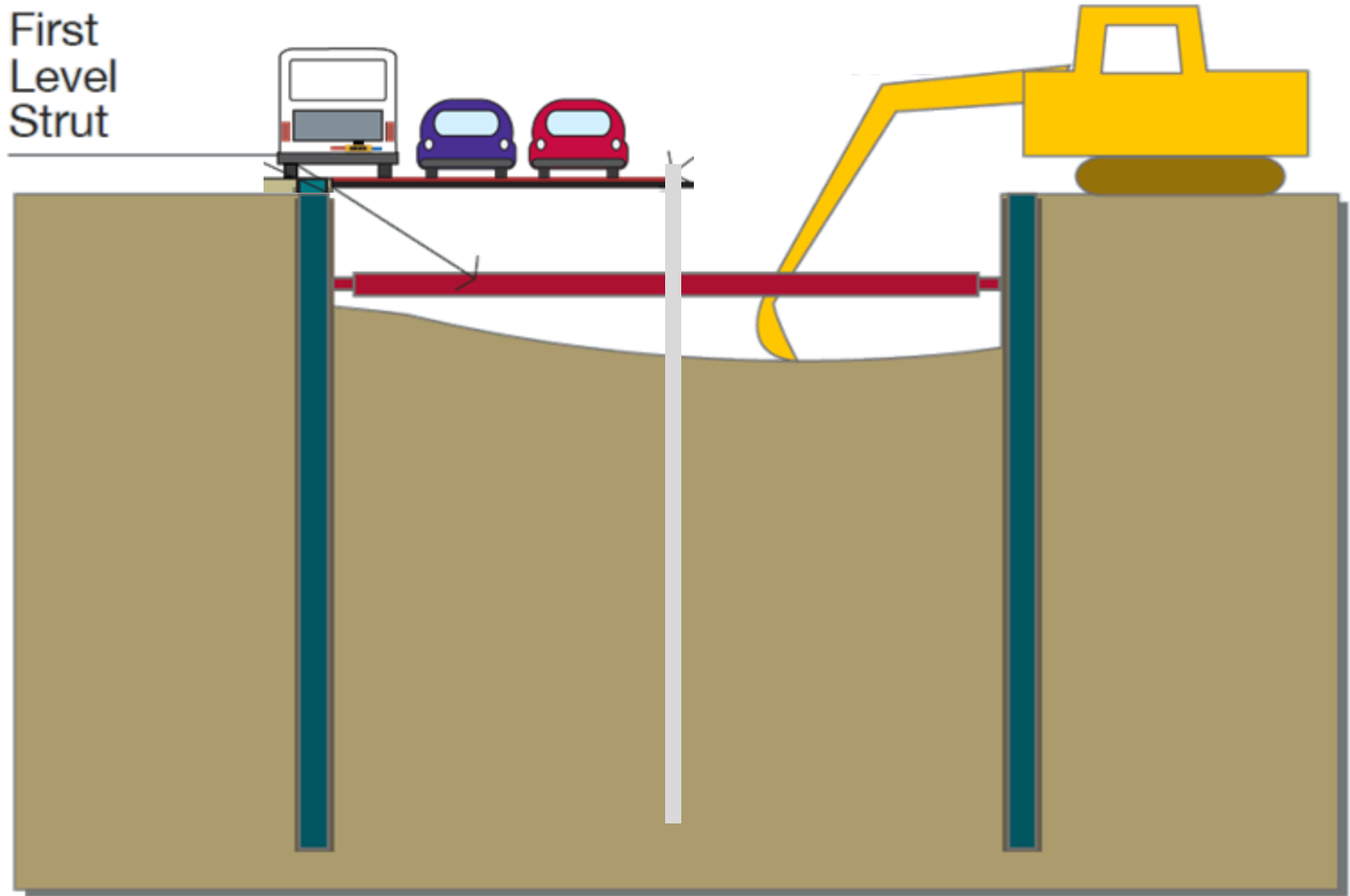


Construction Sequence and Methodology



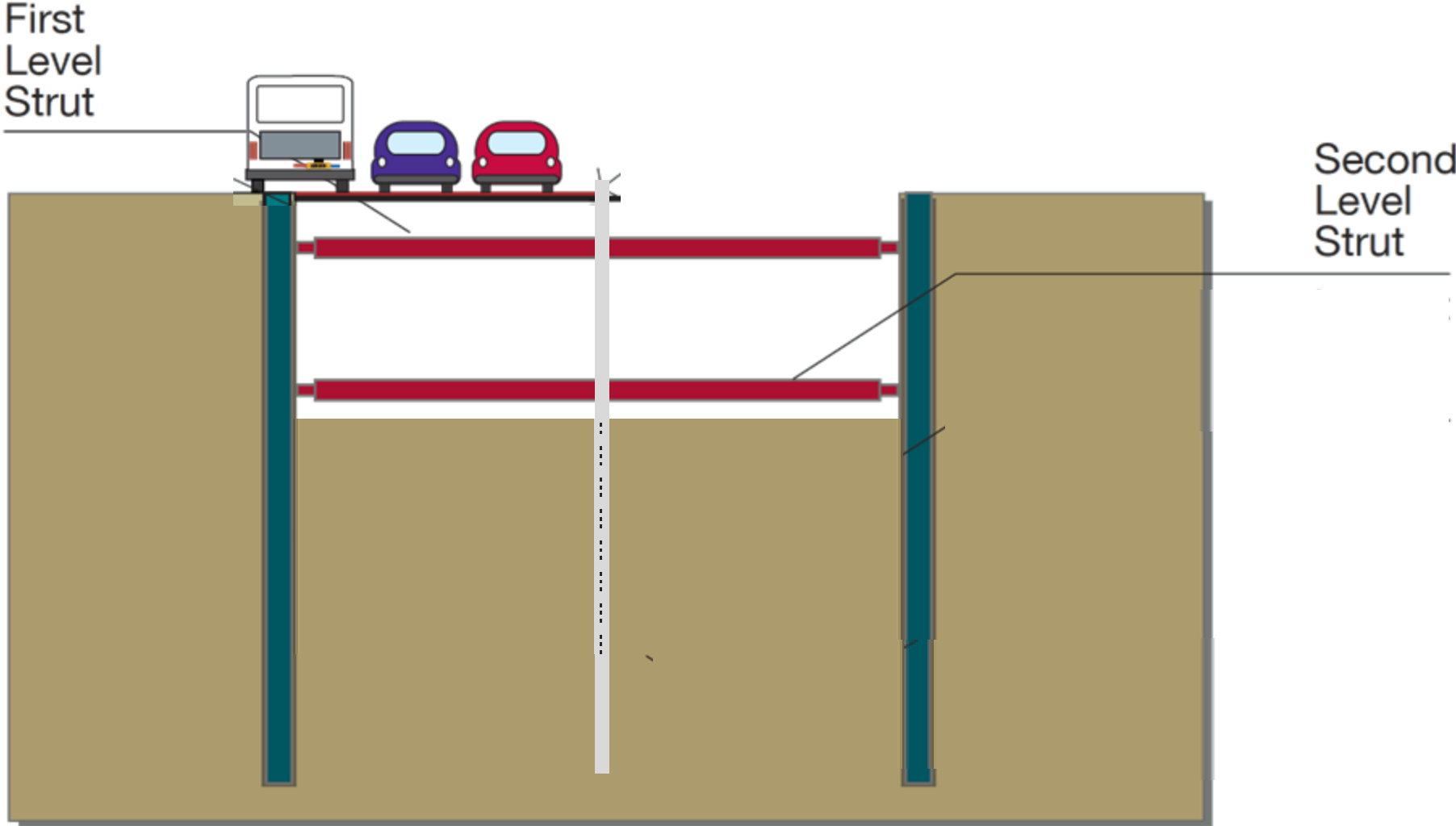
Complete installation of traffic deck
Complete installation of king post
Complete installation of retaining wall

Construction Sequence and Methodology



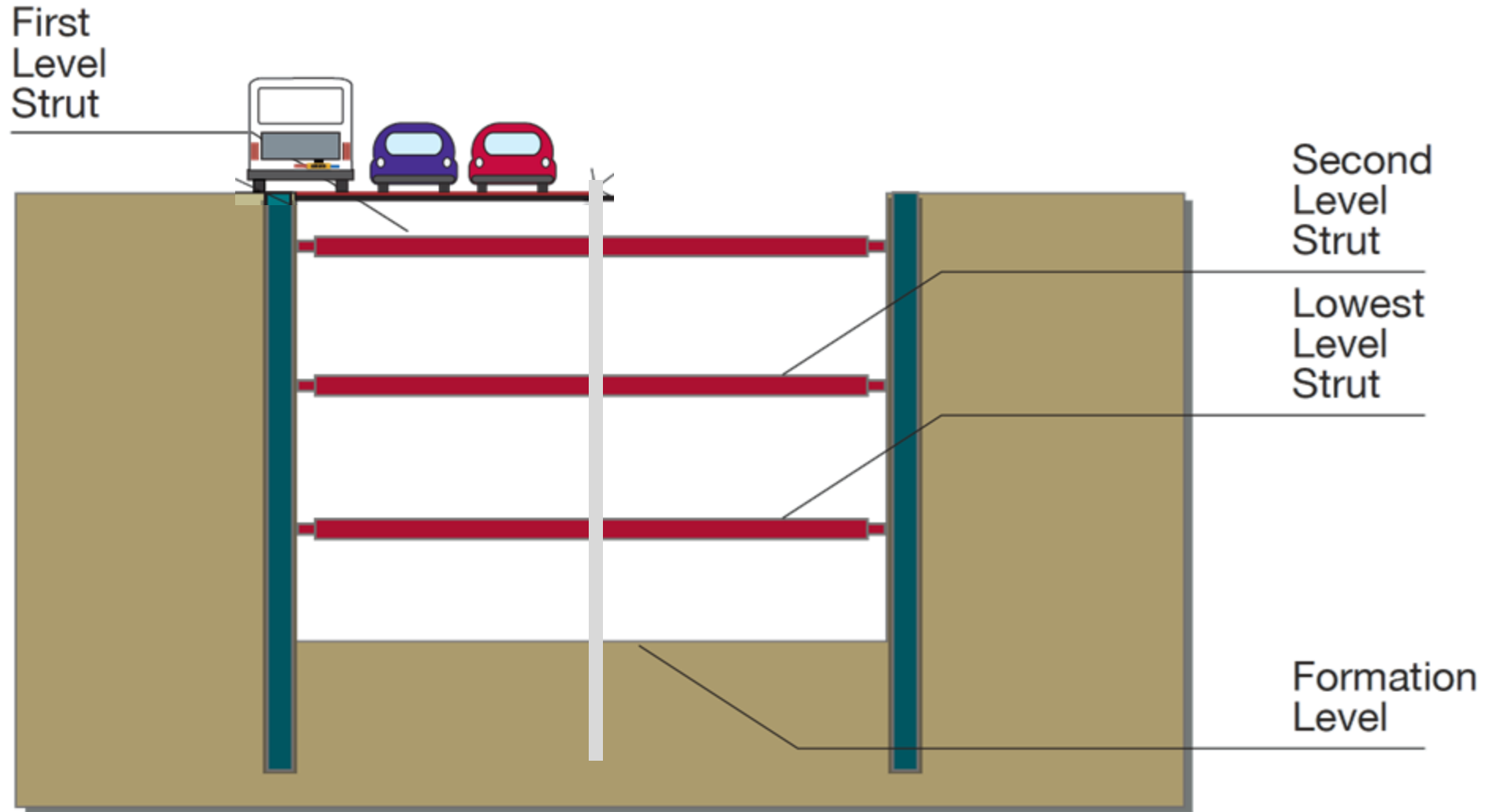
Excavation from ground level & installation of 1st level strut

Construction Sequence and Methodology



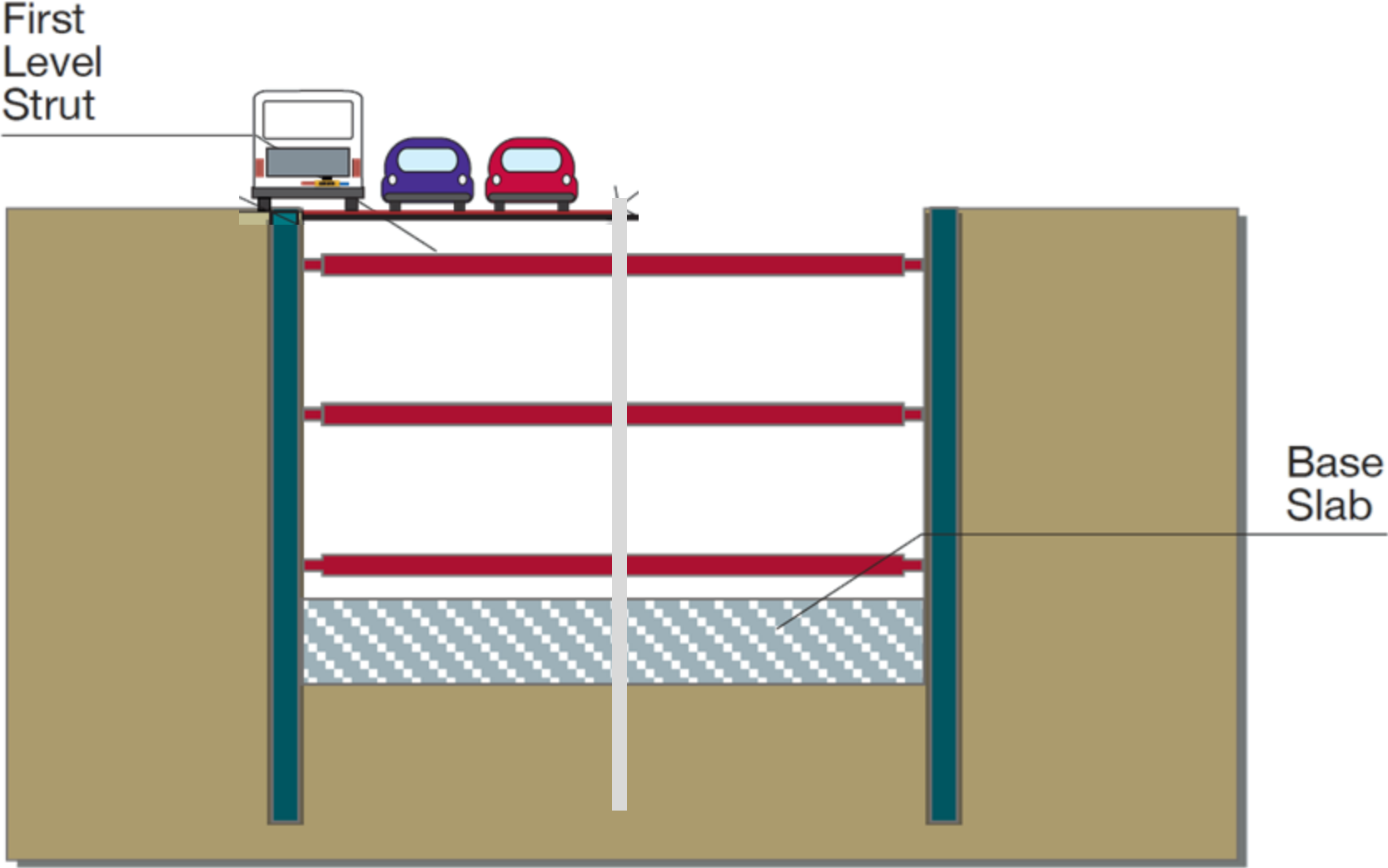
Excavation continues & installation of 2nd level strut

Construction Sequence and Methodology



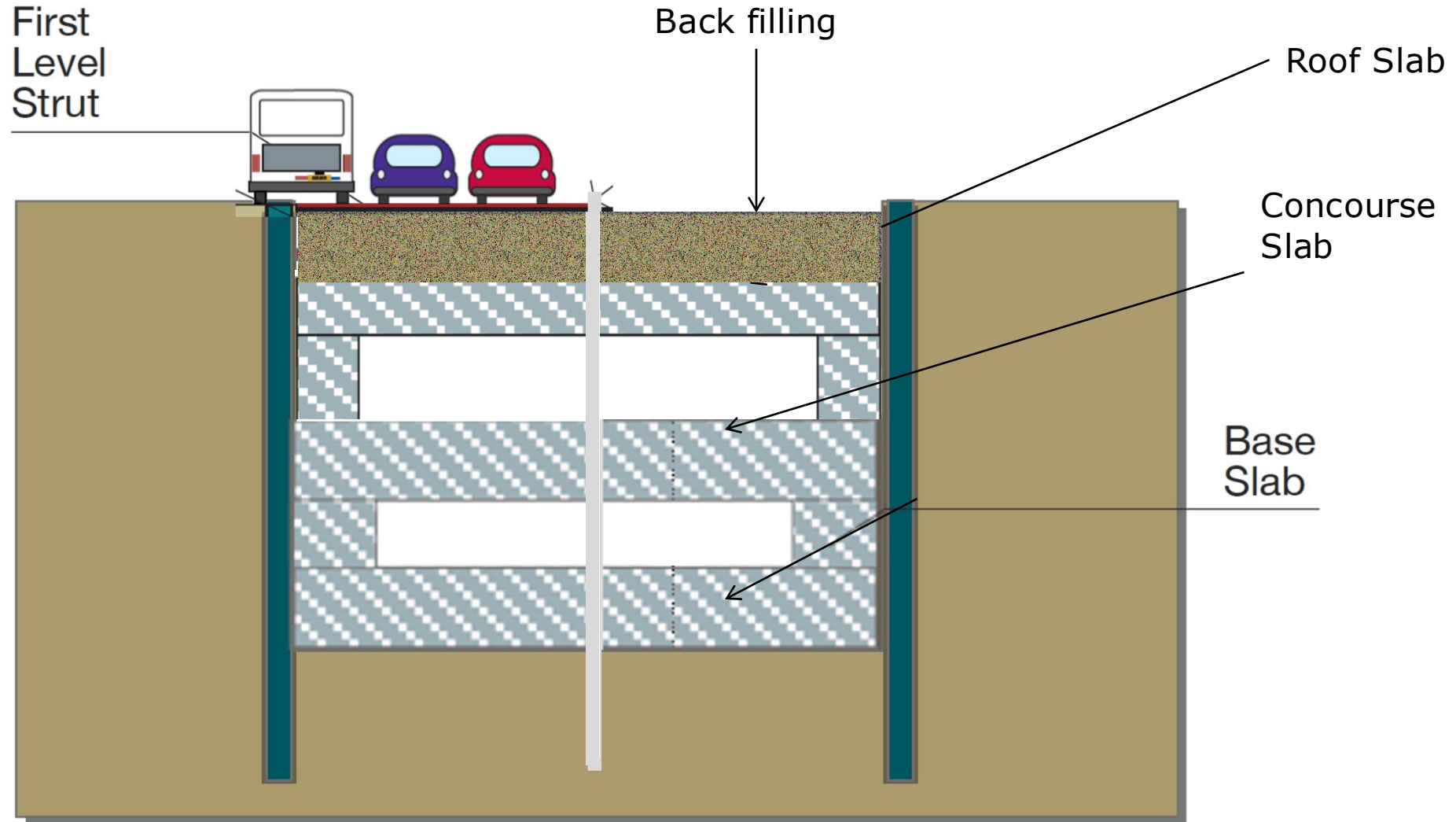
Excavation continues to formation level with installation of struts

Construction Sequence and Methodology



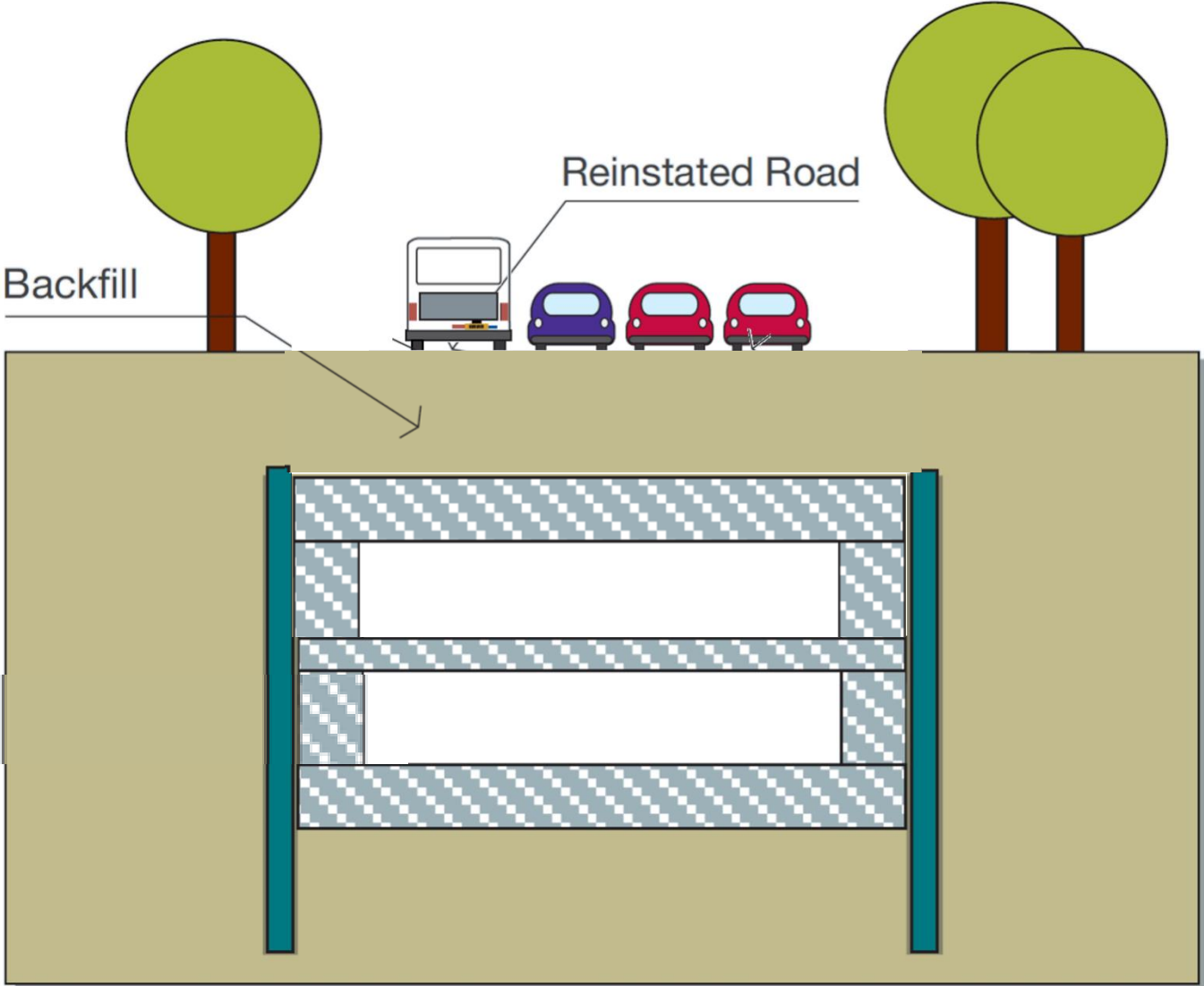
Construction of base slab

Construction Sequence and Methodology



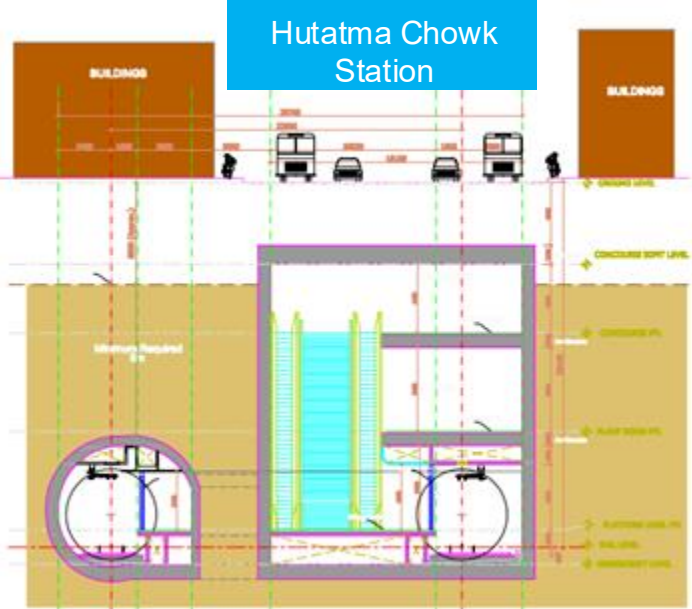
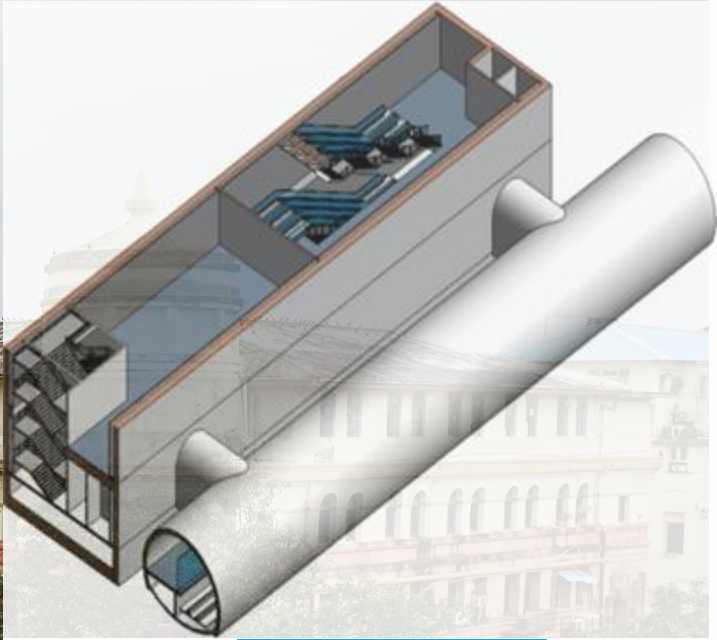
**Completion of walls/ columns, concourse & Roof slab
Reinstatement of ground**

Construction Sequence and Methodology



Road Restoration after reinstatement of ground

HUTATMA CHOWK



Construction Sequence and Methodology: Tunneling New Austrian Tunnel Method (NATM) of Construction





High Vibration Attenuation Track Structure

Train operation induced noise and vibrations needed to be mitigated by adopting appropriate technological solution for track structure.

High Vibration Attenuation Track Structure is adopted for the first time in India to mitigate vibrations in sensitive areas.



Challenges

Geology

Underground utilities

Traffic management

Land acquisition & rehabilitation of affected families

Approvals and permissions

Congested work areas

Safety: construction sites

Safety: buildings, monuments, infrastructure

Muck disposal and logistics

Environmental challenges

Protests & litigations

Media and public perception



Addressing the challenges

| | | |
|---|--|---|
| Meticulous planning | Transparent policies and processes | Competent team and robust project management mechanism |
| Clear roles and responsibilities & delegation of powers | Engagement of experts and specialized agencies | Detailed investigations |
| Superior quality work site management | International standard safety protocol | Constant engagement with stakeholders, citizens, media, political parties |
| Information dissemination almost on real time basis | Effective use of social media | Responsive grievance redressal system |



Challenges

Geology

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Traffic management

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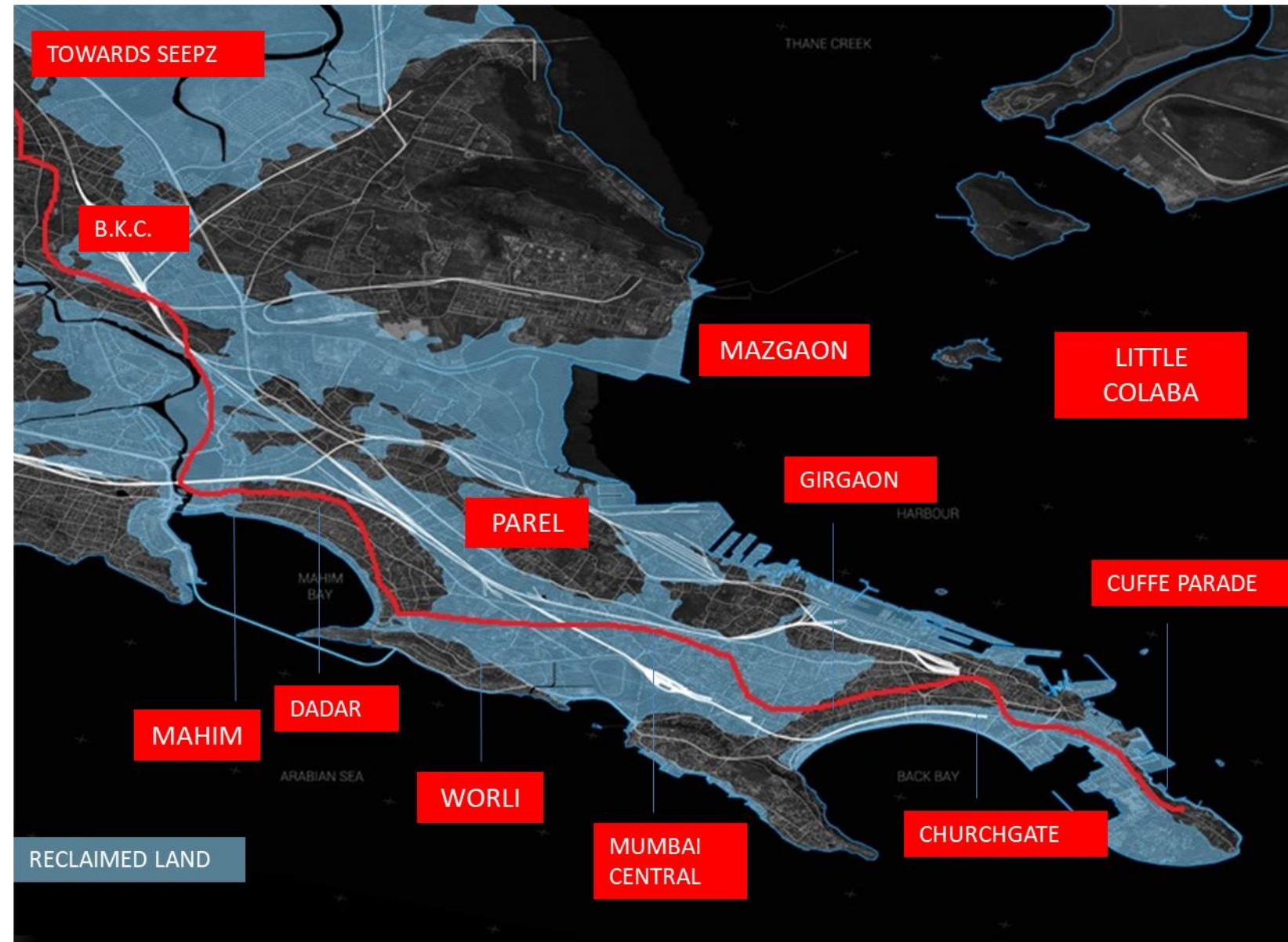
Muck disposal and logistics

Environmental challenges

Protests & litigations

Media and public perception

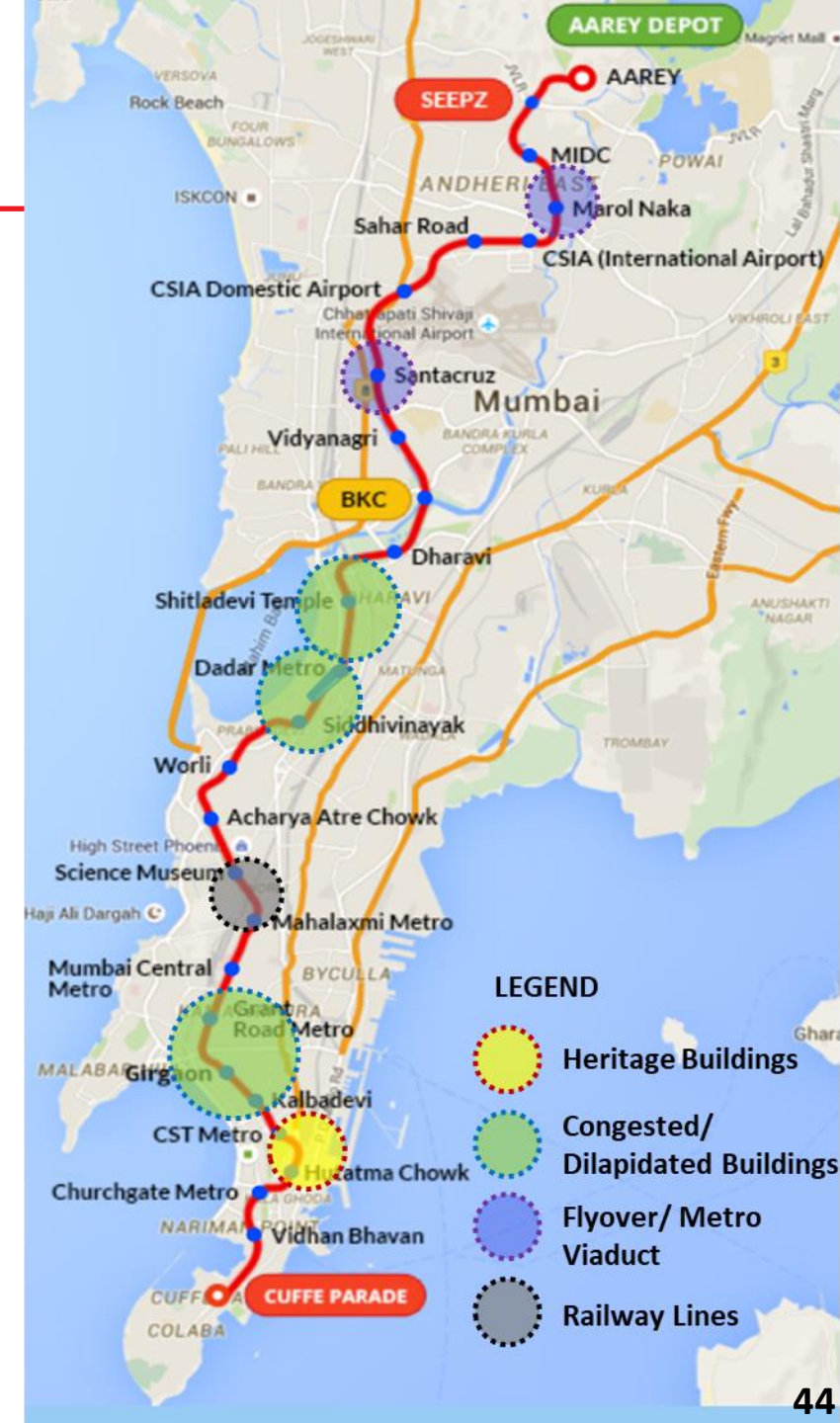
Topography of Mumbai



- Mumbai was once an archipelago of seven islands which were joined by land filling over period of time.
- Mumbai today is a tapered land mass with sea/creek on three sides. It has high population density; and low road space.

Topography of Mumbai

- The corridor passes through densely populated and congested parts.
- It is practically impossible not to have tunnels passing directly underneath or in close proximity of existing buildings and existing infrastructure:
 - Heritage Buildings
 - High Rise Buildings (existing, under construction)
 - Dilapidated Buildings
 - Congested areas with narrow roads
 - Flyovers and Metro Viaduct
 - Railway Lines
- There are administrative and logistical challenges due to deep and old civic utilities, traffic management, muck disposal etc.



Challenges



10.11.2018



12.04.2019 12:49



SHOT ON REDMI NOTE 7
MI DUAL CAMERA

UTILITIES HANGING INSIDE THE STATION BOX



DADAR STATION



SHITLADEVI STATION



ACHARYA ATREYA CHOWK STATION



WORLI STATION

Challenges : Underground utilities



Challenges

Geology

Underground
utilities

**Traffic
management**

Land acquisition &
rehabilitation of
affected families

Approvals and
permissions

Congested work
areas

Safety:
construction
sites

Safety:
buildings,
monuments,
infrastructure

Muck disposal
and logistics

Environmental
challenges

Protests &
litigations

Media and
public
perception

25-02-2019 14:55





- Traffic Diversion Plan in advance
- Stake holder consultation
- Coordination with Traffic Dept.
- 5200 RM of traffic lanes were laid on steel/concrete decking



Challenges

Geology

Underground utilities

Traffic management

Land acquisition & rehabilitation of affected families

Approvals and permissions

Congested work areas

Safety: construction sites

Safety: buildings, monuments, infrastructure

Muck disposal and logistics

Environmental challenges

Protests & litigations

Media and public perception

Land Acquisition: 100% in possession (73.14 ha Govt. & 2.56 ha Pvt.)

Rehabilitation & Resettlement of PAPs:

- 2125 PAP's Rehabilitated (Formation of society in progress)
- 733 PAPs at Kalbadevi and Girgaon are temporarily rehabilitated. (Rent being paid)
- Permanent rehabilitation plan at Kalbadevi (K2 & K3) and Girgaon (G3) is under execution with following updates:
 - K3: contractor awarded, and work is in progress in site.(37 nos. of floors)
 - G3: contractor awarded, and work is in progress in site.(48 nos. of floors)
 - K2: contractor awarded, and work is in progress in site. (16 nos. of floors)

Naya Nagar Launch Shaft – Site Before demolition



Site After Demolition



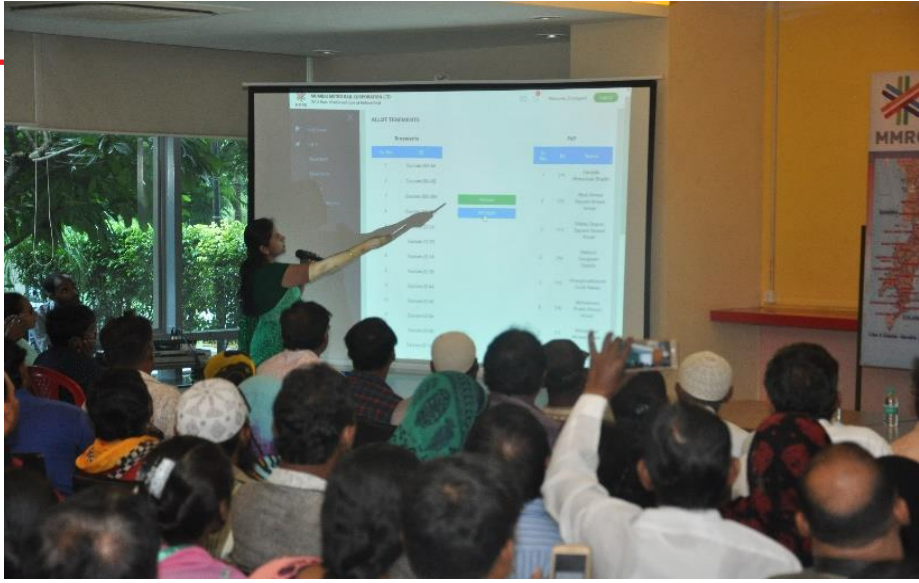
Naya Nagar Shaft



Public Consultation with PAPs



Girgaon & Kabadevi



BKC

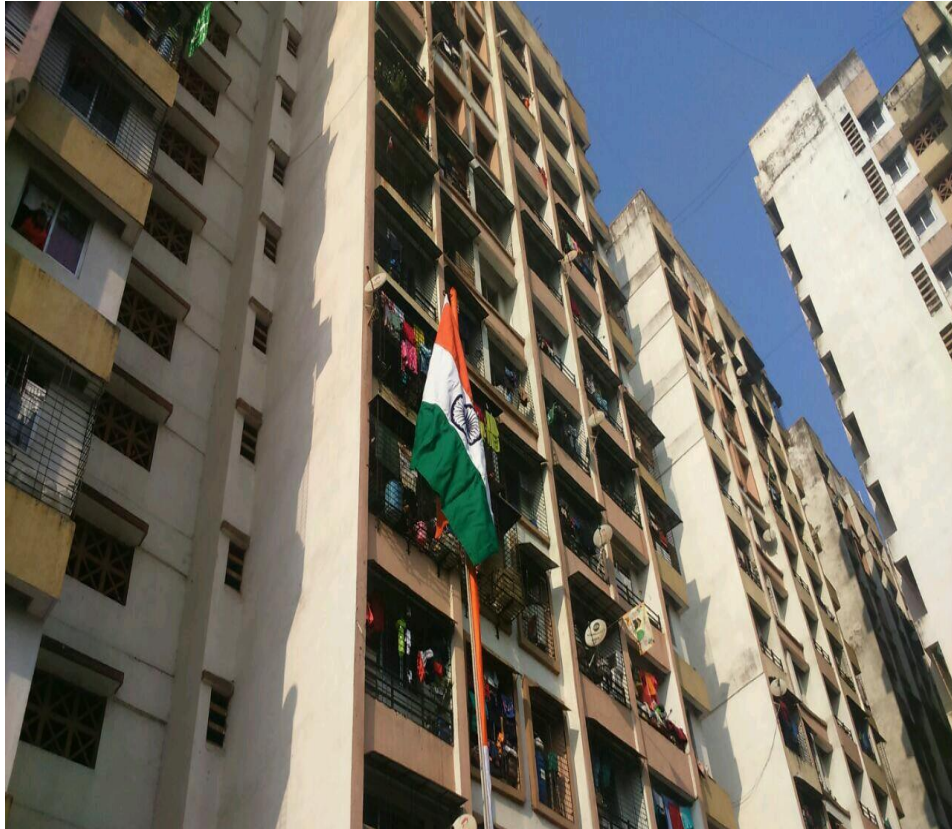


Nayanagar



Sahar Road

Rehabilitation and Land Acquisition



**Land requirement achieved :
75.70 Ha**

2781 Project Affected Families rehabilitated.

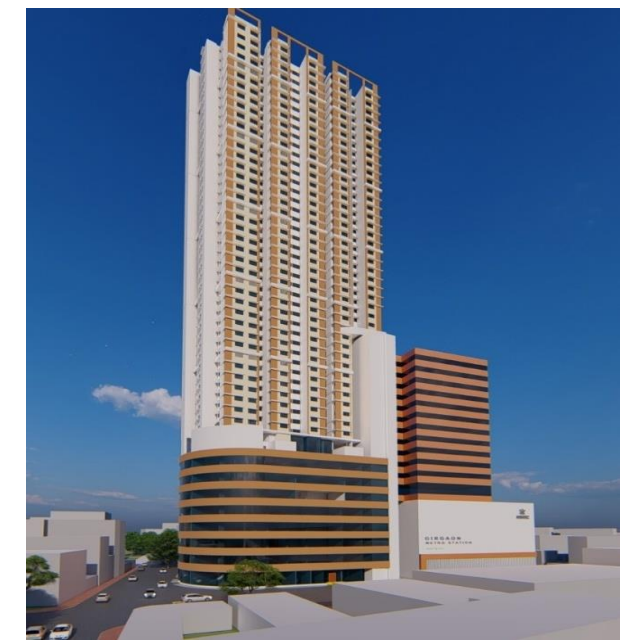
730 families to get benefit of in-situ rehabilitation



Kalbadevi - Girgaon Redevelopment Project Status

**733 families to get
benefit of in-situ
rehabilitation**

Project Configurations



| Blocks | K2 (Kalbadevi Commercial Complex) | K3 (Kalbadevi Heights) | G3 (Girgaon Heights) |
|---|--|--|--|
| Block Area (in sq.mt.) | 1,822.3 sq.mt. | 1,643.8 sq.mt. | 4,613.6 sq.mt. |
| Metro Building Configuration | G+4 Structure | Ground Structure | G+3 Structure |
| Redevelopment Building Configuration | <ul style="list-style-type: none"> Fully Commercial Building Basement (Services) G+2- Fish market 5th To 10th (Rehab Commercial) 10th to 16th Floor (Sale Commercial) | <ul style="list-style-type: none"> Composite Residential Building Basement (Services) G+1 (Commercial & Amenities) 2nd & 3rd (Services) 4th To 37th (Residential) | <ul style="list-style-type: none"> Composite Residential - Commercial 3 Basements (Parking. & Services) Ground to 7th (Commercial & Part Services) 8th & 9th (Services & Amenities), 10th to 48th (Residential) Ancillary Building (G+4 Metro Structure, next 10 floors commercial) |
| Building Height | 70.0 mts. | 119.7 mts. | 155.5 mts. |
| Proposed completion | Aug -2027 | Mar-2026 | Sep-2027 |

Challenges

Geology

Underground
utilities

Traffic
management

Land acquisition
and rehabilitation
of affected families

**Approvals
and
permissions**

Congested work
areas

Safety:
construction sites

Safety: buildings,
monuments,
infrastructure

Muck disposal and
logistics

Environmental
challenges

Protests &
litigations

Media and public
perception

Approvals and Permissions Required

- MML-3 Alignment Notification & Notification under Metro Act
- Central & State cabinet approvals for Project and Funding Pattern
- Tri-Partite Agreement between GoI, GoJ and MMRC
- Mumbai Heritage Conservation Committee Approval
- Tree Cutting Permissions from Local Authorities
- Traffic Diversion NOCs from Local Authorities
- Utilities Shifting Clearances from Local Authorities
- In-situ Rehabilitation with Redevelopment Scheme approval from GoM
- Clearances from MOEF, CRZ, MPCB, Land Authorities including AAI, Defence, State Govt Depts.



Challenges

Geology

Underground utilities

Traffic management

Land acquisition and rehabilitation of affected families

Approvals and permissions

Congested work areas

Safety: construction sites

Safety: buildings, monuments, infrastructure

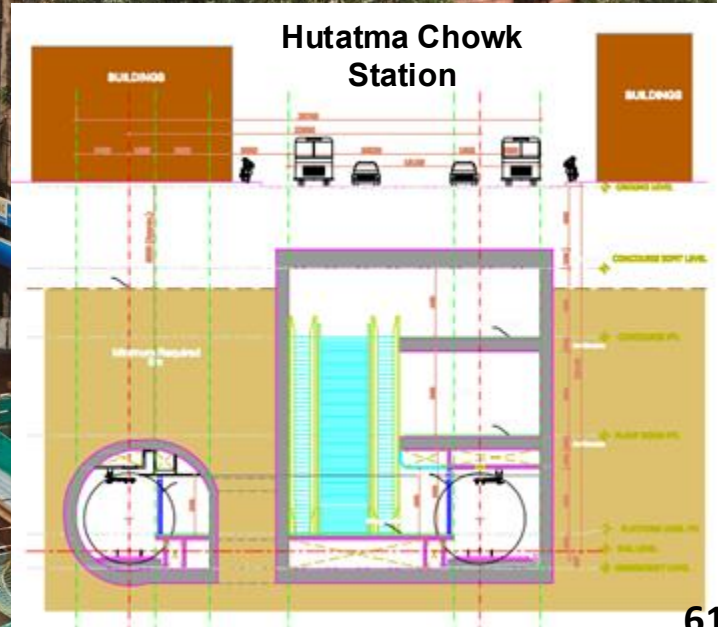
Muck disposal and logistics

Environmental challenges

Protests & litigations

Media and public perception

HUTATMA CHOWK



KALBADEVI STATION



KALBADEVI – K2 BLOCK



KALBADEVI METRO STATION – OPENING TO CENTRAL CAVERN FROM K2 BLOCK



Challenges



Safety practices followed

Strict Adherence to health safety and Environmental Norms of International standards
Regular Audit & safety Score



Talley Token for tunnel entry



Gas monitoring results at tunnel entry



Emergency contacts and site notices



Communication telephone



Rescue stretcher in TBM



Eye wash points in TBM



Rope lights along the barricading



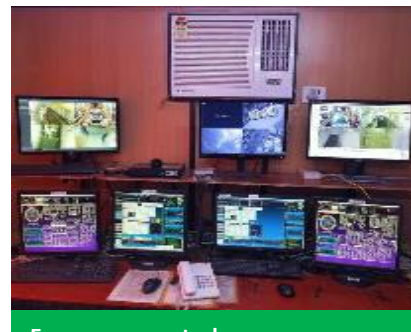
Self rescuer used in Tunnel



First aid box in TBM



Emergency equipment base for station



Emergency control room



Emergency alarm along tunnel



Demo scaffold for training



4 Hour capacity CCBA for ERT








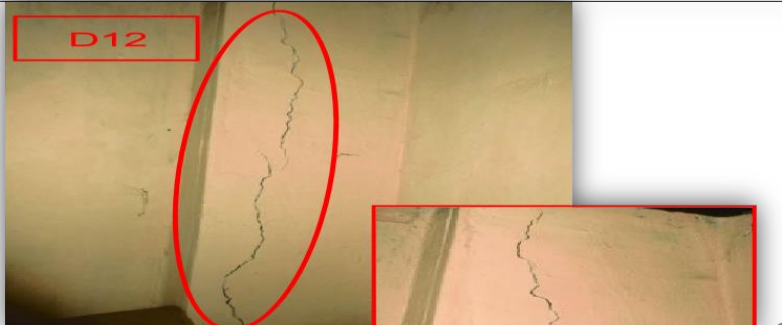
Challenges



Safety Challenge: Protocol Adopted by MMRC

- **Building Condition survey (BCS)** of all buildings in **influence zone of 50 metres** on either side of the alignment before commencement of work
- **Existing** creeks and **weaknesses are mapped** and recorded by experts
- Designers then evaluate the strength of these buildings to **assign allowable impact or serviceability limits.**
- Design of the stations and tunnel, excavation methods are decided keeping the allowable impact limits of existing adjacent buildings.
- **Protection and mitigation** to be applied in buildings where considered necessary

Building Conditions before commencement of work

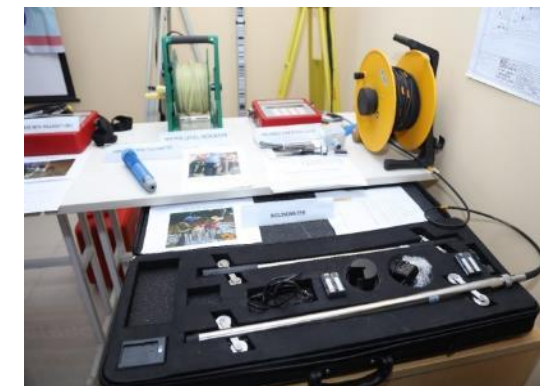
| Floor/Location/Area | Ground floor/ Room-1, Shop-5, Passage-2, Room | | |
|---|---|--|---|
|  <p data-bbox="229 585 1248 642"> Specific Location : Room-1, Ceiling Crack Size: Major spalled concrete (Exposed rebar) Photo ID: 16W 008-53, 16W 008-54 </p> | <p data-bbox="1095 585 1248 614">Wall: N/A</p> |  <p data-bbox="1312 585 2331 642"> Specific Location : Shop-5 Crack Size: Minor crack (~2.0 mm, ~0.3 m long) Photo ID: 16W 008-66, 16W 008-67 </p> | <p data-bbox="2165 585 2331 614">Wall: North</p> |
|  <p data-bbox="229 971 1248 1028"> Specific Location : Passage-2, Ceiling Crack Size: Major spalled concrete (Exposed rebar) Photo ID: 16W 008-99 </p> | <p data-bbox="1095 971 1248 999">Wall: N/A</p> |  <p data-bbox="1312 971 2331 1028"> Specific Location : Passage-2 Crack Size: Moderate damage Photo ID: 16W 008-100, 16W 008-101 </p> | <p data-bbox="2191 971 2331 999">Wall: SW</p> |
|  <p data-bbox="229 1356 1248 1428"> Specific Location : Passage-2 Crack Size: Moderate crack (~3.0 mm, ~0.5 m long) Photo ID: 16W 008-102, 16W 008-103 </p> | <p data-bbox="1095 1356 1248 1385">Wall: SW</p> |  <p data-bbox="1312 1356 2331 1428"> Specific Location : Room Crack Size: Minor crack (~2.4 mm, ~1.5 m long) Photo ID: 16W 008-135, 16W 008-136 </p> | <p data-bbox="2165 1356 2331 1385">Wall: East</p> |

Building Condition along alignment and Monitoring Instruments

| Sn | Description of item | Total In Nos. |
|----|---|---------------|
| 1 | Buildings Investigated | 2416 |
| 2 | Heritage Structures | 103 |
| 3 | Dilapidated Buildings | 2266 |
| | Very Severe | 48 |
| | Severe | 436 |
| | Moderate | 883 |
| | Very Slight/ Minor | 739 |
| | Negligible | 160 |
| 4 | Instrumentation & Monitoring @ buildings | 1723 |
| 5 | Building Supported | 124 |

Monitoring Instruments

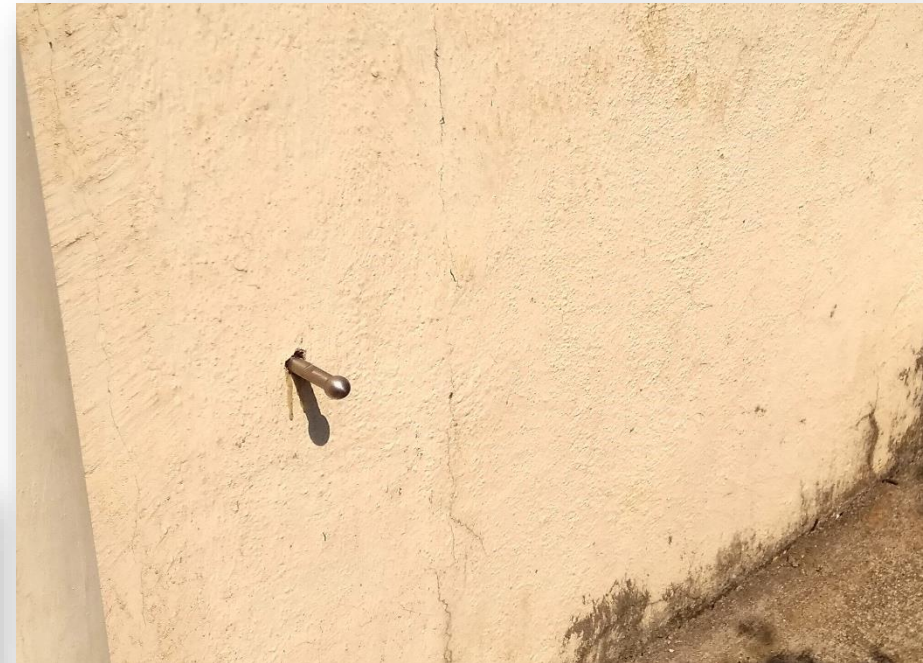
- Building Settlement Marker
- Soil Settlement Marker
- Pavement Settlement Marker
- Crack Meter, Inclinator
- Rod Extensometer, Piezometers
- Vibrating Wire, Tiltmeter
- Vibration & Noise Monitor/ Seismograph
- Total Stations & Targets, Load Cell & Strain Gauge
- Shotcrete Creep Test Equipment
- Water Stand Pipe
- Frequency of measurement would depend on the nature of the work.
- For heritage and weak buildings 24X7 Online monitoring will also be undertaken when considered necessary.



Instrumentation & Monitoring

Building Settlement point

To check the settlement of the structure during station construction



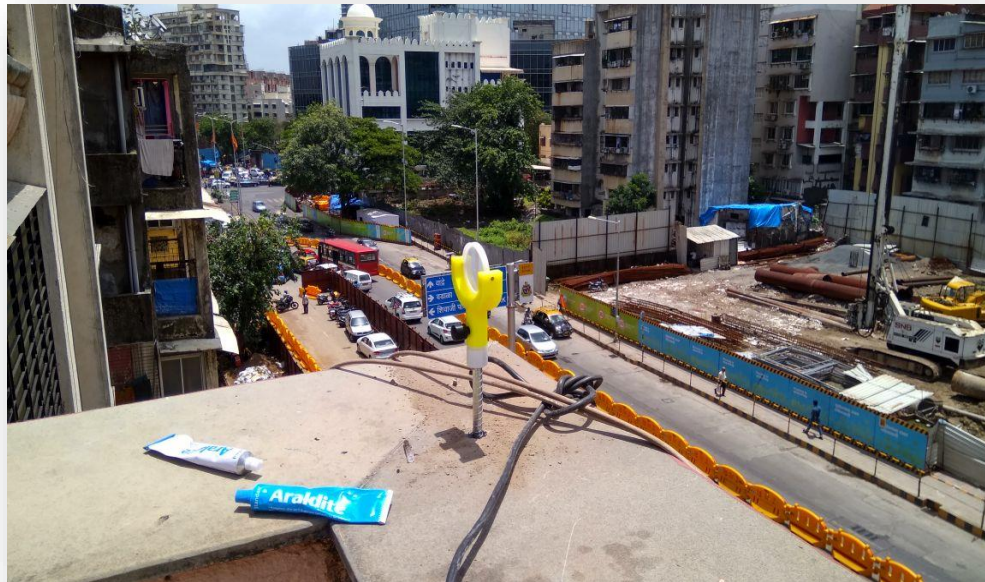
Crack meter

To measure the crack of the building structure



Tilt Plate

To measure the tilt of the building structure



Optical target

It measure the deviation of the building structure in three directions



Vibration monitor

To measure the vibration at nearest building structure during construction activity



Propping and supporting arrangement for building



**Propping
arrangement for
safety of building**



Challenges

Geology

Underground utilities

Traffic management

Land acquisition and rehabilitation of affected families

Approvals and permissions

Congested work areas

Safety: construction sites

Safety: buildings, monuments, infrastructure

Muck disposal and logistics

Environmental challenges

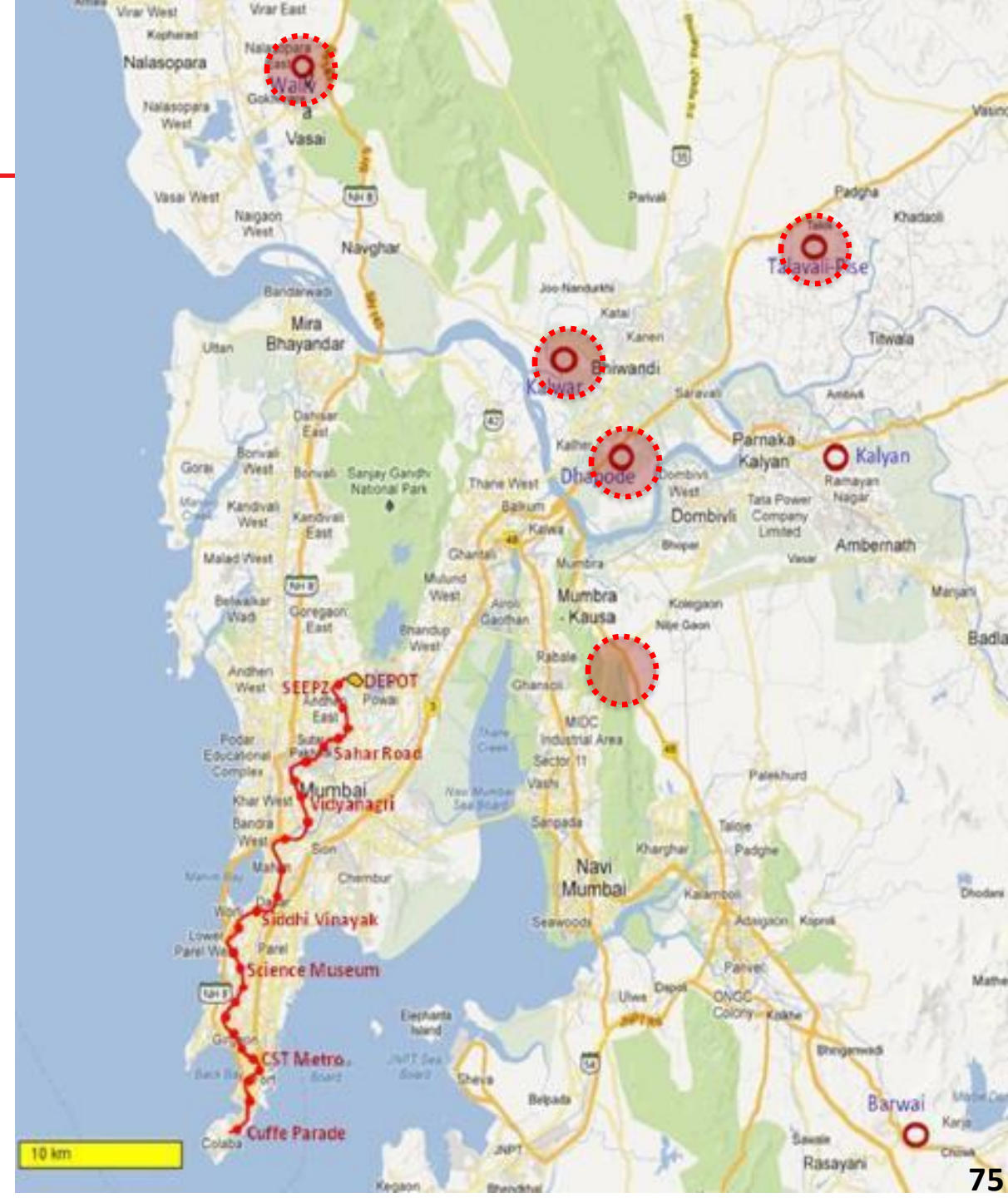
Protests & litigations

Media and public perception

Muck Disposal at farther distances

Project generated 8.5 Million Cum muck during construction of Stations and Tunnels.

Abandoned quarries (Govt. owned) were identified for muck disposal. These quarries were approx. **16 to 74 Kms** away from sites





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Environmental challenges

Protests & litigations

Media and public perception

Removal of Trees (Cut + Transplant) (3093 for stations and allied activities and 2574 at Depot & allied activities)

Mitigation Actions:

- Compensatory plantation + Plantation through CSR + Miyawaki Plantation= 33,023.
- 2931 number of grown-up trees at respective station sites after completion of works
 - MMRCL submitted undertaking dated 9th May 2017 in WP 814 of 2017 to plant equivalent number of trees that would be affected at station sites / allied activities and green cover to extent of 95% of area would be restored after completion of station construction work.
 - Total Trees- 2931; 26 u/g stations; Total Tree species– 29
 - Trees Growing period at nurseries – 4 years; Maintenance – 3 Years at Station sites.
 - **Total Trees In-situ planted -1319 at station sites and 20 trees planted under public appeal till 20 November 2025 .**
- Transplantation : 1,952 .





Photographs of Tree Package 19, 20 and 21 at Holding Nurseries



Tree Transplantation



MMRC



Air, Water, Noise Pollution during Construction

Mitigation Actions:

- High Standard Housekeeping
- Benchmark survey
- Realtime monitoring

Environmental Measures during Construction

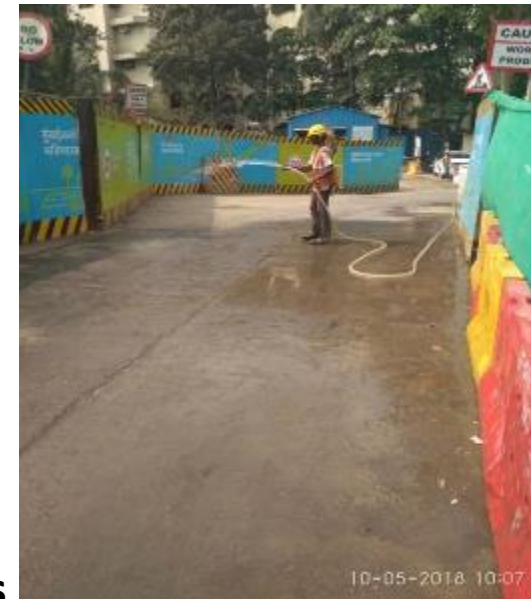
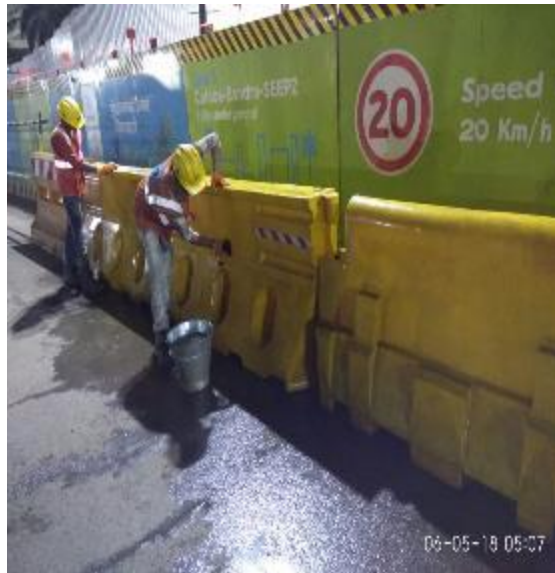


Enclosed work areas



Wheel Washing Plant

Environmental mitigation Initiatives: House keeping



Barricade cleaning at all station / RMC locations



House keeping at Mid shaft Pali ground

Environmental Measures during Construction



Air Quality Monitoring





Challenges

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and rehabilitation
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permissions

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areas

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construction sites

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infrastructure

Muck disposal and
logistics

Environmental
challenges

**Protests &
litigations**

Media and public
perception

- Protest by Project Affected People (PAPs)
- Protest by elite groups with NIMBY attitude
- Opposition by environmentalists, activists & certain citizen groups.
- Opposition by political parties/ leaders

Litigations

Number of cases -168

(Supreme Court -09 , Bombay High Court -109, City Civil Court -28, other courts -22)

Number of cases where stay order was passed – 16

(High Court 14, NGT -1, Supreme Court -1 (group matters))

MUMBAI METRO LINE 3 COMMISSIONING



**Phase-1: Inauguration
by Hon'ble PM on 05/10/24**



**Phase - 2A: Inauguration
by Hon'ble CM & DCM on 09/05/25**



**Phase-2B: Inauguration
by Hon'ble PM & CM on 08/10/25**

Ridership Details

| | |
|---|---------------------------|
| Total Passengers travelled (7 th Oct 2024 to 26 th Nov 2025) | 2,00,43,752 |
| Average Passengers per day (9 th October 2025- 26 th Nov 2025) | 1,47,495 |
| Maximum daily ridership achieved | 1,82,461 (on 16.10.25) |

Project Progress









03.06.2024 12:04









CROSS OVER AT SAHAR



SAHAR CROSSOVER

AAREY DEPOT WORKSHOP



TERMINAL -2



CONCOURSE LEVEL



| गंतव्य / Destination | प्लेटफॉर्म / Platform | वेळ / समय / Time |
|----------------------|-----------------------|------------------|
| आरे जेव्हीएलआर | 2 | 14:03 |
| आरे जेव्हीएलआर | 2 | 14:03 |

Welcome to SAHAR R D Station



स्टेशन नियंत्रण कक्ष
Station Control Room

ग्राहक सेवा
Customer Care

TERMINAL -1

←  लिफ्ट
Lift   ↖

बाहेर
Exit

Chhatrapati Shivaji Maharaj
International Airport - T1

←  लिफ्ट
Lift  →

PLATFORM LEVEL



FIRE
EXIT



बाहेर
Exit



बाहेर
Exit



BANDRA COLONY

| गंतव्य / Destination | कोच / Coaches | वेळ / समय / Time |
|----------------------------------|---------------|------------------|
| KOTAK-वांद्रे-कुर्ला कॉम्प्लेक्स | 8 | :08 |
| KOTAK-बांद्रा-कुर्ला कॉम्प्लेक्स | 8 | :08 |



PLATFORM LEVEL



MMRC
KOTAK - Bandra -
Kurla Complex

3

→

सावधान

SHITLADEVI







FIRE EXIT

Warning signs and symbols on a black signpost, including a lightning bolt symbol and various prohibition signs.





↑ बाहेर Exit

↑ बाहेर Exit

बाहेर Exit

2

www.mta.co
Dusse Purwaha











ग्राहक सेवा
Customer Care
MMRC

FIRE
EXIT

Accessibility and direction signs: wheelchair icon, downward arrow, and red prohibition symbols.

LIC
Life Insurance Corporation of India

↑↑
THIS SIDE UP

SWISS MILITARY
↑↑
THIS SIDE UP



MUMBAI METRO 3 NCMC CARD



FEATURES

Enables contactless entry at Metro Line 3 stations

Same card can be used on Metro Lines 1, 2A & 7, buses and metro networks in other cities

NCMC cards issued by Metro Lines 1, 2A & 7 and other transport operators are compatible and rechargeable at Metro Line 3 stations

MUMBAI METRO 3 NCMC CARD



FARE STRUCTURE

Fares on Line-3 will be charged as per the regular fare slab

Fare will range from ₹ 10 to ₹ 60 between Aarey JVLR and Acharya Atre Chowk station

Stay Connected Underground!

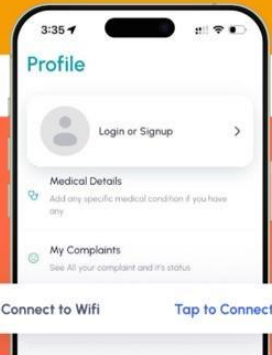
01 Install & Login

Download & install the MetroConnect3 app and login before entering the station.



02 Connect to Wi-Fi

Go to your phone's Wi-Fi settings and select MetroConnect3 Public Wi-Fi.



03 Free Wi-Fi Inside!

Open the MetroConnect3 app, goto profile & tap Connect to Wi-Fi, and you're done!

Fast, Reliable, Secure

24X7 Customer Support 180 022 0221

@ contact@mmrc.com www.mmrc.com



GET THE APP NOW



Mumbai Metro Line 3

To buy MMRCL QR tickets on
WhatsApp,
Scan this QR code



+91 98730 16836
Send 'Hi' message

Buy MMRCL Line 3 Tickets Hassle Free!!

Scan this QR code to purchase
QR Tickets on WhatsApp







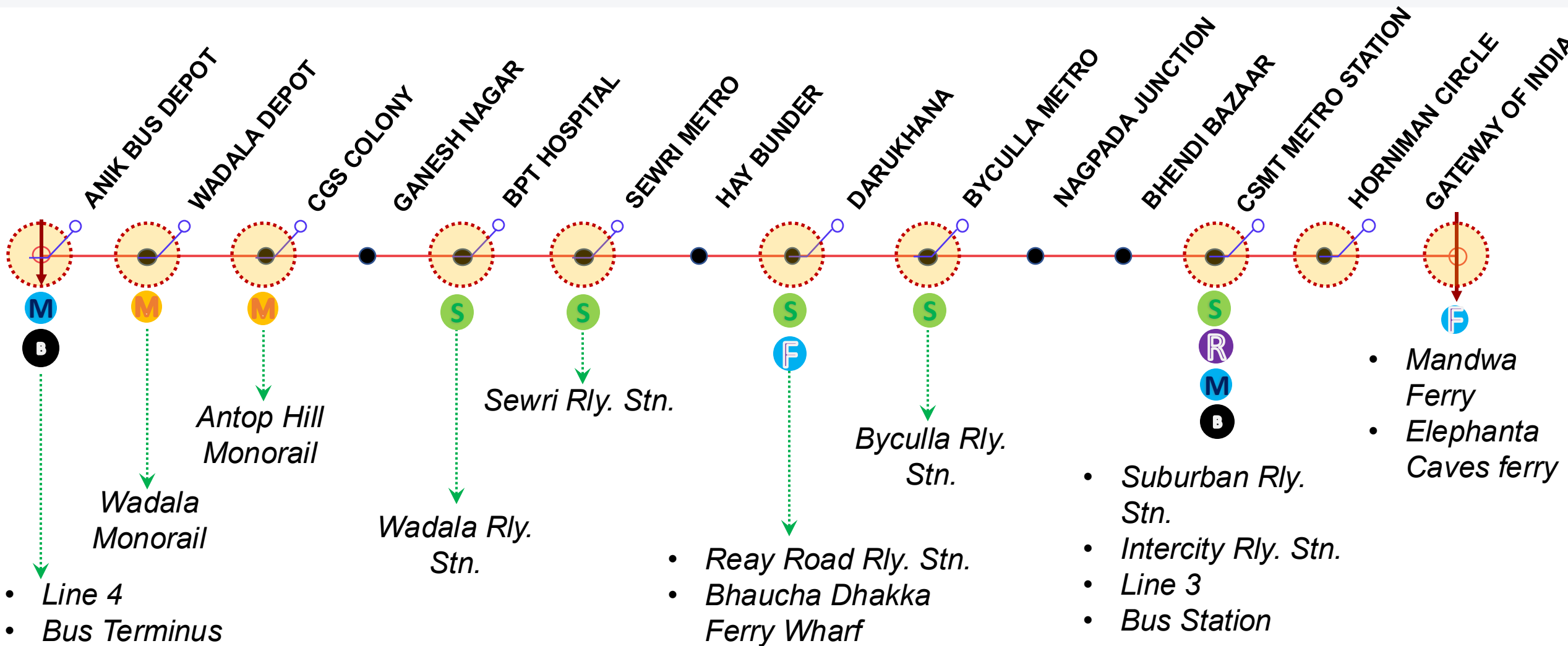
Mumbai Metro Line-11 (Anik Depot to Gateway of India)


Line 11 (Anik Depot- Gateway of India)



- **Alignment Length** : 17.51 km
(U/g 16.833km and At-grade 0.667km)
- **Total Stations (Nos.)** : 14 stations
(1 At-Grade and 13 U/g)
(8 cut & cover, 5 NATM)
- **U/g Average Depth** : 20.0m to 22.0m
- **Depot Location** : Anik Depot (16 Ha)
- **Land Requirements** : Permanent- 22.72ha
(Govt.- 20.35 ha, Private- 2.37 ha)
Temporary- 19.55ha
(Govt.- 17.08 ha, Private- 2.47 ha)

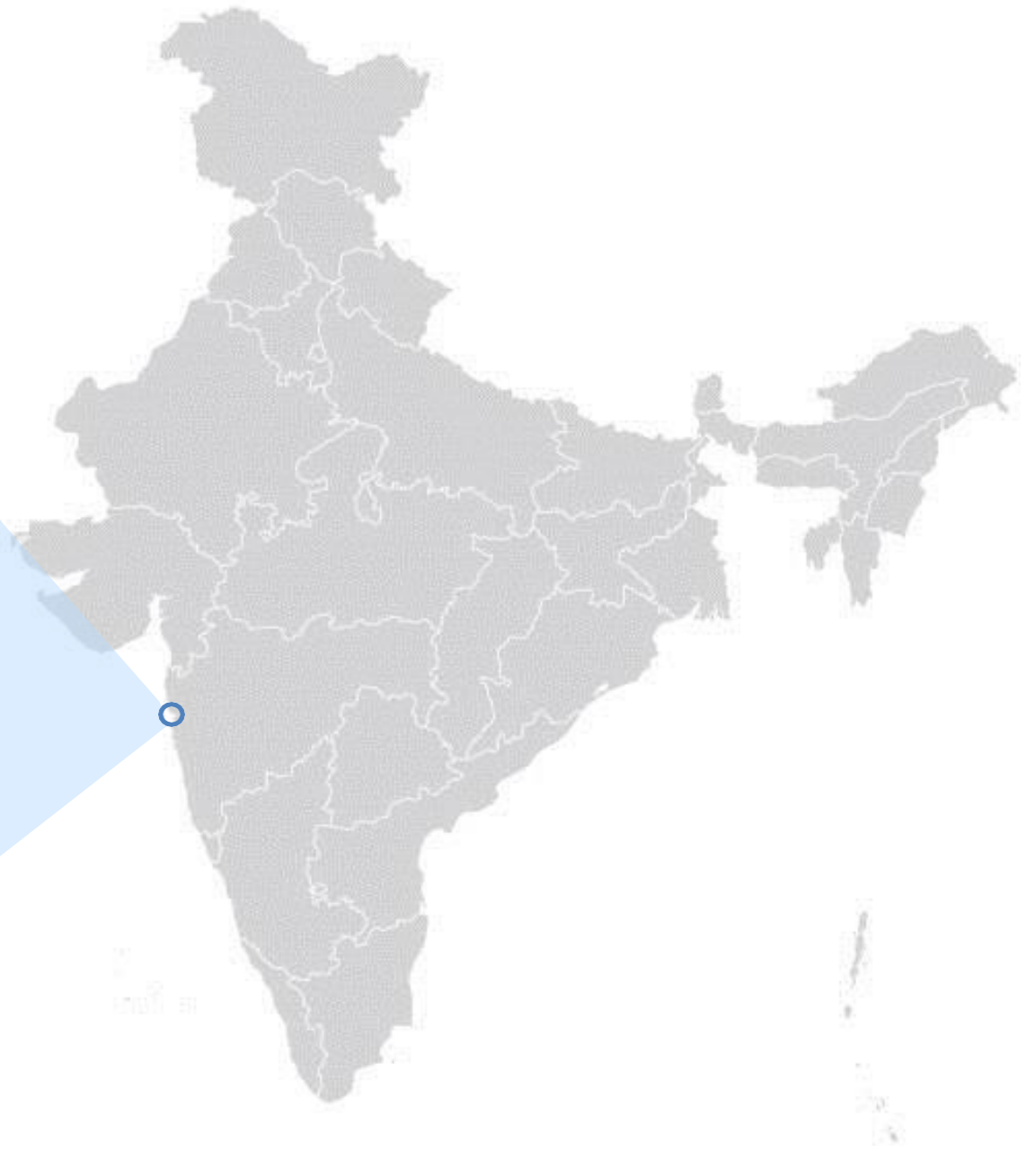
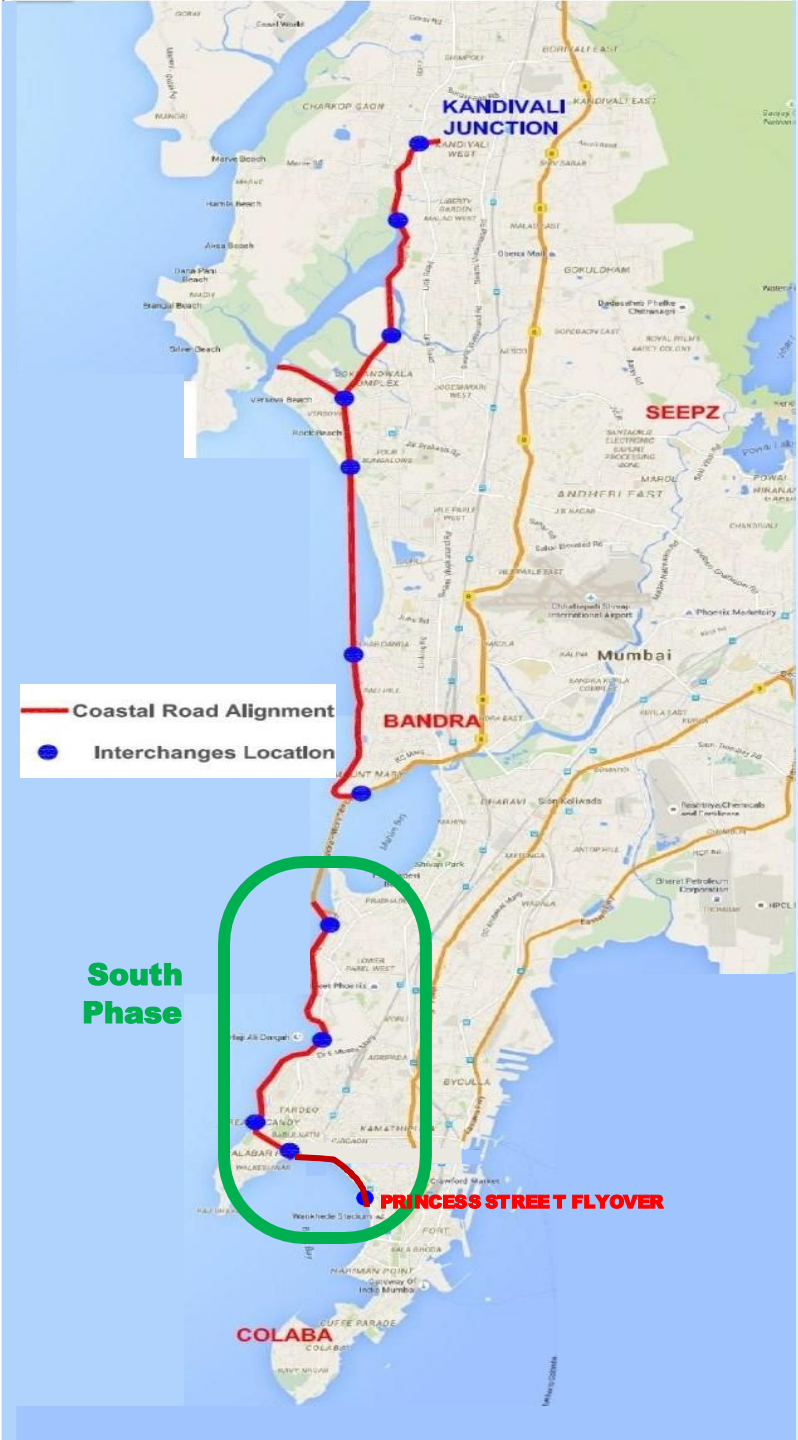
Multimodal Interchanges



-  Suburban Railway Interchanges
-  Metro Interchanges
-  Intracity Bus Station
-  Monorail Interchange
-  Intercity Rail
-  Ferry Wharf/ Ferry



Coastal Road (South)



Highlights of the project

India's largest diameter 12.19 m Tunnel Boring Machine (TBM) is being used to bore the tunnels

Diameter is equivalent to 4 storey building

First time in India, Saccardo Ventilation System will be installed in road transport tunnels.

Saccardo Ventilation system in which Saccardo Nozzles introduce air jet into a tunnel at a high velocity. This air jet imparts most of its momentum to the Tunnel air & hence helps to drive the tunnel air in desired direction

First time in India, the bridge will be constructed on the Monopile foundation

Monopile is large diameter single pile instead of group of piles in foundation of bridge – this technology reduces time & cost of construction, is eco friendly owing to less disturbance to sea bed, and is noise free working).

Multiple complexities and variety in a single project

There is a road on reclamation, bridges, interchanges, tunnels undersea as well as hills, the creation of green open spaces, etc.

Projected traffic of Avg 45,000 PCU* per day, in each direction

60,000 PCU at Bandra - Worli Sea Link end.

30,000 PCU from Priyadarshani Park at Napean Sea Road to Princess Street Flyover end at Marine Drive

Traffic reduces towards Priyadarshani Park through Interchanges

Project Timeline

Concept & Planning

- **1967** : Costal Road was shown in Sanctioned Regional Development Plan of Mumbai as West Island Freeway
- **2008** : CTS for MMR region recommended a Highway Corridors on the Western Coast
- **2016** : GC appointed
- **2017** : Receipt of All State & Central Statutory Permissions

Project Milestones :

- **2018 (Aug)** : Administrative approval by Standing Committee ,BMC
- **2018 (Oct)** : LOA issued to all Civil Contractors as Design & Build Project
- **2019 (July)** : High Court stopped Coastal Road Project
- **2019 (Dec)** : Supreme Court revoked the order of High Court
- **2020 (Mar)** : Work Commenced

Project Commissioning :

- **2024 (March)** : South bound traffic commenced from Worli upto Marine Drive
- **2024 (June)** : North bound traffic commenced from Marine Drive upto Haji Ali
- **2024 (July)** : North bound traffic commenced from Haji Ali upto Worli Sea face
- **2024 (Sept)** : North Bound Worli Sea Face to Bandra Worli Sea Link (BWSL) via Bow String Arch Bridge
- **2025 (Jan)** : South bound traffic commenced from BWSL to Worli Sea Face via Bow String Arch Bridge
- **2025(May)** : Remaining arms of Worli & Hai Ali Interchange

Reclamation

Sea Walls

Promenade

Casting Yards

Cut & Cover

Tunnel Boring
Machine

Tunnels

Utility Boxes

Pedestrian
Underpasses

Ramps

Monopiles

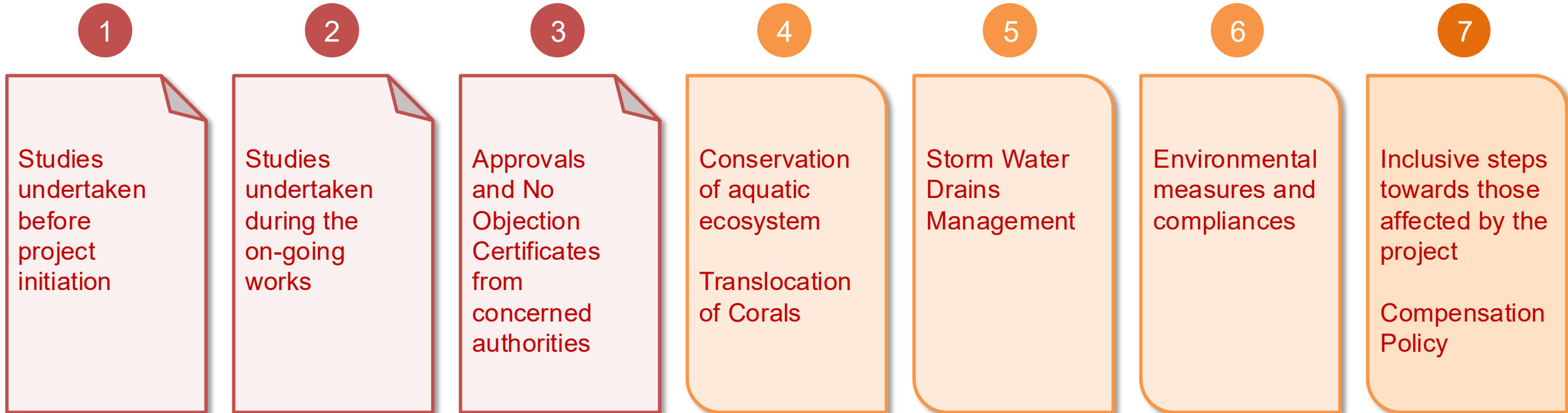
Launching
Girders

Bridges

Interchanges

Green Spaces
Concepts

Rigorous studies and efforts



Studies undertaken before project initiation

1. Inception Report
 2. Feasibility Report
 3. Detailed Project Report (DPR)
 1. Executive Summary
 2. Main Report
 3. Economic & Financial Analysis Report
 4. Engineering Report
 1. Topography Survey Report
 2. Geotechnical Report
 3. Traffic Studies Report
 5. Design Report
 1. Alignment & Pavement Design Report Part 1
 2. Bridge & Tunnel Design Report Part 2
 3. Reclamation & Urban Design Report Part 3
 4. BRTS & Construction Methodology report Part 4
 6. Drainage Design Report
 7. Material Investigation Report
 8. Social Impact Assessment Report
 9. Tunnel Safety & Services Report
 10. Environmental Impact Assessment Report
 11. Risk Assessment & Disaster Management Plan
4. Studies on extreme waves, extreme water levels, storm surge, tsunami height and Coastal morphology for Coastal Road project by National Institute of Oceanography, Goa.

Approvals & No Objection Certificates

**In order to process the Request For Proposal (Tenders),
BMC project team obtained NOCs from the following 19 authorities**

1. Ministry of Environment & Forest, Climate Change, Government of India
2. Maharashtra Coastal Zone Management Authority
3. Maharashtra Maritime Board
4. Public Works Department
5. Maharashtra State Road Development Corporation
6. Joint Commissioner of Police (Traffic)
7. Commissioner of Fisheries
8. Indian Navy
9. Coast Guard
10. Tree Authority
11. Mumbai Heritage Conservation Committee
12. Mumbai Port Trust
13. High Power Committee – Girgaon Chowpatty
14. Coastal Port Engineer
15. Tri-member Committee – Marine Drive
16. Revenue Dept. Govt. of Maharashtra
17. Collector, Mumbai City
18. Coastal Police Mumbai
19. Fire Brigade, Mumbai

Translocation of Corals

- Total 18 colonies of corals covering area of 0.251 sq.m. were found in Worli region. They were successfully translocated to Worli distance about 130m from the Project activity area
- The area coverage of Corals in Haji Ali were 0.11 sq.m. which was translocated successfully at an intertidal region of Navy Nagar Colaba, Mumbai.
- The translocation of corals have been executed by experts from NIO in the presence of representatives from Additional Principal Chief Conservator of Forests, Mangrove Cell.



Social inclusion

Impact on fishermen community at Worli and Haji Ali

Assessment of impact on their livelihood with the help of TISS

Calculation of compensation using SDG framework

Direct Transfer of compensation to bank accounts of affected families

Change in bridge design and enhanced span to mitigate the concerns related to movement of their boats















POLICE

POLICE

MH-01-AN-1335

शिवली रस्ता मार्गे
सांदे / सिव्हागड
/ Bandra / Airport
Via. Coastal Road

5.5m



KEEP LEFT



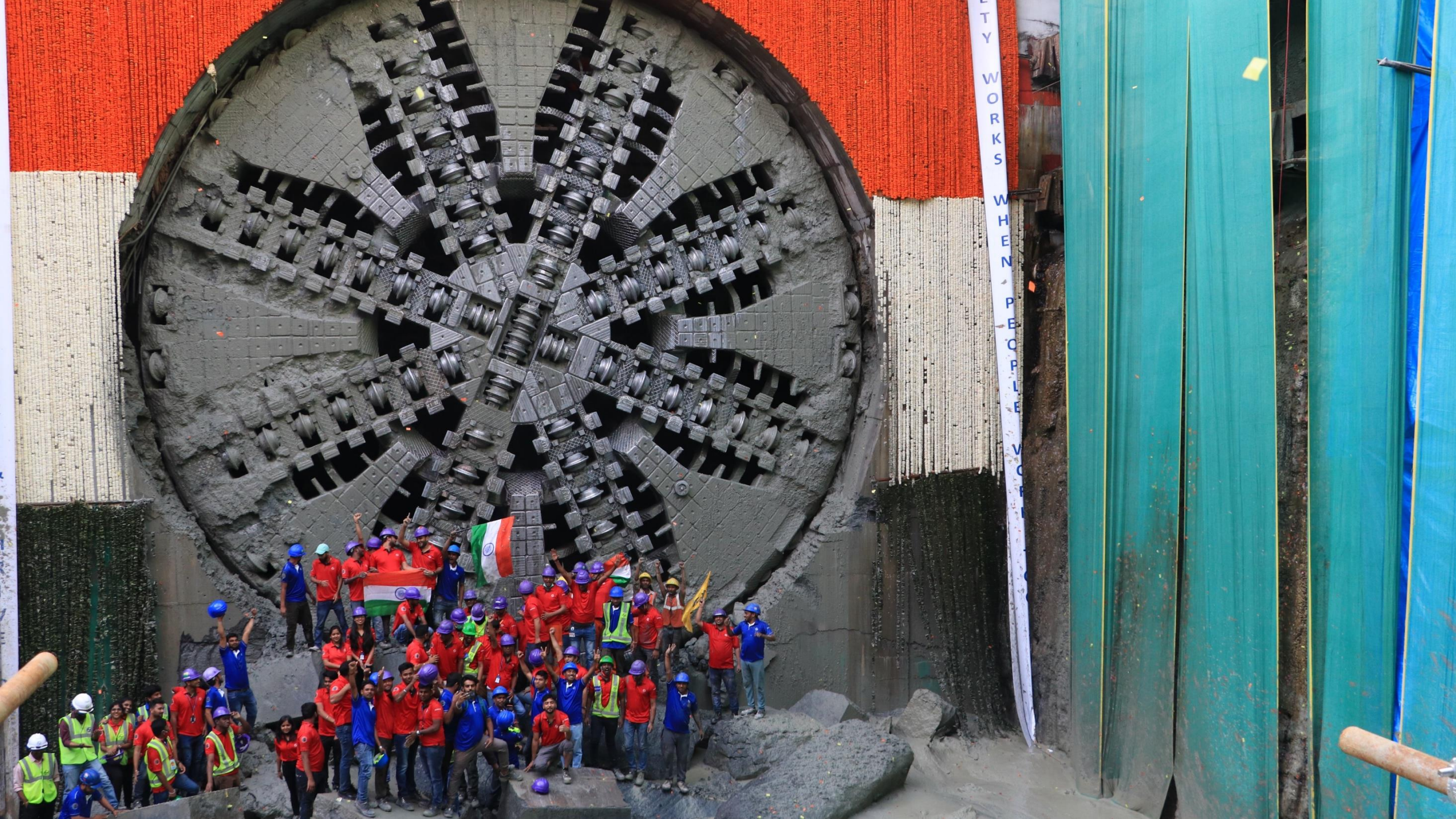


भुलाभाई देसाई मार्ग
Bhulabhai Desai
Road

5

6-10
6*120





The recipe for the successful project delivery

Adequately empowered leadership team

Dedicated and skilled work force

Team building and empowering the team through systematic power delegation

Quick decision making avoiding unnecessary delays and ambiguity

Regular and rigorous reviews and site visits at all levels

Transparency, commitment and professionalism

Pre project preparation

Use of technology and professional project management tools

Constant engagement with stakeholders

Problem solving approach

Effective use of social media and engagement with citizens

Strong Political Will and Vision



Thank You