मेट्रोची गरज- शाश्वत विकास

अश्विनी भिडे
व्यवस्थापकीय संचालक, मुंबई मेट्रो रेल कार्पोरेशन

लोकमान्य सेवा संघ, पार्ले

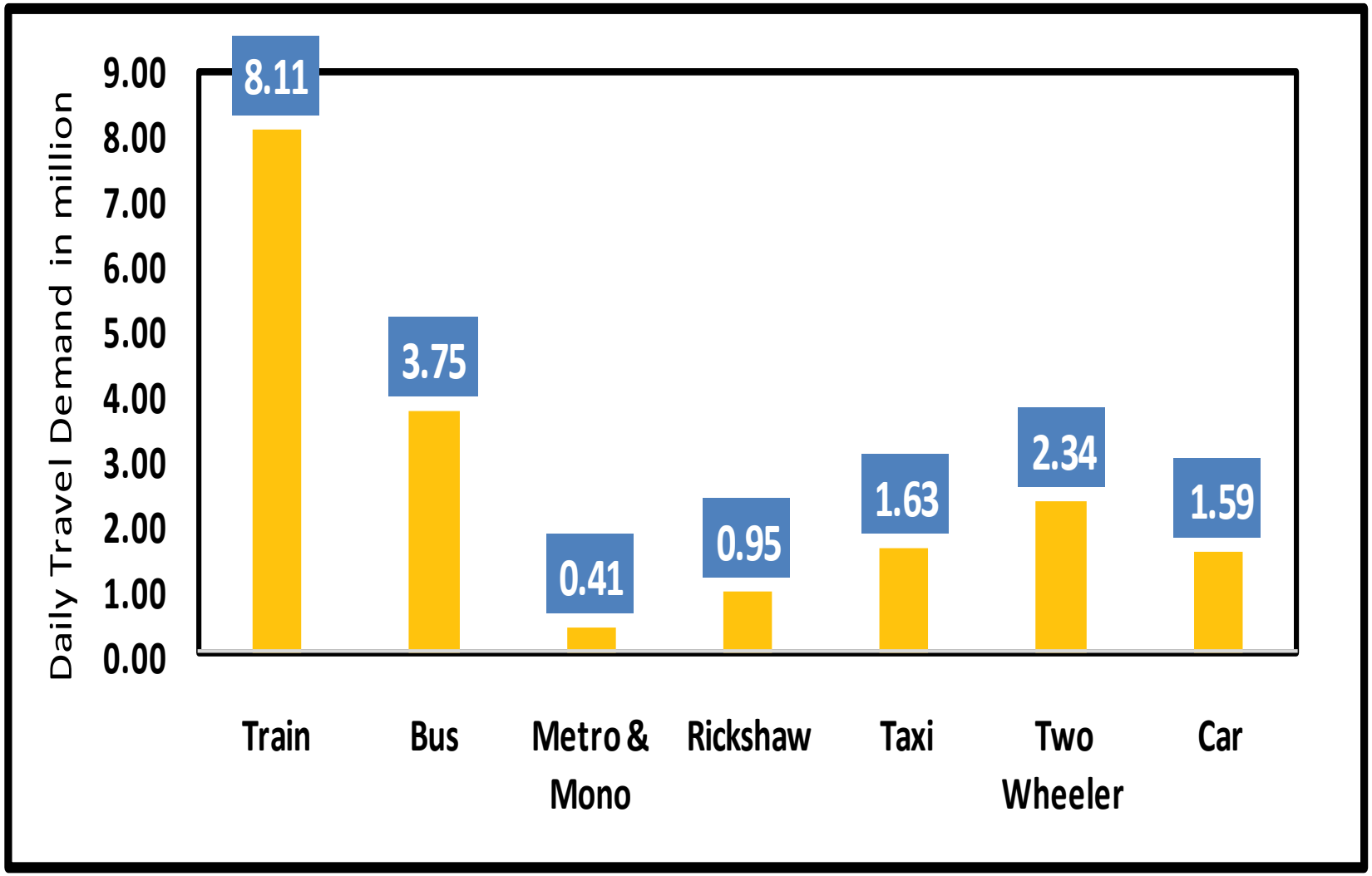
दिनांक - २० सप्टेंबर २०१९

Why Metro?

Mumbai Traffic Scenario

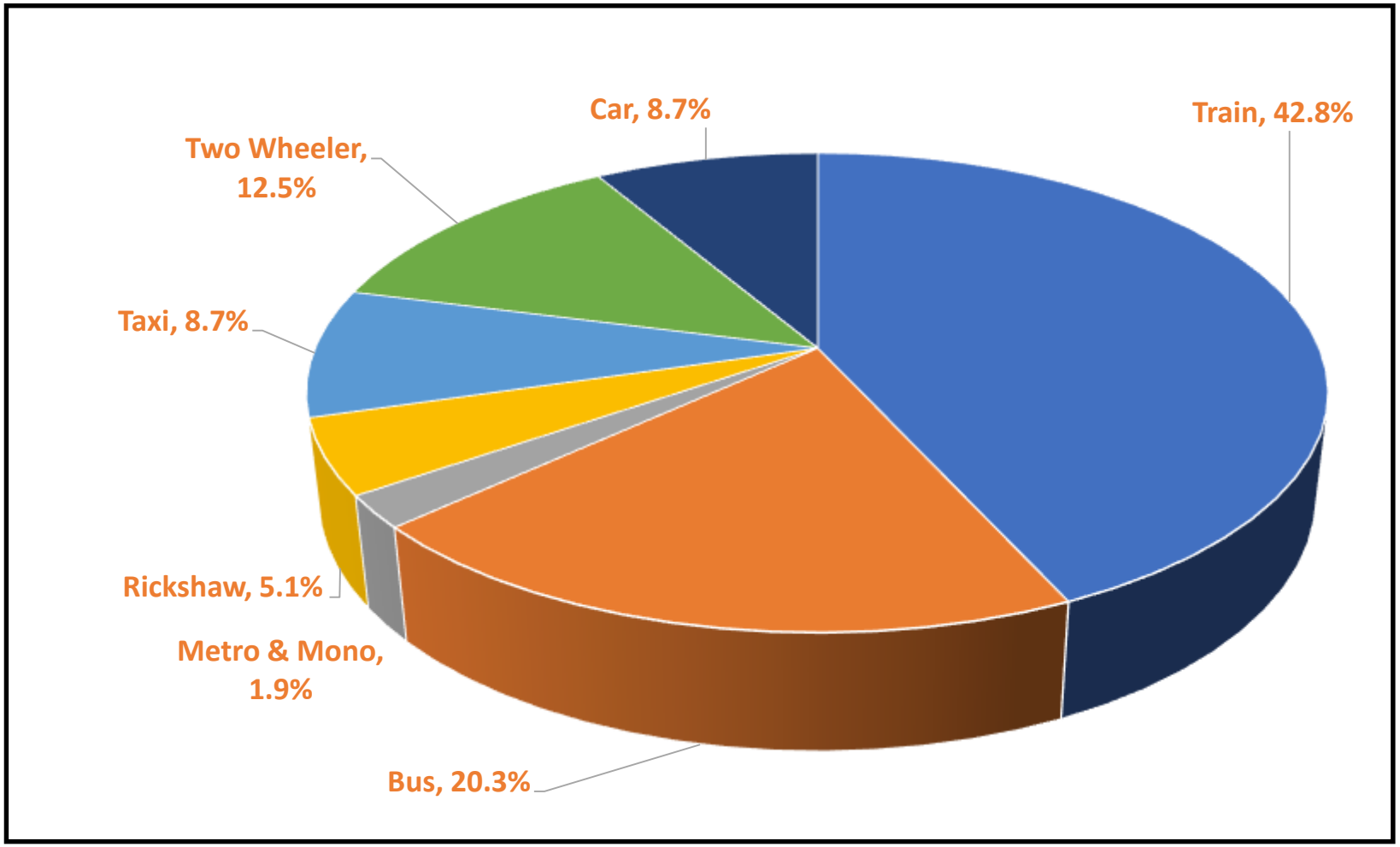
- **Mumbai Suburban :**
  - 80 Lakh people travel daily with
  - Super crush density of 12 passengers/sq.mt.
- **BEST:**
  - 38 Lakh people travel daily
  - Average speed 8-10 km/Hr
- **The Modal Share of Public Transportation**
  - 88% in 1991
  - 78.1% in 2005
  - 65.3% in 2017
- **Increase in private vehicles :**
  - 23 Lakh (2005) to 72 Lakh (2017).

Mumbai Traffic Scenario 2017



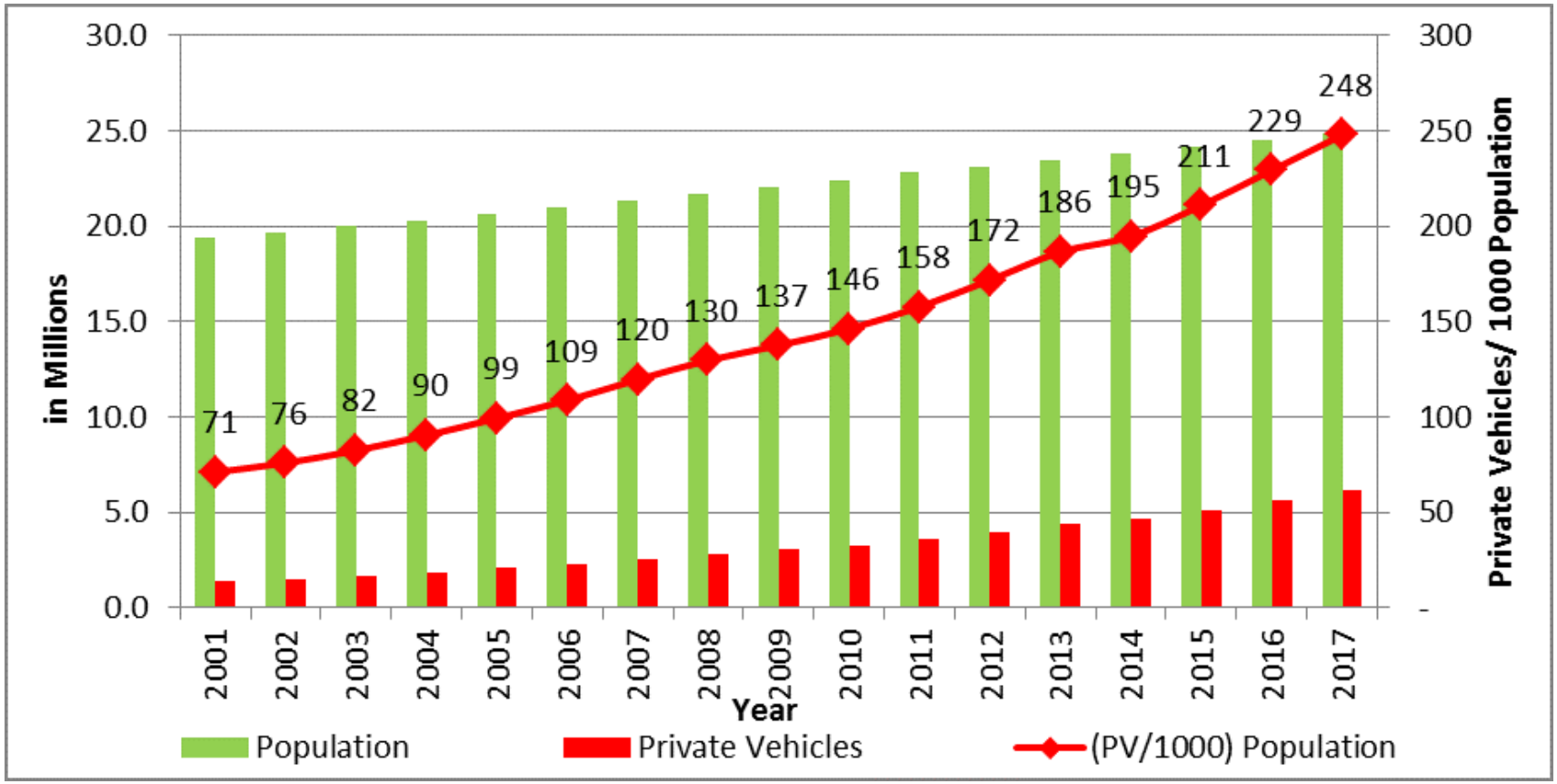
* Source: CTS for Mumbai Metropolitan Region (MMR)- Jan 2019, MMRDA

Mumbai Traffic Scenario 2017



* Source: CTS for Mumbai Metropolitan Region (MMR)- Jan 2019, MMRDA

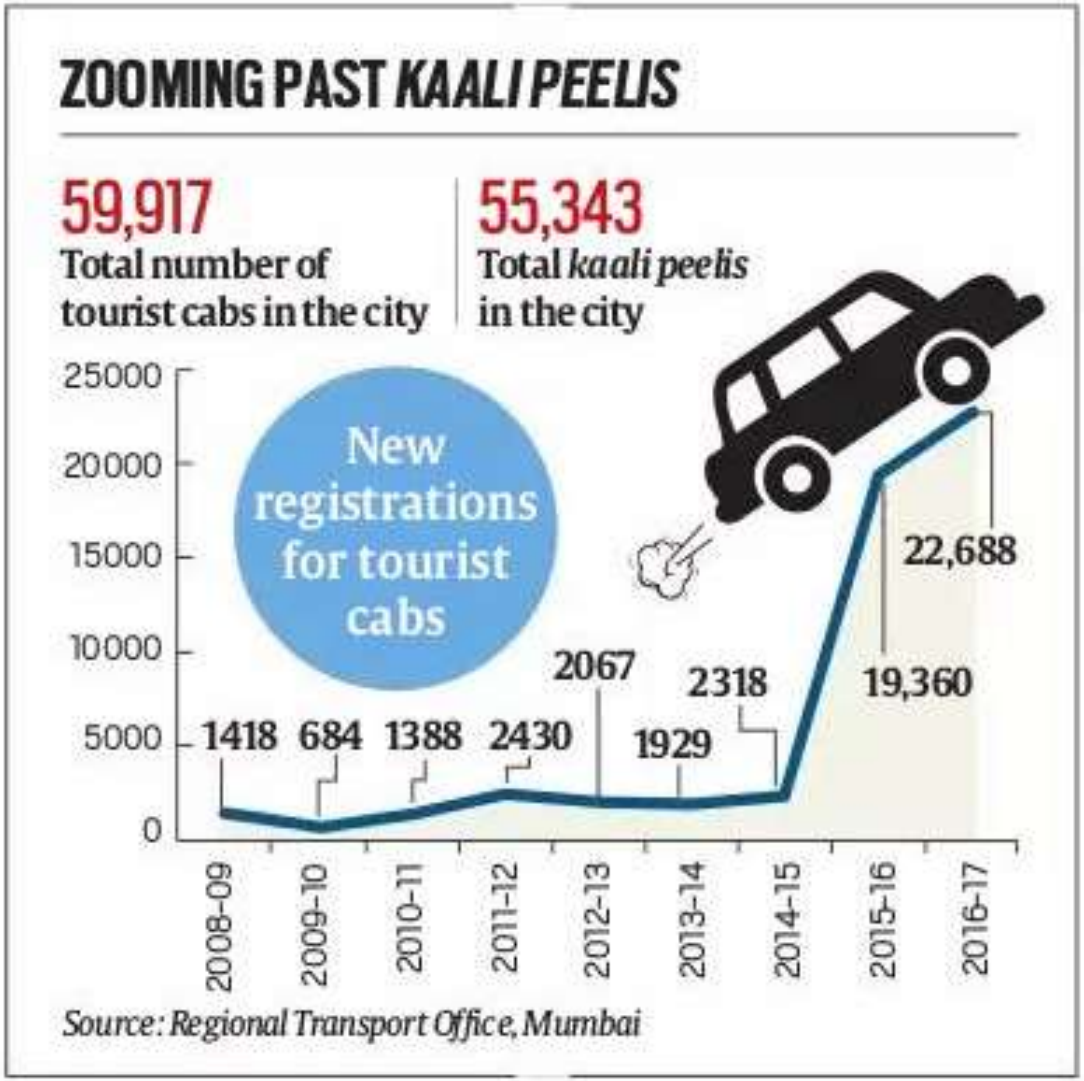
Private vehicle Population of MMR, Veh/1000 persons



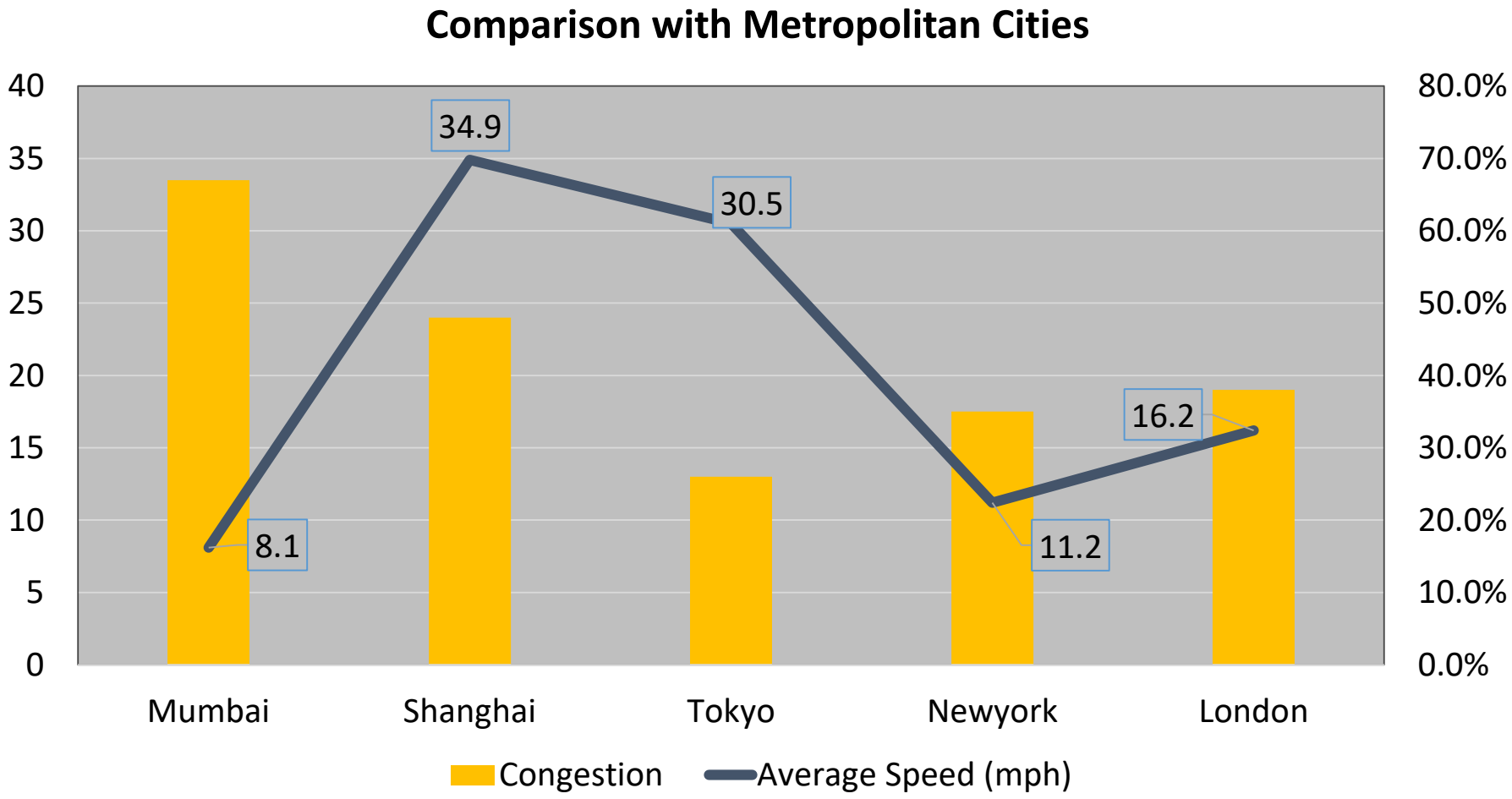
* Source: CTS for Mumbai Metropolitan Region (MMR)- Jan 2019, MMRDA

Rise of App-Based Cabs in Mumbai

- **Traditional Taxi/Auto** service quality, operators behavior articulated commuters to prefer app based services that offer;
- Popularity soared despite surge pricing.
- Resulted into more vehicles on the road



Mumbai Traffic Congestion and Average Speed



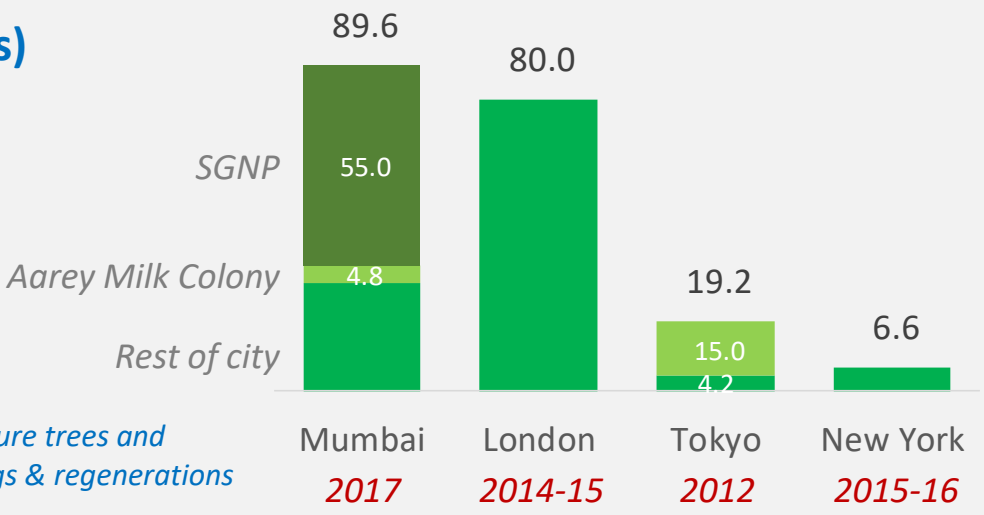
* Source: CTS for Mumbai Metropolitan Region (MMR)- Jan 2019, MMRDA

First the good news

Mumbai has higher green cover than any other mega city

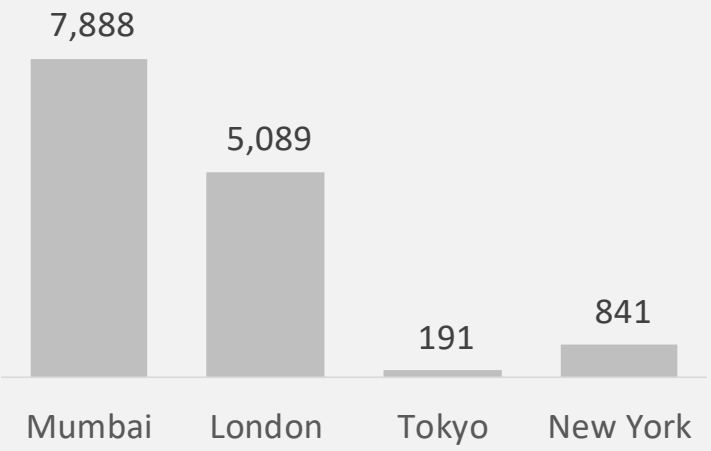
MMRC

Trees (in lacs)



SGNP has ~55 lac mature trees and additional 3.5X saplings & regenerations

Trees per Sq. Km.



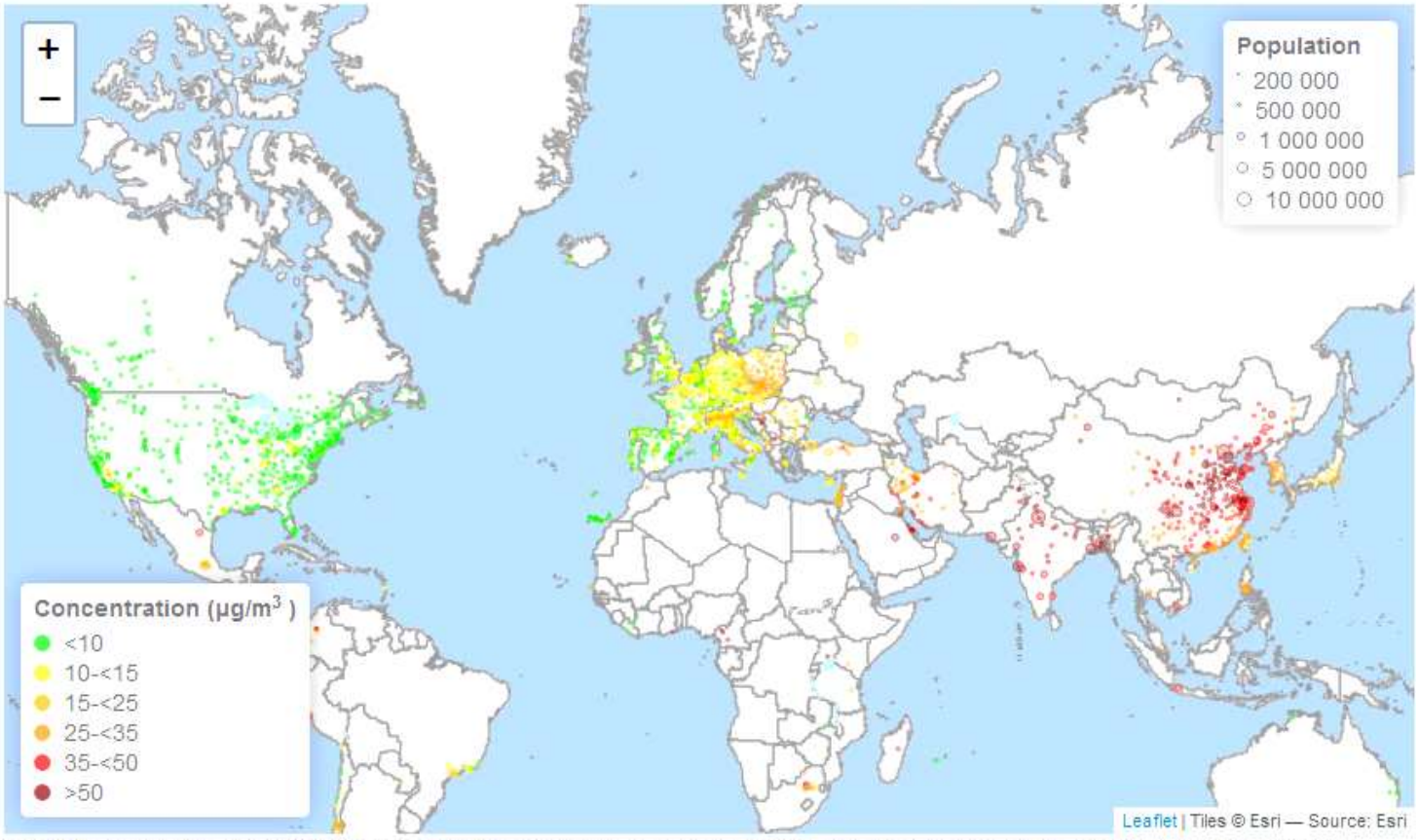
Source:

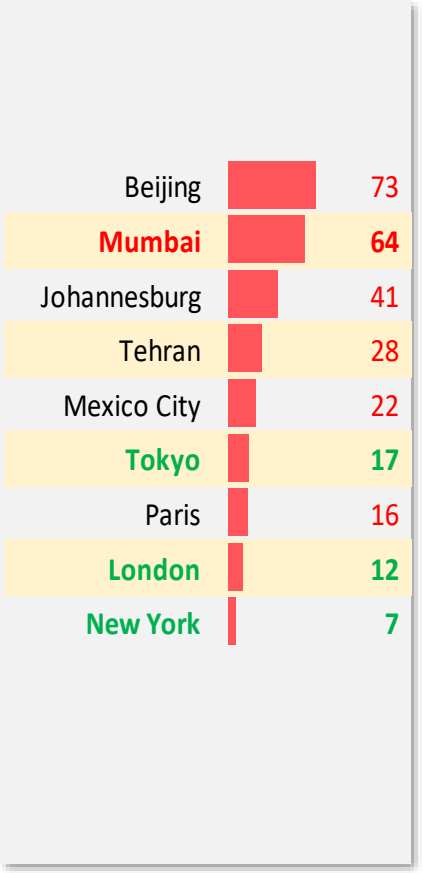
- Mumbai: Tree census 2017 by MCGM. Article published on Dec, 21, 2017 in Asian Age by Sonali Telang quoting tree census data of Mumbai.
- Article published in The Asian Age dtd 8th Sept, 2019.
- Tokyo: The Urban Forest of Tokyo(Article published online on 27.3.2012 by Sheauchi Cheng, Keizo Fukunari and Joe R. McBride)
- London: Data taken from London Datastore
- New York: Tree count 2015-16 street tree census inf on official web ofnew york city department of parks and recreation. Nycgovparks. org/trees/treescount.

Despite excluding 55+ Lacs SGNP trees

Despite this Mumbai is amongst the most polluted mega city

PM2.5 Concentrations in cities across the World in 2018 (Source: WHO)





In micrograms per cubic meter

Air pollution & # vehicles in Mumbai have grown rapidly

More vehicles on road > More time to travel due to congestion and long distances > Poor public transport

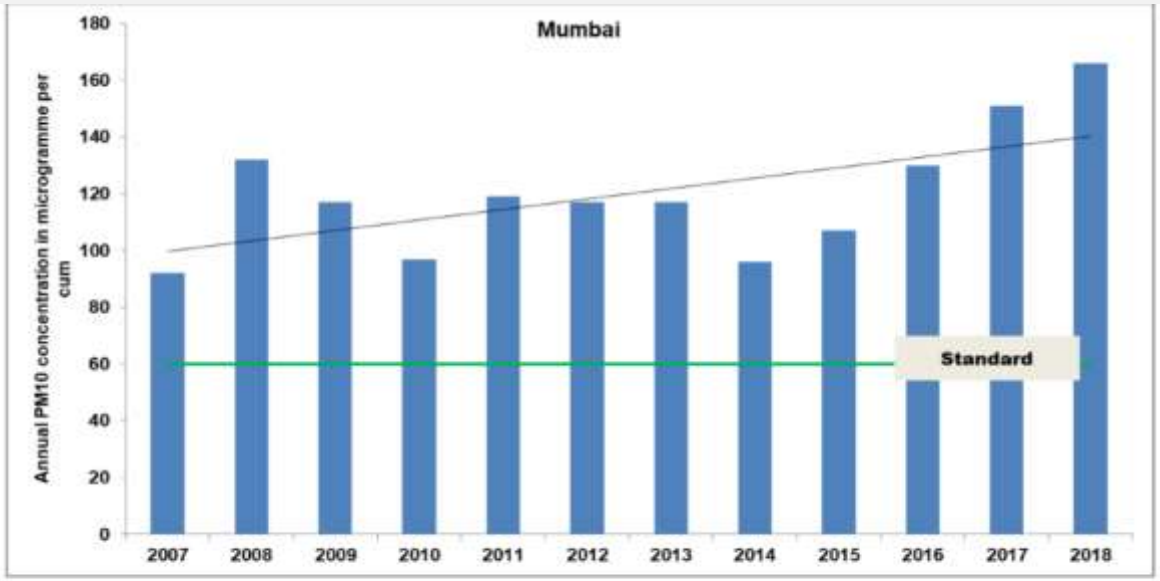
Year	# Vehicles (lacs)
2016	28.2
2015	25.7
2014	23.3
2013	21.9
2012	20.3
2011	18.7
2010	17.7
2009	16.7
2008	16.1
2007	15.0
2006	13.9
2005	13.0
2004	12.0
2003	11.2
2002	10.7
2001	10.3

Source: MoRTH Statistics

Before Ola, Uber Era

Transport Emissions

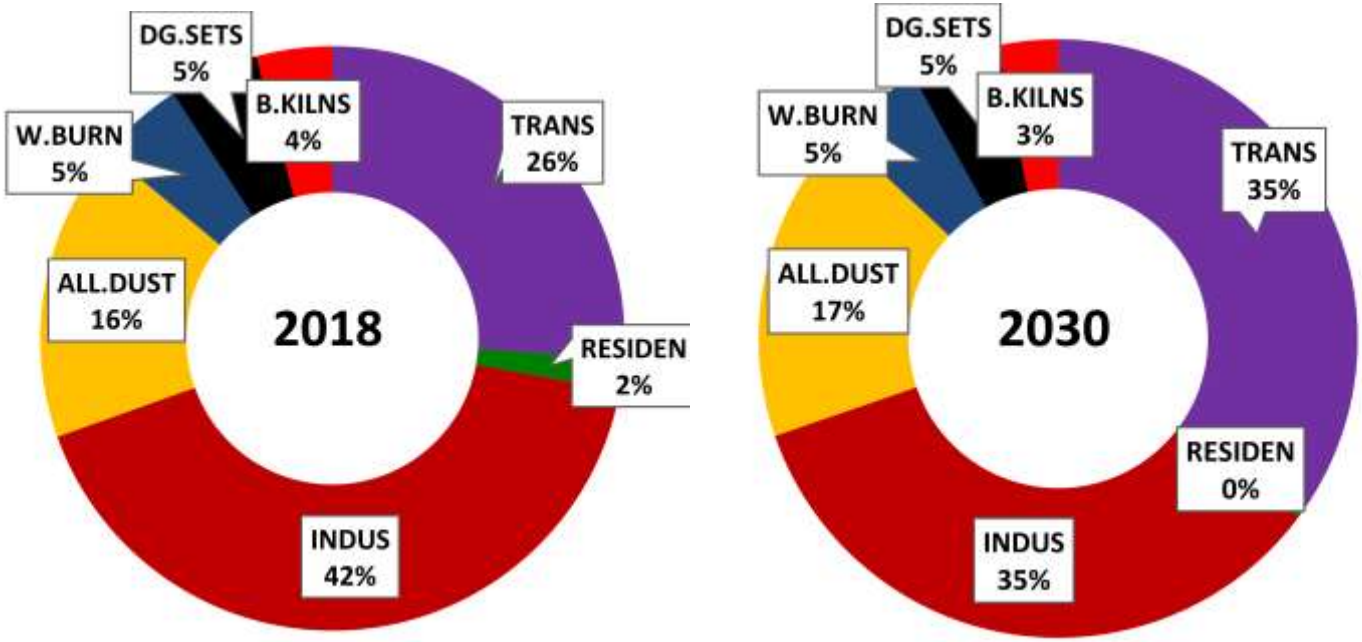
PM 2.5	PM 10	NOx
19%	11%	29%

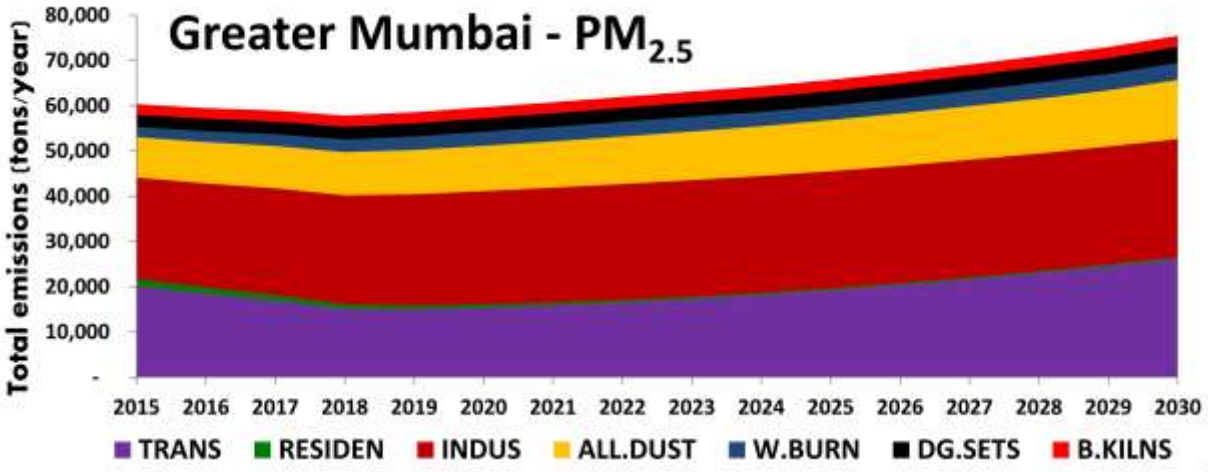


- 80% rise in PM10 levels between 2007 and 2018
- 60% reduction needed to meet clean air standard

Source: Based on CPCB Envis centre

Total PM2.5 Emissions by Sector 2018-2030





* Source: UrbanEmissions.info

Rail Based Maas rapid Transit System is the only way out to deal with pollution & congestion

Mumbai Metro will save lives; and also save trees
Cannot afford to waste a single day

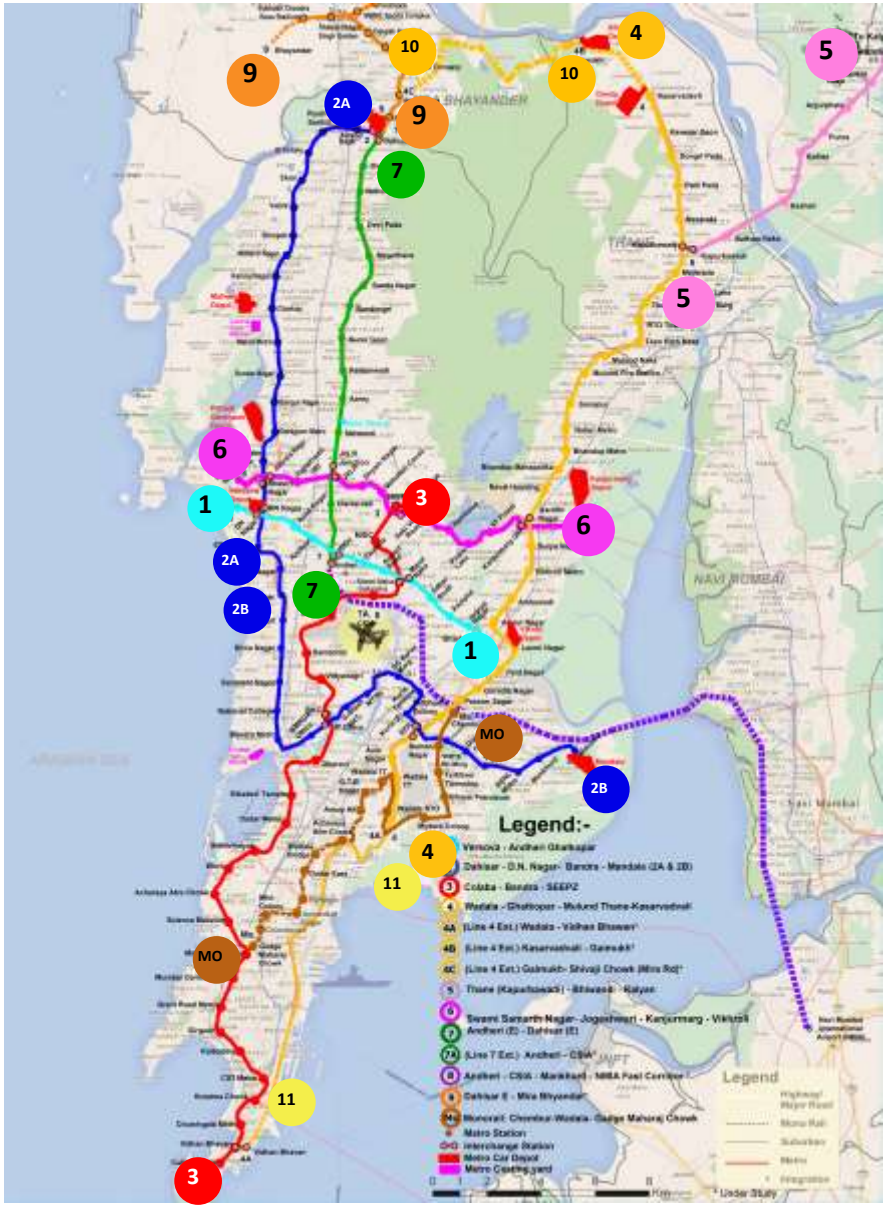
MMRC

10 deaths per day due to local train accidents caused by over-crowding which run 3X their capacity

They take not just precious lives, but with ~300 kgs wood from 2 fully grown trees having 2 ft. girth. approx. 6000 trees / yr too! *<for tree lovers>*

Most Mumbaikars cannot afford other transport modes. Most don't have time to wait.

Mumbai Region MRTS (Metro/Mono) Network



1. Versova Andheri Ghatkopar (11.4 km)
2. Dahisar - D.N. Nagar- Bandra - Mandale (2A & 2B) (42.2 km)
3. **Colaba - Bandra – SEEPZ (33.5 km)**
4. Wadala - Ghatkopar - Mulund Thane-Kasarvadvali (32.3 km)

4A. Kasarvadvali - Gaimukh* (2.7 km)

5. Thane (Kapurbawadi) - Bhiwandi – Kalyan (24.9 km)
6. Samarth Nagar- Jogeshwari-Kanjurmarg–Vikhroli (14.5 km)
7. Andheri (E) - Dahisar (E) (16.5 km)
8. Andheri - CSIA - Mankhurd - NMIA Fast Corridor * (35 km)
9. Dahisar E - Mira Bhyandar& Andheri - CSIA*(13.5 km)
10. Gaimukh- Shivaji Chowk (Mira Rd)* (9.2 km)
11. Wadala - Azad Maidan* (12.7 km)
12. Kalyan – Dombivali – Taloja*(20.7 km)
13. Shivaji Chowk-Virar*(20.7 km)
14. Kanjurmarg-Badlapur*(20.7 km)

MO. Monorail: Chembur-Wadala- Gadge Maharaj Chowk (20 km)

Total : 357.1 km

Operational: 30 km (Metro 1 & Mono Phase 1 &2)

Under execution: 163 km (Metro 2 to 7)

Under planning: 164 km (Metro 4A & 7A to 14)

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**

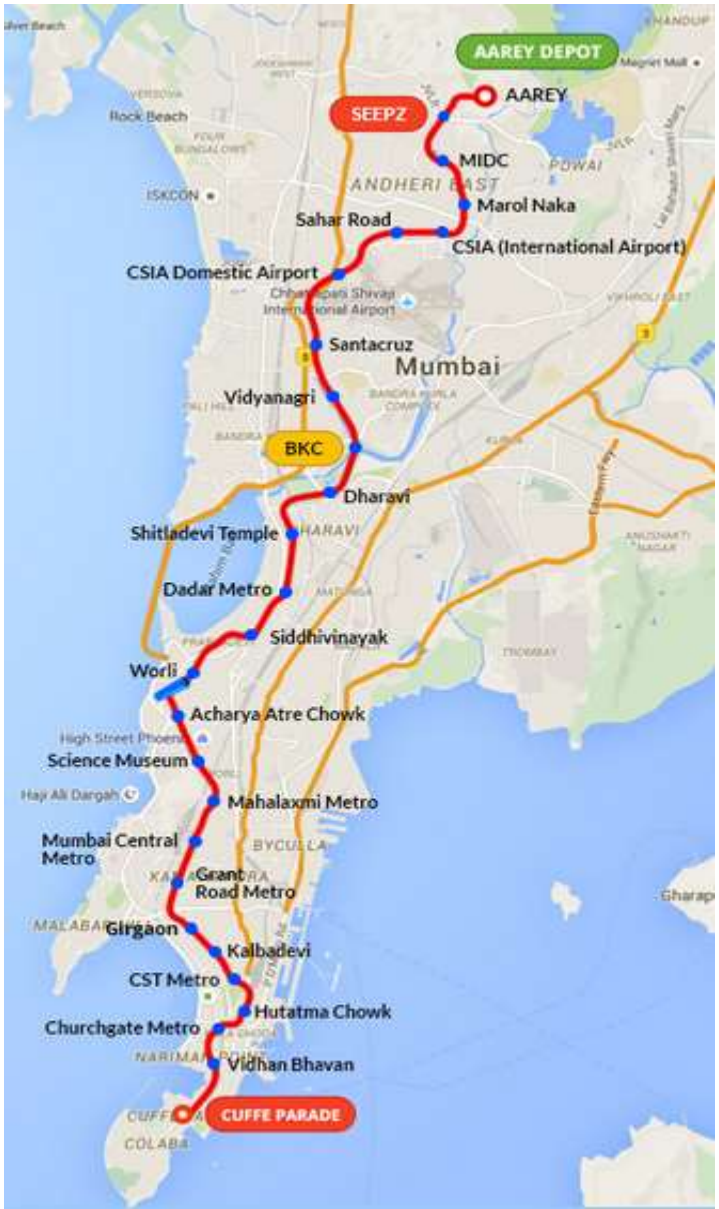
Sr No.	Mode of Transport	2017		2031		2041	
		in Lakhs	% of Total	in Lakhs	% of Total	in Lakhs	% of Total
1	Sub-urban	81.1	43.2%	69.4	29.3%	67.7	25.1%
2	Metro & Mono	4.1	2.2%	83.6	35.3%	111.7	41.4%
3	Bus	37.5	20.0%	17.1	7.2%	22.5	8.3%
4	Motorised Transport	65.1	34.7%	66.7	28.2%	68.2	25.2%
	Total (in Crs)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

*Source: CTS for Mumbai Metropolitan Region (MMR)- Jan 2019, MMRDA

Mumbai Metro Line 3: Alignment

- **33.5 km (fully underground)**
- **Stations : 27** (26 U/G+1 At Grade)
- **Completion cost : Rs 23,137 Cr.**
- **Soft loan (JICA) : 57.2 %**
- **Contribution – GoI/GoM/Others : 42.8%**
- **EIRR : 17.93%**
- **FIRR : 2.71%**
- **Implementation : Phase I : Dec. 2021**
  Phase II : June 2022

	2021	2031
Ridership	14 Lakh	17 Lakh
Headway (CP-BKC)	4 min	3 min
Coaches	248 (31x8cars)	336 (42x8 cars)



Connecting the Unconnected

- **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, Mumbai Central (WR), Marol Naka (Line 1), Mahalaxmi (Monorail), Mumbai Central (ST)
- **Airport connectivity**
  - Domestic Terminal, International Terminal(T2)

~ 30 Employment clusters/Govt /Pvt. Offices

~ 12 Education Institutions

~ 11 Major Hospitals

~ 10 Major Transportation Hub

~ 25 Religious & recreations structures

~ 3 million Population in influence zone

In Emergencies on Suburban Provide Evacuation

Mumbai Metro Line 3: Salient Features

- 8 coach Trains
- Carrying capacity of each train: 2400 passengers
- Energy Efficient Modern Rolling stock (25 Kv AC traction) with regenerative braking system

- Platform Screen Doors & Automatic Train Protection
- 2-level stations provided with Escalators & lifts designed for physically challenged
- Centralized control of Train Operations World Class standards
- Fully Air conditioned Stations and trains

- Centralized control of train operations .
- ITS for train operation and intermodal integration.
- commercial speed – 35 kmph

Mumbai Metro Line 3: Project Benefits

MMRC

Environmental

- 35% Reduction in traffic
  (456,771 less vehicle trips/day)
- Reduced fuel consumption
  (save 243,390 l/day)
- Reduction in air pollution by 2.61 lakh ton per year
- As per UNFCC auditor's report: 2.61 lakh ton/year
  (United Nations Framework Convention on Climate Change)
- Reduction in noise pollution

Safety & Security

- Platform Screen Doors
- Closed Door Cars
- Women Safety & Security
- Continuous Surveillance (24X7)
- No Trespassing possible

Economic

- Repositioning of Mumbai on Worldwide competitiveness
- Additional Employment During and After construction
- Improved Productivity

Comfort & Reliability

- End to End Air Conditioned Travel
- Higher Frequency 100% Time Adherence
- Eliminate Peak Hour delays, Reduced Travel time

Scope of Work and Project management

❖ **General Consultants on board for 7 years: Consortium of**

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

❖ **Civil contracts:**

- 8 Civil Packages including car depot package
- **55 km tunneling** :
  17 Tunnel Boring Machines, 11 TBM shafts
- **26 underground stations:**
  7 off road, 19 below roads;
  7 NATM, 19 Cut & Cover
- **Car depot at Aarey**

❖ **System contracts:**

1) Traction and Power Supply
2) Lifts and Escalators
3) Rolling Stock
4) Signaling and Telecommunications
5) Automatic Fare Collection
6) Tunnel and Station ventilation
7) Security Systems
8) Depot Equipment
9) Track work

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

MMRC's in-house team

Importance of the Car Depot

- Car Depot is mandatory & essential facility for smooth operation of any Metro system where all Metro trains not only parked but also maintained for safe operations.

- It is an essential part of the system without which it is impossible to commission or run safe operations. It is the starting point for train operation every day.

- A Car Depot serves Metro trains akin to a “home” for any human being.

Importance of the Car Depot

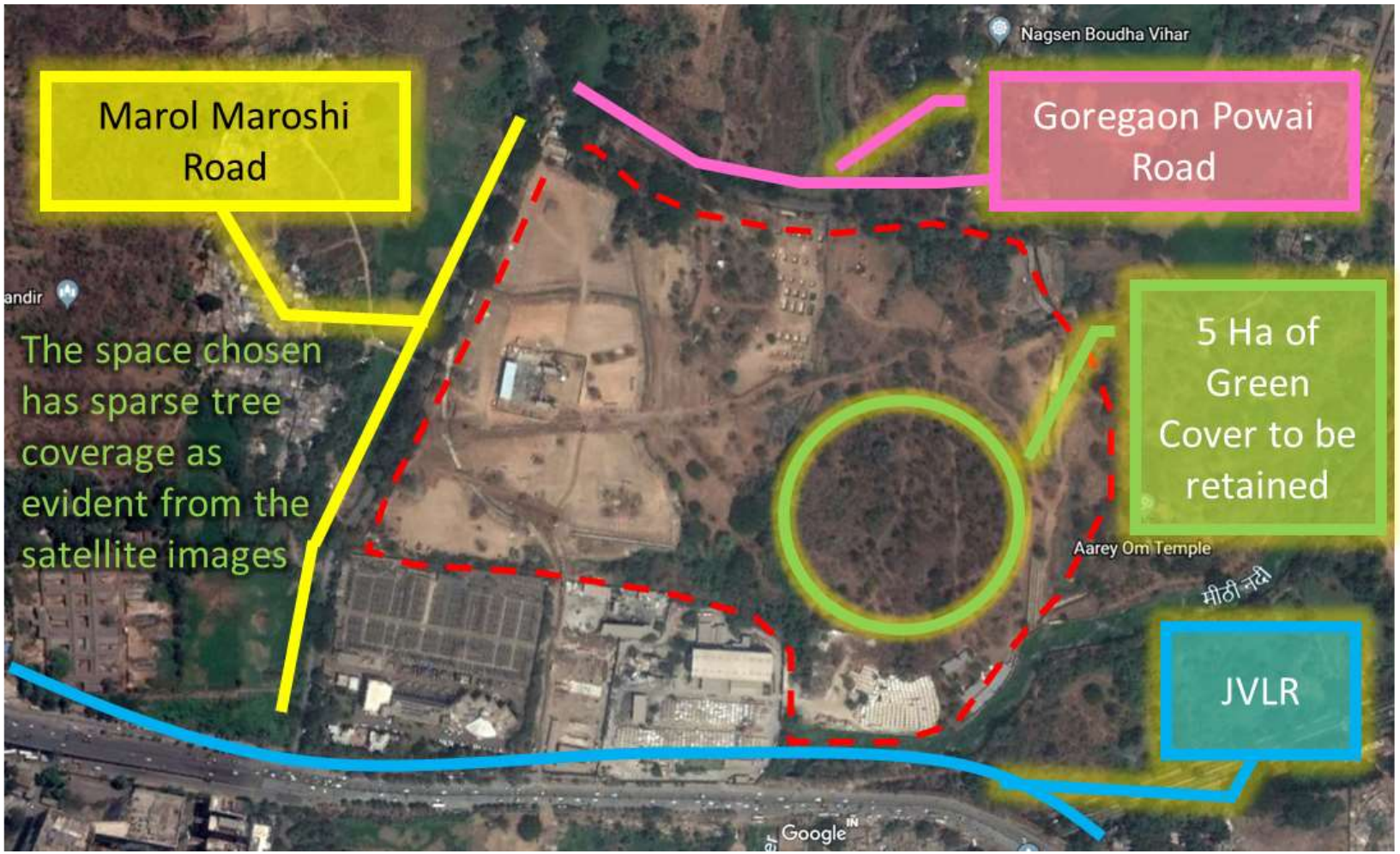
1. Workshop and Inspection Bays
2. Stores for essential spares
3. Rolling Stock Cleaning Facility to provide outside and inside cleaning
4. Stabling Lines for 31 trains (8 car each) and various other auxiliary vehicles (Catenary Maintenance Vehicle, Self-Propelled diesel driven rail cum road vehicle)
5. Train Driving Simulator, Maintenance simulators of various functions like rolling stock, Signalling, E&M, Electrical.
6. Operations Control Centre and Depot Control centre
7. Maintenance base for requirements of the entire main line

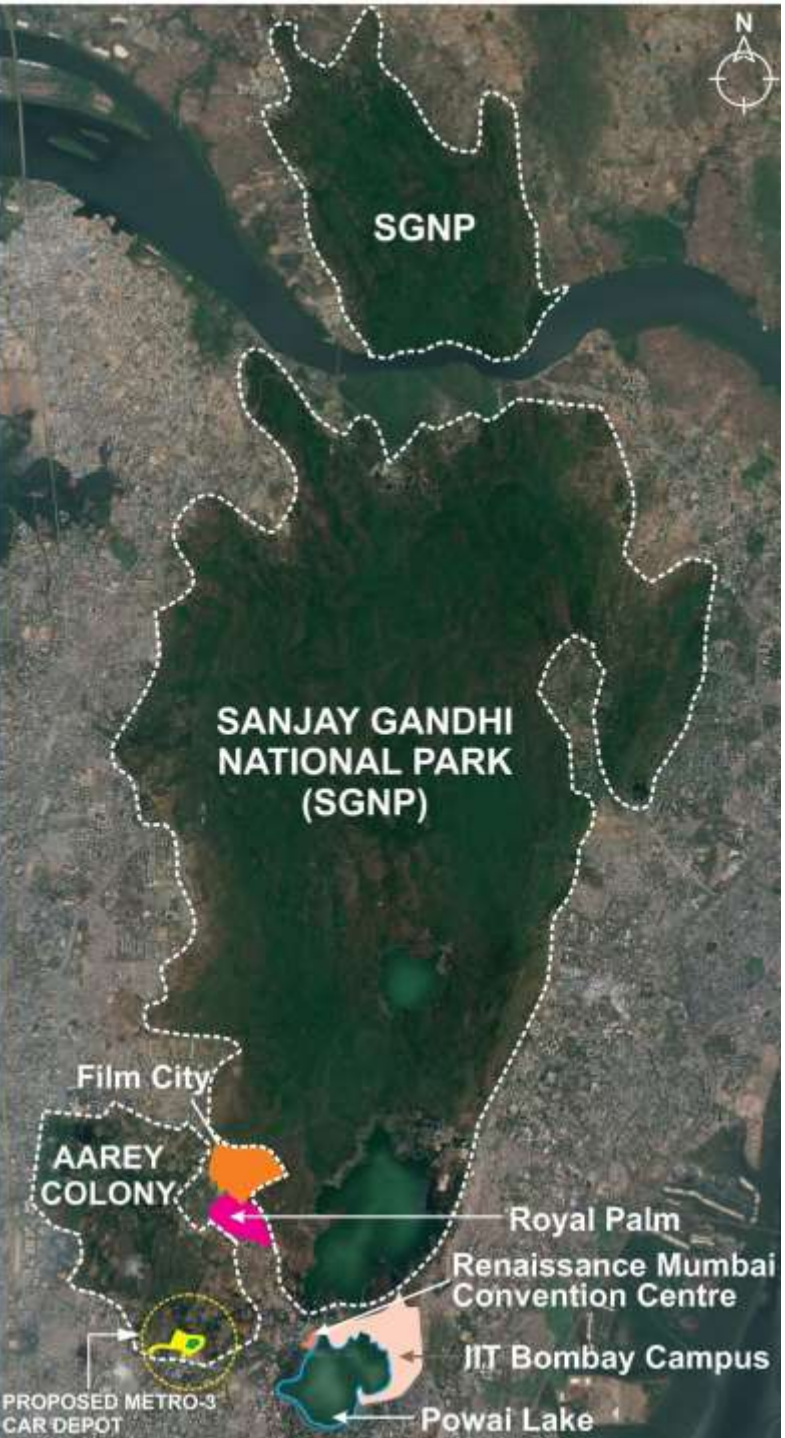
Why at Aarey?

1. No other technically feasible option available
2. All other options studied and evaluated. Have even given finality at Supreme Court level
3. Most optimally placed operations wise
4. The location is surrounded by Jogeshwari-Vikhroli Link Road (JVLR), Goregoan-Powai Link Road (GPLR), and Marol-Maroshi road. These roads carry approximately one lakh of vehicles daily.
5. Allotted the bare minimum space required to operate the facility, safely and smoothly

Why at Aarey?

The proposed location is surrounded by Jogeshwari-Vikhroli Link Road (JVLR), Goregoan-Powai Link Road (GPLR), and Marol-Maroshi road. These roads carry approximately one lakh of vehicles daily.





MMRC

Is Metro Car Depot eating into the entire green lungs of Mumbai ?

Metro 3 Car Depot at Aarey Colony: Facts

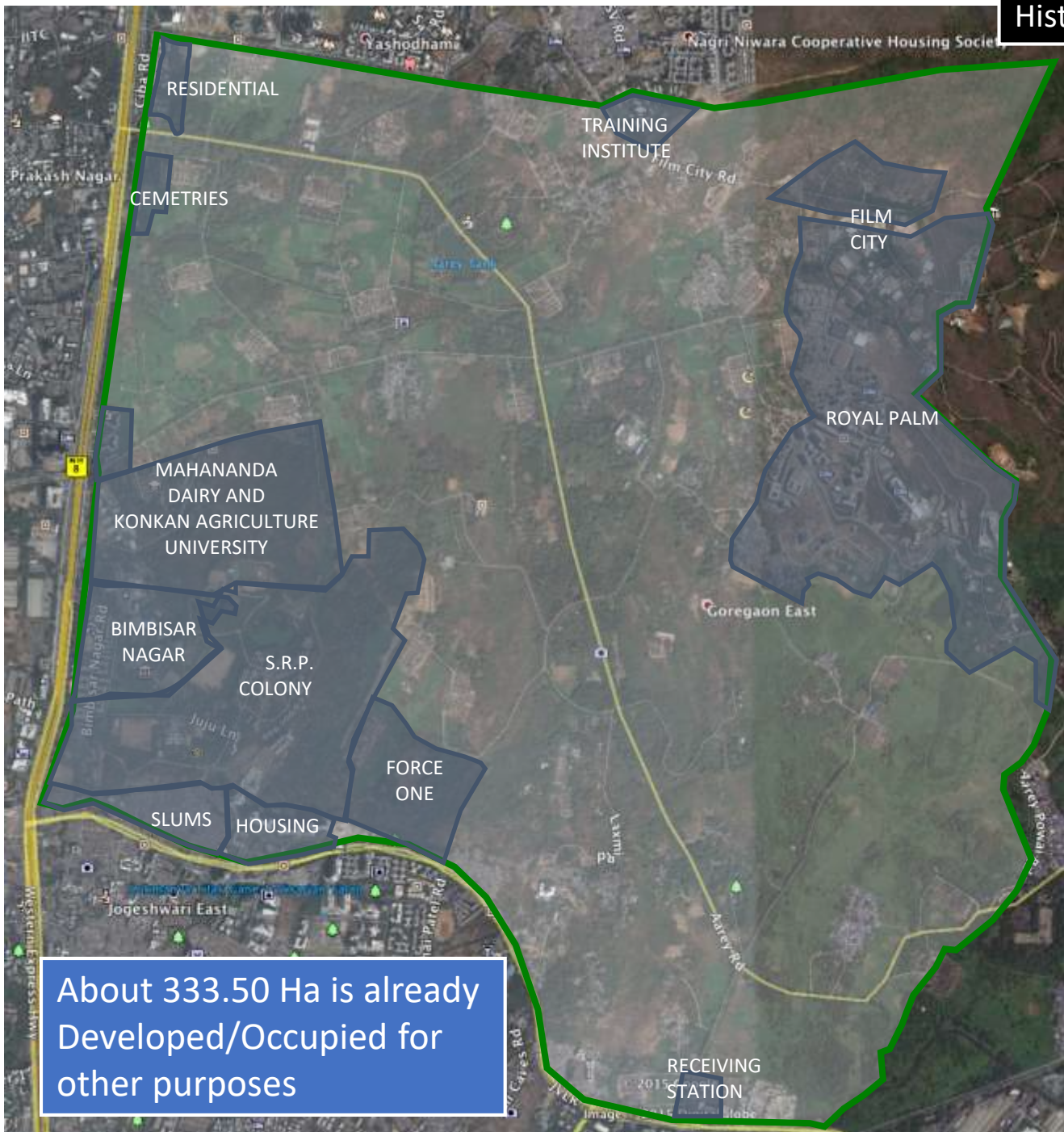
Sanjay Gandhi National Park: **12000 Ha**

Aarey Colony : **1287 Ha**

Land needed for Metro 3 car depot: **30 Ha**

Green cover retained within depot: **5 Ha**

Only 17% land out of 30 Ha has tree cover rest is grazing land

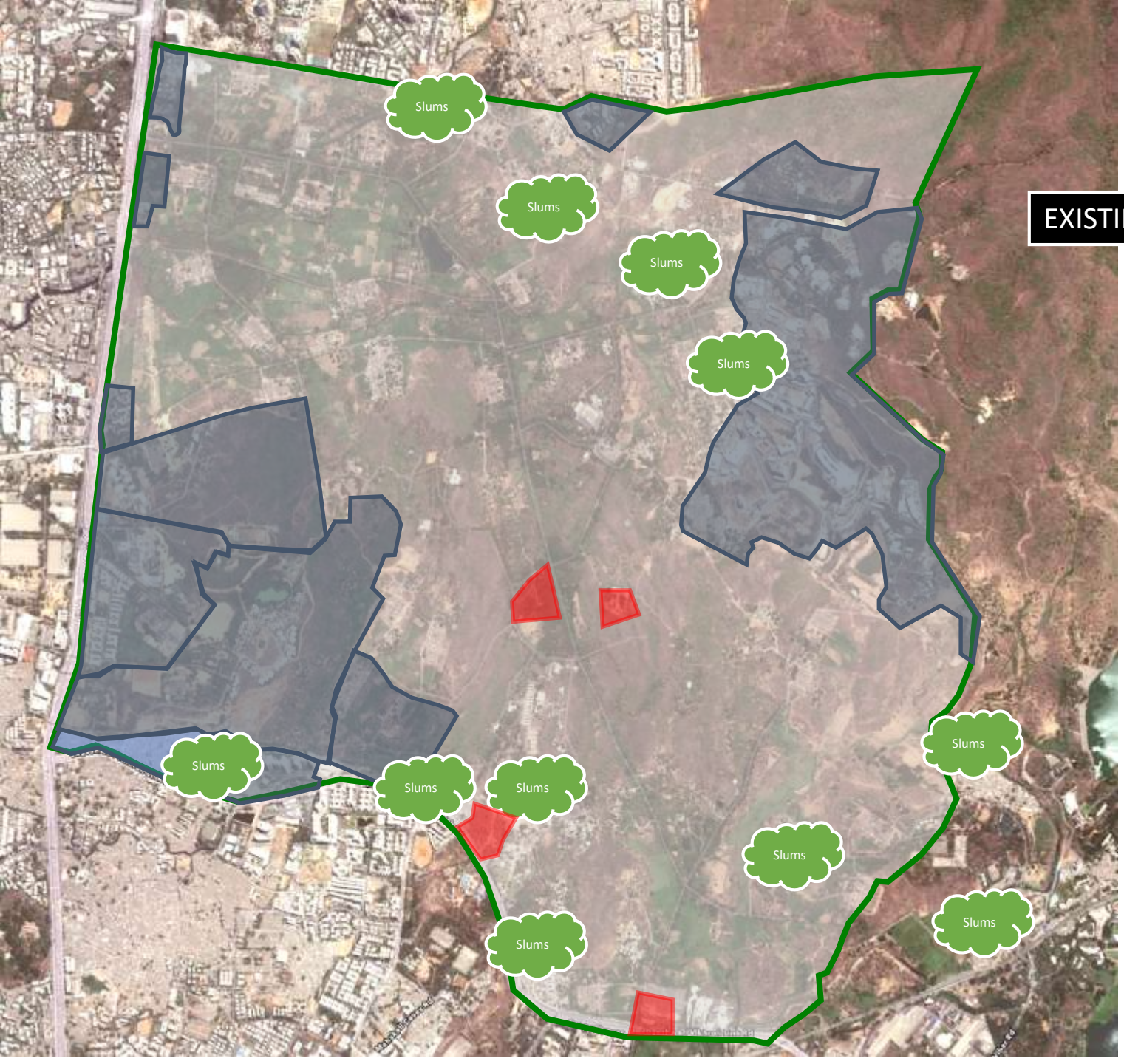


History of Adhoc Allotment of Land

1962	Water Complex- Powai by MCGM 1962 – 65 Acres
1966	Modern Bakery 1966 – 18 Acres
1971	Police Wireless Station 1971 – 1.25 Acres
1971	Konkan Agriculture University 1971 – 145.80 Acres
1974	Goregaon Mulund Link Road 1974 – 8.15 Acres
1975	Doodhsagar Co. Op. Society 1975 – 5 Acres
1977	Low Cost Housing - MHADA 1977 – 26 Acres (Bimbisar Nagar)
1989	Film City 1989 – 329 Acres
1993	Receiving Station/Now Reliance Training Center 1993 – 10 Acres
2007	Force One 2007 – 98 Acres
2010	SRA Scheme 2010 – 27 Acres
1971	Mahananda Dairy 27 Acres
After 2008	To MMRDA for JVLR Construction 9 Acres

1970 To 2014

There are also areas allotted to RBI Institute near Film City, Reliance Energy and recently at a IOC Petrol Pump along Western Express Highway. , Metro III terminal

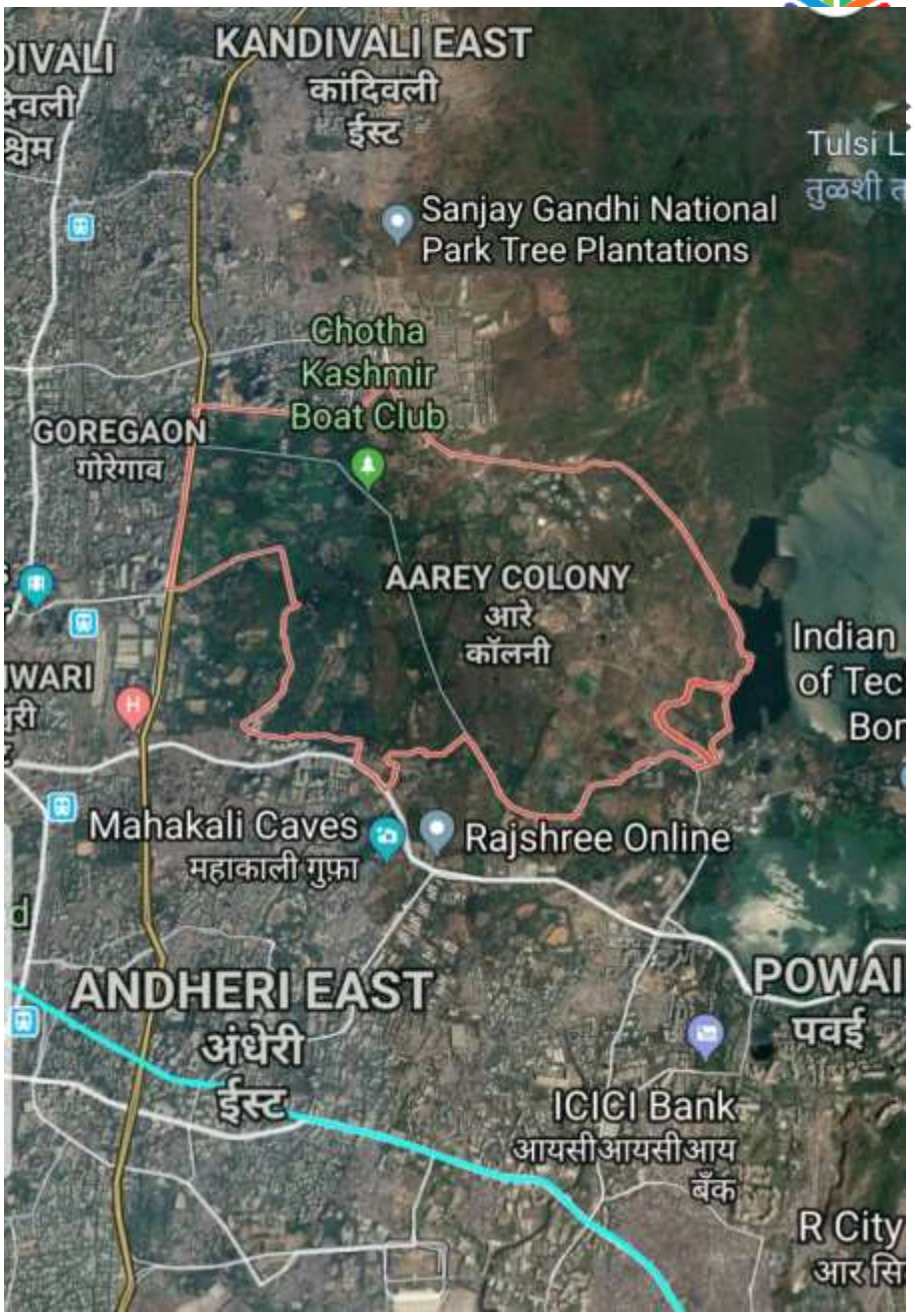


MMRC

EXISTING SLUMS IN AAREY


Nagsen Boudha Vihar
Aarey Om Temple
Google


6:52
Archdiocesan Heritage Museum
The Mumbai Filmcity Tours office
Film City Temp
चित्रपट नगरी मंदिर
Chotha Kashmir Boat Club
AAREY COLONY
आरे कॉलनी
SAHI BANGUDA
सही बंगुदा
Movietime: The Hub Mall, Goregaon East
Central Poultry Development...
सेंट्रल पोल्ट्री डेव्हलपमेंट...
Filter Pada
फिल्टर पाडा
Trauma Care
Picnic Point Garden
Aarey Rd
Jogeshwari Caves
जोगेश्वरी लेणी
Mahakali Caves
महाकाली गुफा


KANDIVALI EAST
कांदिवली ईस्ट
Sanjay Gandhi National Park Tree Plantations
Chotha Kashmir Boat Club
GOREGAON
गोरेगाव
AAREY COLONY
आरे कॉलनी
Mahakali Caves
महाकाली गुफा
Rajshree Online
ANDHERI EAST
अंधेरी ईस्ट
POWAI
पवई
ICICI Bank
आयसीआयसीआय बँक


SAVE
Aarey


Dr. Bhau Daji Lad Museum
Veer Mata Jijabai Bhosale Udyan And Zoo
Byculla Zoo House Park
Bird Aviary

Metro 3 Car Depot at Aarey Colony: Facts

- Total Trees in MCGM area: 29.57 Lakh
- Total Trees in 1287 Ha Aarey Milk Colony: 4.83 Lakh (Tree census 2017-18)
- Trees affected by Metro 3 Car Depot: 2700 only
- Trees to be transplanted: 460
- Trees to be cut: 2240 and 6 times more trees to be planted as compensatory plantation

Identified 2700 trees	Mumbai Metro Project
Would have absorbed 64 MT CO_2 per year	64 MT CO_2 reduction will be achieved in just 197 trips i.e. 4 days of peak Hours operations
Would have absorbed ~1280 MT CO_2 in their life time	1280 MT CO_2 reduction will be accomplished in just 3948 trips i.e. 80 days at peak

Why not at other locations?

A. At DPR Stage (2011)

Following sites having vacant areas of the requisite size along the alignment have been identified for setting up of depots;

i. Mahalaxmi Race Course
ii. Exhibition grounds at BKC
iii. Kalina University land
iv. Aarey milk colony land,

B. Committee Stage (2015)

In addition to above following 4 options were explored by the technical committee;

i. Backbay reclamation
ii. Mumbai Port Trust land
iii. Dharavi
iv. Sariput Nagar near JVLR and;
v. Kanjur Marg at the intersection of JVLR and Eastern Express Highway

All locations were examined on merits by experts and ruled out, except Aarey & Kanjur Marg on basis of inadequate land area and technical suitability, environment, legal/ownership constraints as well as regulatory constraints.

Why not at Kanjurmarg?

- **Kanjurmarg was never an option at DPR stage**. However, the citizen's group suggestion was accepted by the technical committee and recommended State Government to make land available within 3 months.

- There is title dispute pending in Bombay High Court since 1996 involving private parties and State Government wherein Bombay High Court issued Status Quo orders in 1997.

Why not at Kanjurmarg?

- However, MMRC through State Government made sincere efforts to vacate the stay and release the land for car depot for one and half year, couldn't succeed.

- As case was not resolved in reasonable time State Government allowed MMRC to opt for Aarey Milk colony site for Car Depot.

- **Incidentally the case is still not resolved.**

Why not at Kanjurmarg?

- Kanjurmarg option was given up after it was not possible to absorb the delays in getting land and also the additional time required dealing with the marshy land.

- Such complex projects are not open ended without timelines for individual activities.

- Thus while Line 3 project cannot use the said land, the same land pocket can be used for another metro line project if that fits into their respective commissioning dead lines.

Decisions at apex courts

Following claims have been thoroughly examined by Hon'ble Courts in various petitions filed and rejected on merits after hearing both the sides:

- **Aarey is ''Forest'' :**

Rejected by Bombay High Court in case of 2766/2017 and NGT 34 of 2015

- **Change of Land use from NDZ to Car Depot is illegal:**

Rejected by Bombay High Court in case of 2766/2017)

- **Shift Metro-3 Car Depot from Aarey Milk Colony to any of the alternate sites:**

Rejected by Hon. Supreme Court (Ref SLP (C) No. 31178/2018, I.A.No 33819/2019)

Other objections and redressal

1) **Eco Sensitive Zone**: Not true, Car Depot land outside ECZ

2) **Illegal tree cutting**: Not true, no tree is cut without tree authority permission, 5 ha tree patch trees will remain unaffected

3) **Tribal community**: No tribal/Adivasi residence at all in car depot land

Other objections and redressal

4) Concretization of Depot would lead to flooding of Mithi river?

- Depot site is unpaved in 75% of its area, that will allow the rain water to directly seep into the ground. All water ways passing through this area towards Mithi river are also channelized by proper SWD system approved by MCGM.

- Thus, the assumptions that 7.5 Ha paved area will lead to flooding of Mithi river if not correct.

Mitigation Measures

- **Transplantation** : 1,576 trees, 659 survived (45%), 1,266 new trees planted against 633 non survived trees

- **Compensatory Planation** : 14,346 trees
  - Trees of 6” to 12” girth & 12’ to 15’ ft height (Tree Authority Norms)

- **Plantation under CSR:** 9,500 trees
  - Trees below 5’ height (Forest dept Norms)

Mitigation Measures

- **Total Plantation: 23,846 trees**
  - Native species like Site Ashoka, Kadamb, Kaduneem, Arjun, Mohagani, Behada, Karanj, Kanchan
  - Locations: Aarey colony, Mankhurd, Kanjurmarg, Powai, Vidyanagari, BKC, Marol, SGNP
  - MOU with SGNP for plantation and maintenance for 7 years

- **Restoration of trees** at station locations after project completion: 3,000
  - Nurseries appointed

- **Project Neighbourhood** : 25,000 saplings

Tree Plantation




Tree Plantation

Tree Plantation/Transplantation




Tree Plantation

Tree Plantation

Tree Plantation

Tree Plantation

Transplanted Trees

How can we make Future Transport sustainable?

- More efficient and smart transport network: connecting the unconnected
- Commuter centric Transport: Safer, faster, more comfortable and sustainable
- Economic activity will be governed by the modifies public transport network
- Interchange stations to be new development nodes
- Transit oriented development to get a boost
- Multimodal integration and station area planning to be important

How can we make Future Transport sustainable?

- Last mile connectivity to be ensured in a planned manner
- Station Area Planning
- Rise in Electric vehicles
- Integrated and smart parking
- Extensive use of technology: Common mobility card, Smart cards, Transport Apps, On line journey planners etc
- More scope for pedestrianisation
- With enhanced Public Transport Capacity and more efficient connectivity ideas like Congestion Charge, restriction on private vehicles could be a reality

Mumbai Metro 3: Progress of Construction

TUNNELLING

- All 17 TBMs working
- 34 Km of tunneling completed (62%)

STATIONS

- Work in Progress at all 26 Underground stations
- Secant piling 99 % (Stn Box) & 51 % (Entry/Exits)
- Excavation 76 % completed
- Base slab construction 41% completed
- Concourse slab construction 14% completed
- Mezzanine/ Plant room Slab construction 14% completed
- Roof Slab construction 3% completed

DEPOT

- Work in progress in 10 Ha of land (50% approx.);
- Earth work, SWD & Boundary wall completed in available area.
- Work to commence in remaining area after the tree cutting permission from MCGM.

Progress of Project

Cuffe Parade

Progress of Project

Vidhan bhavan

Progress of Project

Vidhan bhavan

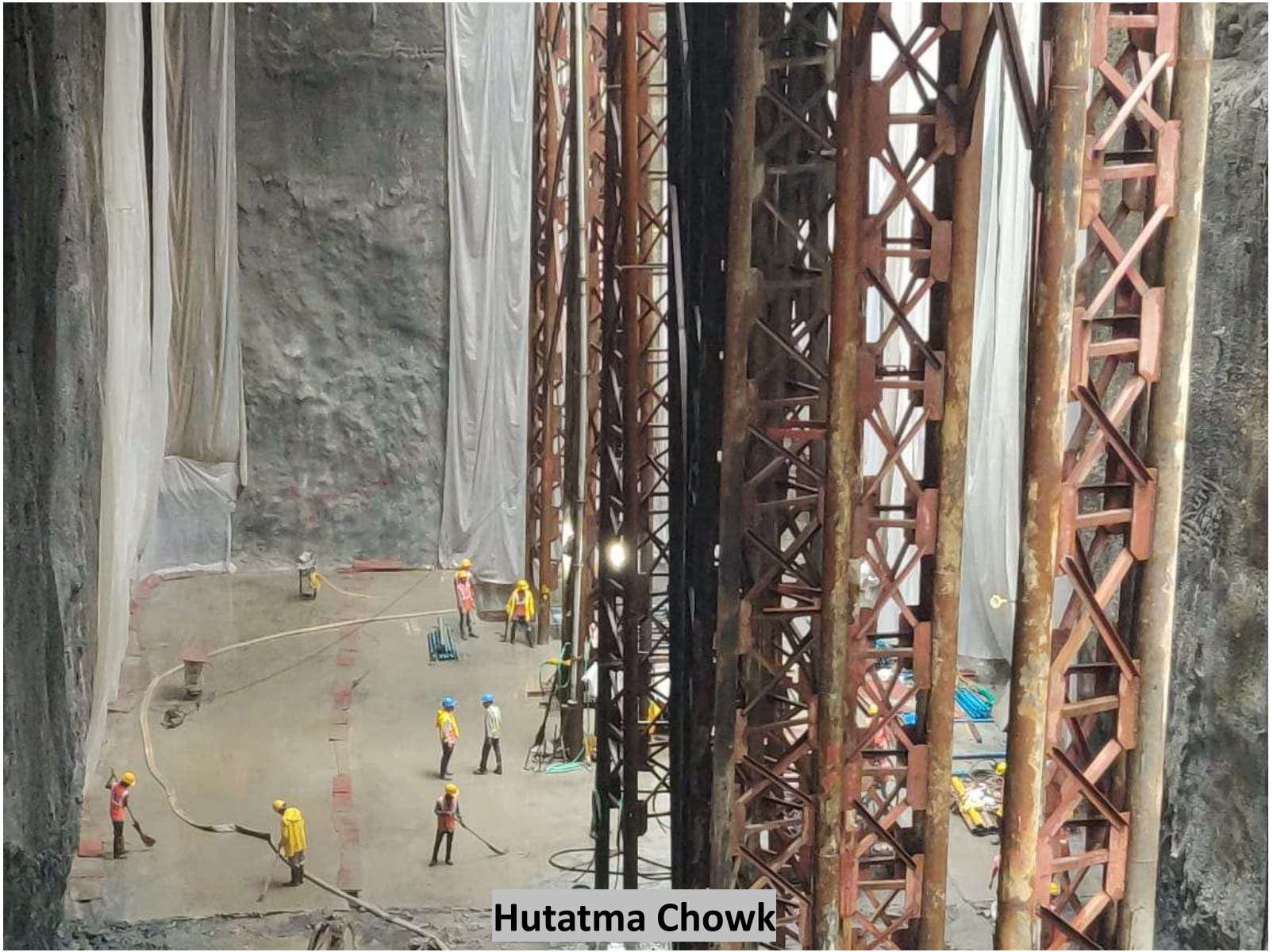
Progress of Project

Hutatma Chowk

Progress of Project

Hutatma Chowk

Progress of Project



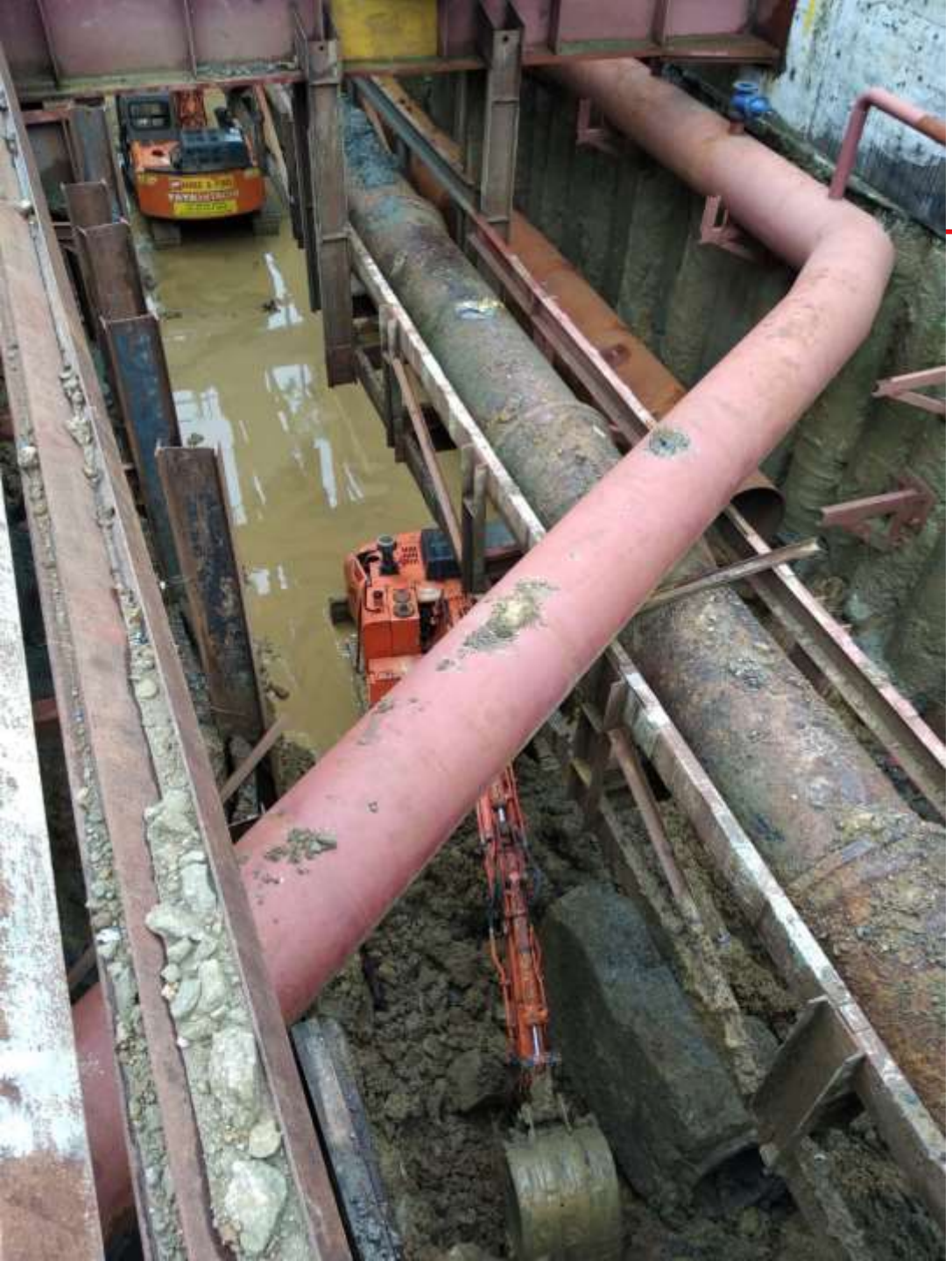
Hutatma Chowk

Progress of Project

Churchgate

Progress of Project

Grant Road Station



MMRC

Grant Road Station

Progress of Project

SCIENCE MUSEUM

Progress of Project

SCIENCE MUSEUM

Progress of Project

SCIENCE MUSEUM

Progress of Project

Acharya Atre Chowk

Progress of Project

Acharya Atre Chowk

Progress of Project

Progress of Project

MUMBAI CENTRAL

Progress of Project

Progress of Project

MUMBAI CENTRAL

Progress of Project

MAHALAXMI

Progress of Project

EXCAVATION -MAHALAXMI

Progress of Project

EXCAVATION -MAHALAXMI

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Dadar

Progress of Project

Progress of Project

Shitaladevi

Progress of Project

Shitaladevi

Progress of Project

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Dharavi

Progress of Project

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Progress of Project

BKC

Progress of Project

Progress of Project

Vidya Nagari

Progress of Project

Santacruz

Progress of Project

Santacruz

Progress of Project

Airport T1

Progress of Project

Sahar road

Progress of Project

Sahar road

Progress of Project

CSIA-T2 Station

Progress of Project

CSIA-T2 Station

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Marol

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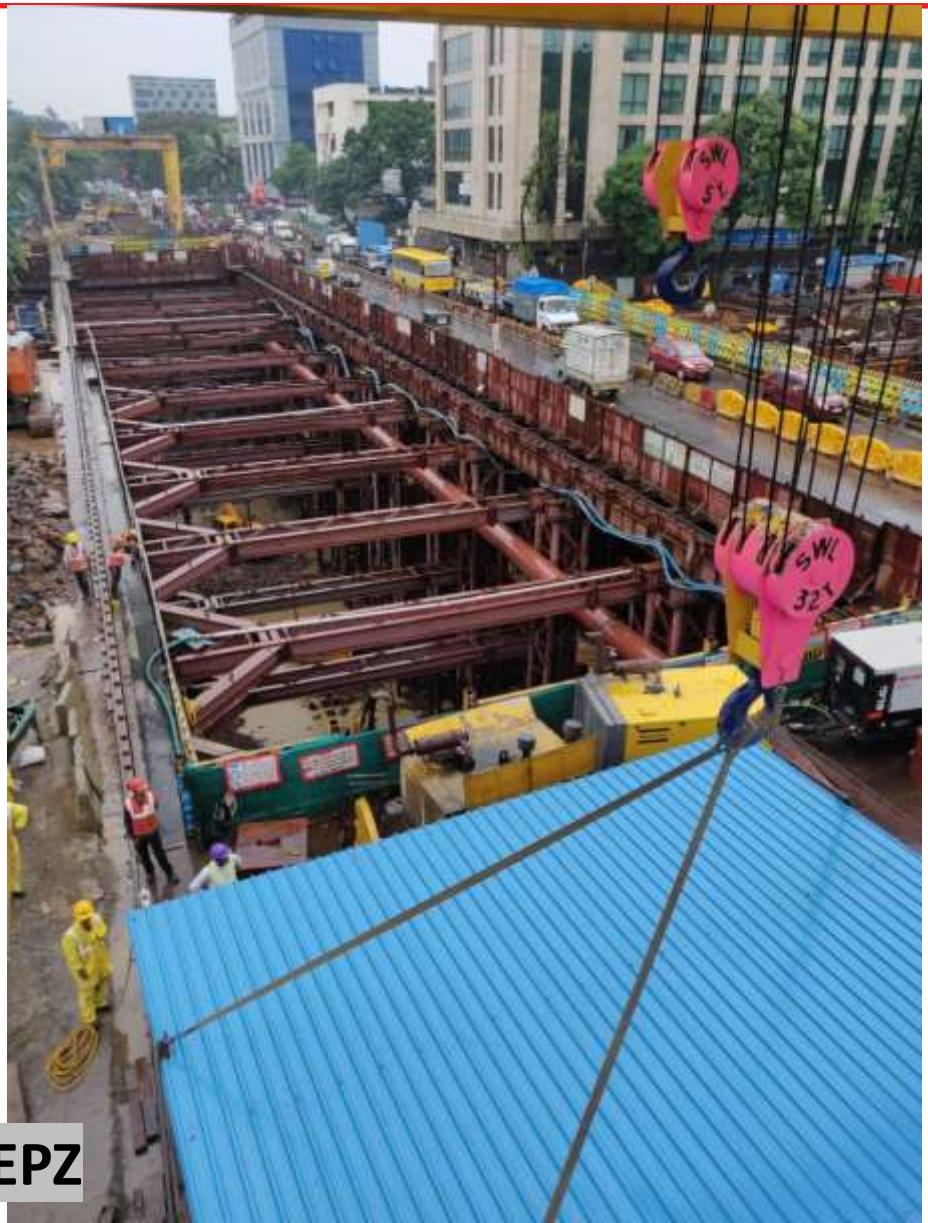
SEEPZ



MMRC

SEEPZ

Progress of Project

Progress of Project

Cross Passage Work

Progress of Project

Pali TBM shaft

Progress of Project

Progress of Project

Construction Sequence and Methodology: Tunneling

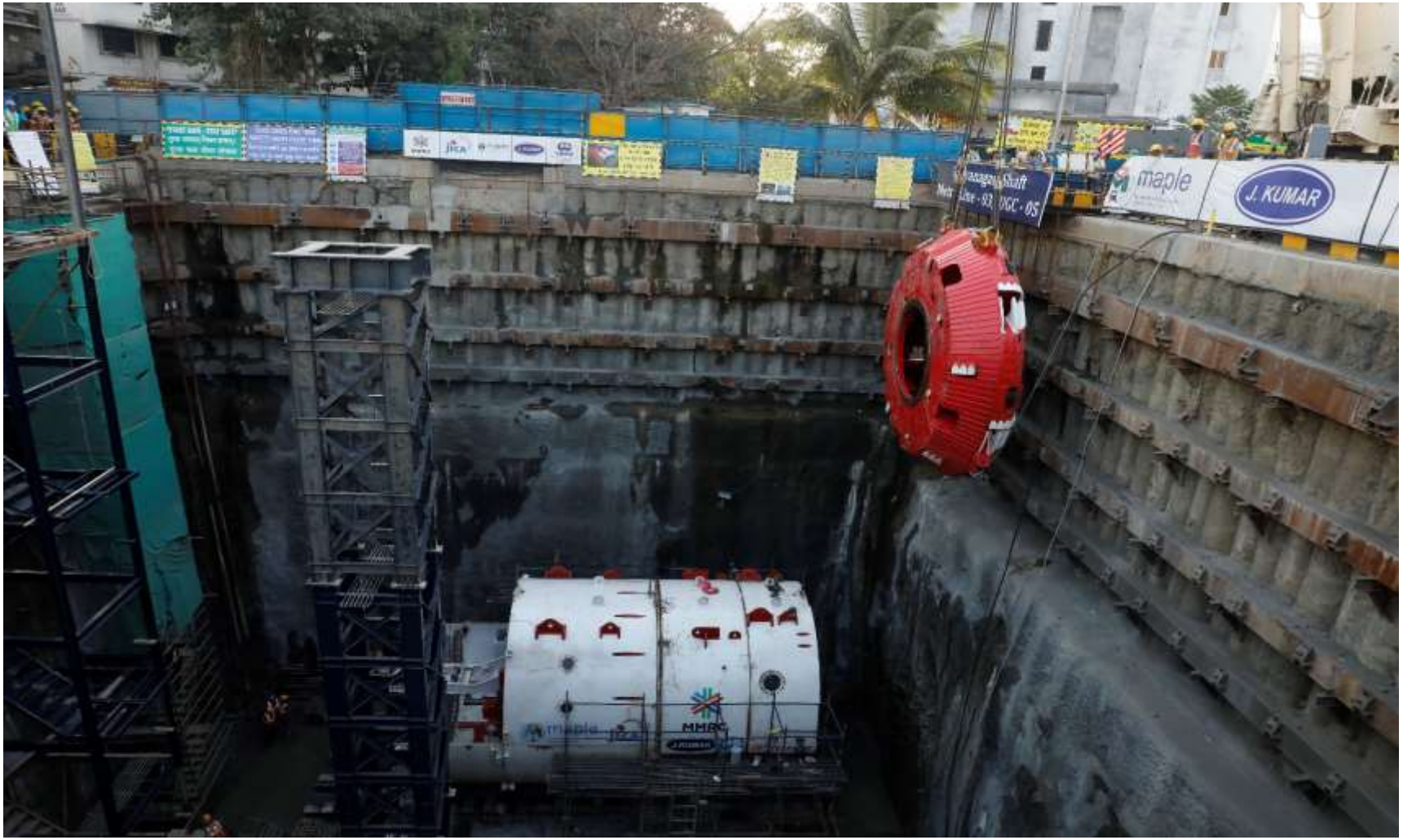
Tunnel Boring Machine: Total 17 TBMs for Metro 3

Construction Sequence and Methodology: Tunneling

Overview of Launching Shaft site

Construction Sequence and Methodology: Tunneling

Lowering of the Cutter Head

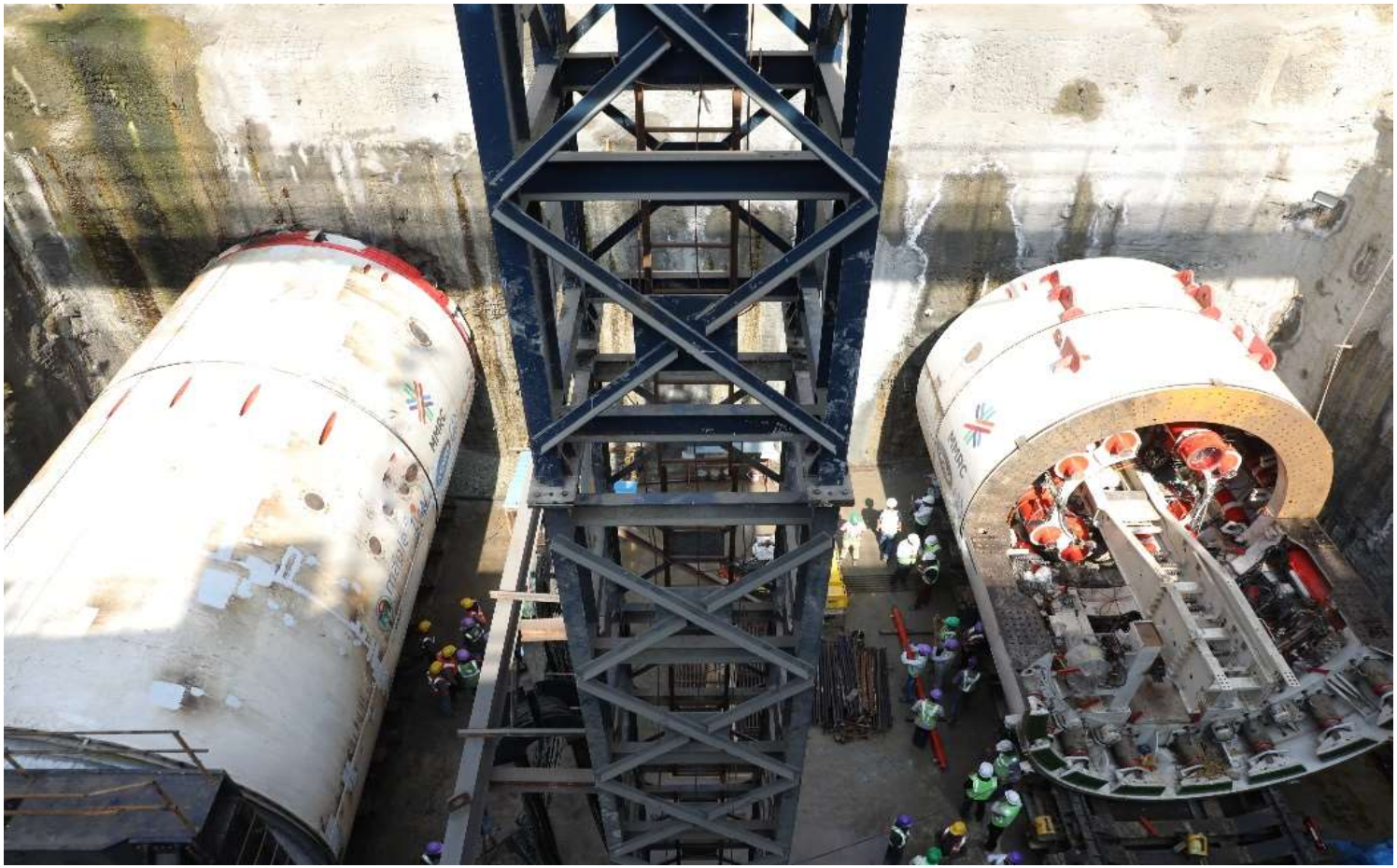


Construction Sequence and Methodology: Tunneling

Lowering of the Cutter Head

Progress of Project

Progress of Project



Progress of Project

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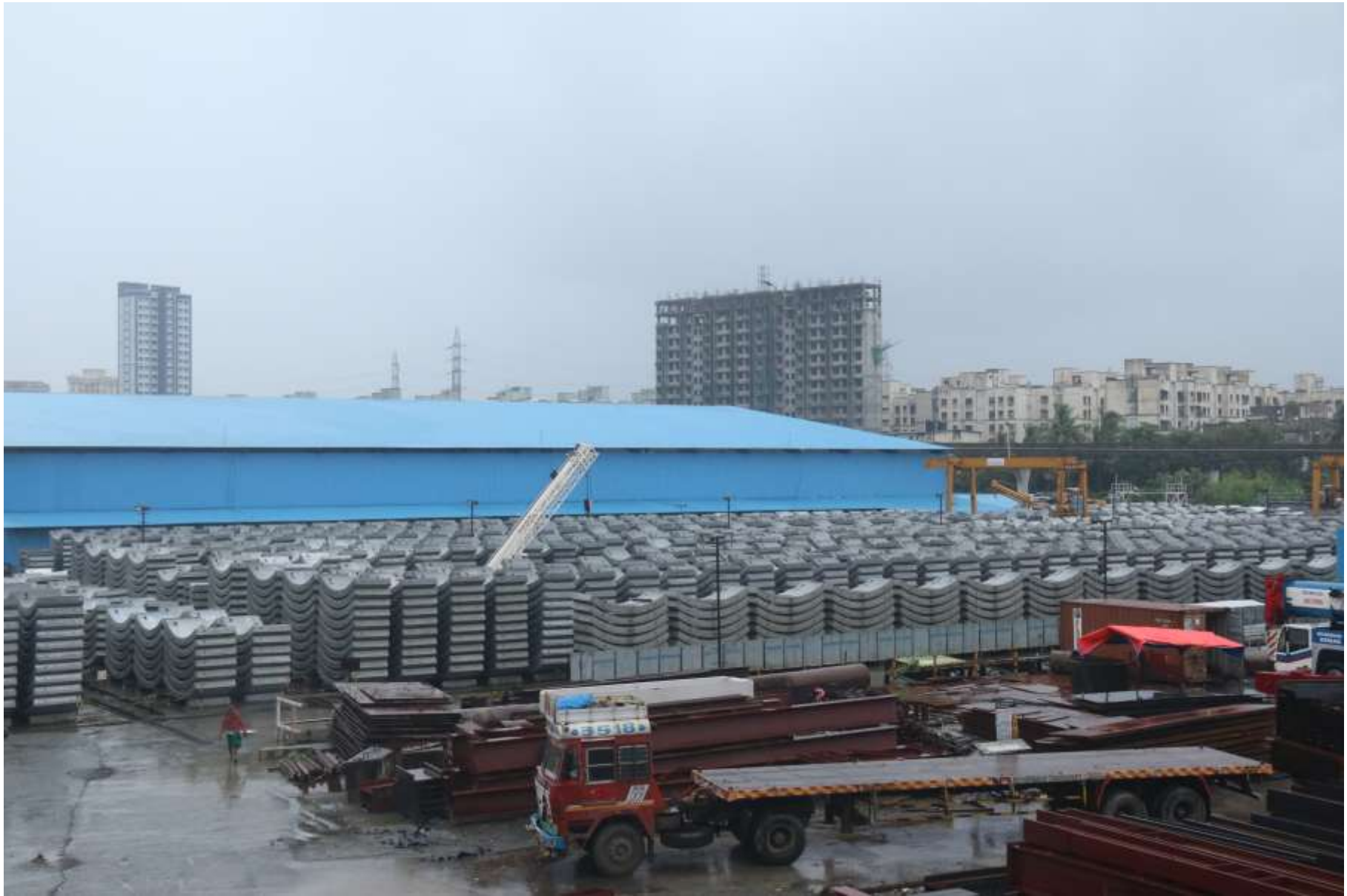
1st Breakthrough – CSMIA-Terminal-2 station

Progress of Project

On going Construction: Casting Yard

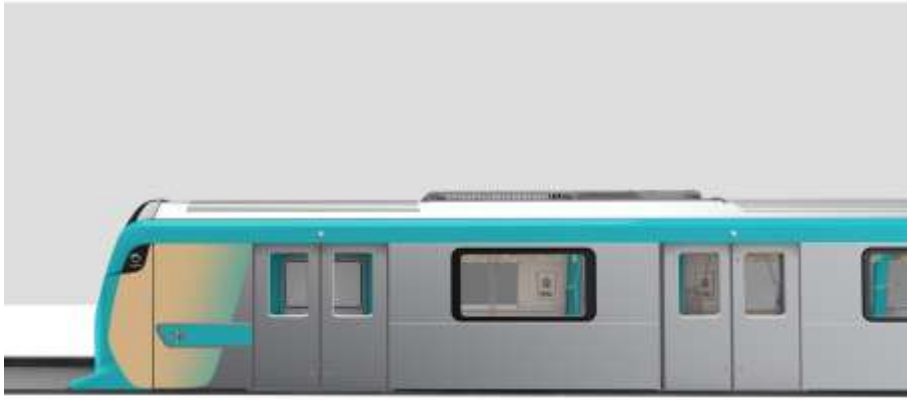


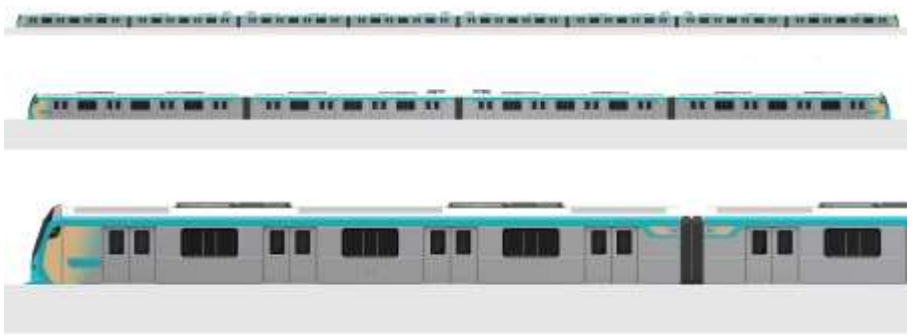
Progress of Project

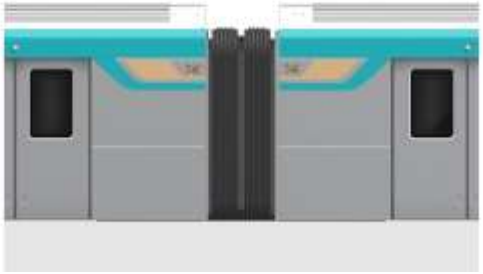
CASTING YARD

Progress of Project

Maintenance Workshop Building -







To Summarise

- A safe, efficient, comfortable and reliable public transport is a desperate need of MMR
- Saves lives, improves health and wealth
- Unlocks long term Environmental benefits
- Enormous economic benefits
- Employment and Business opportunities
- Faster and professional implementation
- Proactive support from the citizens and all the stakeholders
- One day's delay and the exchequer looses Rs 4.23 Cr

Thank you for your kind attention

@MumbaiMetro3

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Mumbai Metro Rail Corporation

Mumbai Metro Rail Corporation

'Of course I have a car. But I don't have a road to drive it on!'

R.K. Laxman in
'The Times of India'