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Travel and Land-use Impacts of Mumbai-Ahmedabad HSR in Mumbai Metropolitan Region

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Presented by

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Background

Line Classification	Sanctioned Speed	Realised Journey Speed
Group A	160 km/hr	80 – 100 km/hr
Group B	130 km/hr	65 – 75 km/hr
Group D	110 km/hr	55 – 65 km/hr

Note: Suburban Sections of Mumbai, Delhi, Chennai and Kolkata are Classified as Group C Lines

Parameter	Value
Route km	68,000*
Passengers Carried, million/day (non-suburban)	10.50
Passengers Carried, million/day (suburban)	12.50
Average trip length (non-suburban)	283 km
Average trip length (suburban)	31.8 km

*(4th Largest in the world)

- Domestic Air Passengers Carried, million/day: 0.38
- Civil aviation in India is growing at the rate of 17-22 % per annum and it is the 3rd largest in the world
- For European HSR - 30% demand shift from Air, 15% from Road, 30% from conventional rail and 25% induced traffic. Similar trend is expected to be followed in India as well.

Mumbai-Ahmedabad HSR Alignment

Mumbai-Ahmedabad HSR Details

- Characteristics:
  i. Max speed – 350kmph
  ii. Distance covered – 508km
  iii. No. of Stations – 12 stations

- 65km Stretch of HSR runs through MMR with 3 stations (Virar, Thane and BKC) inside it.

- High land prices forcing people to move in the outskirts, which are also supported by government schemes like “Pradhan Mantri Awas Yojna”.

- Boisar, which is the next HSR station after Virar, is one of the location selected for this scheme.

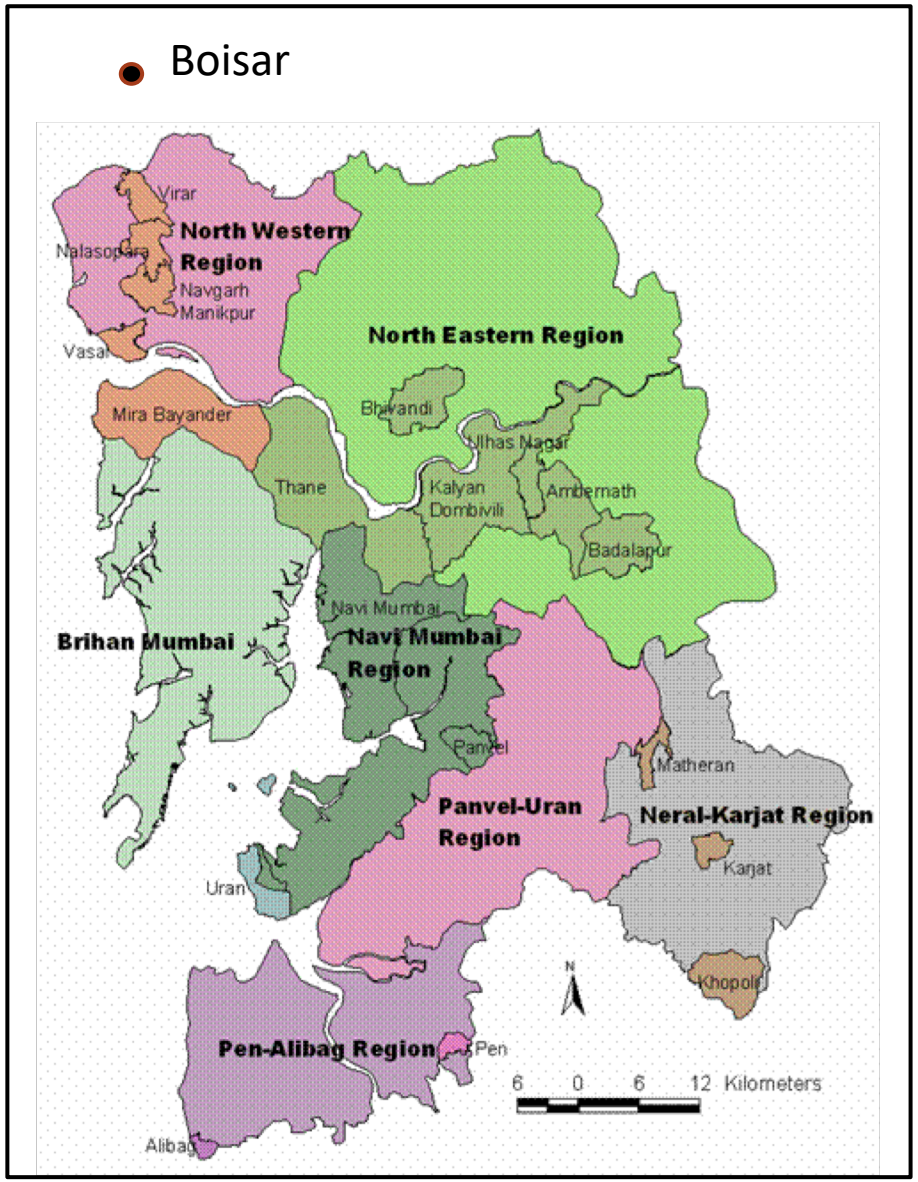
Objectives

At present, MMR has 465km stretch of suburban rail with a large fleet of buses complementing these systems. About 230km of metro network is planned to come up in the future. Introduction of HSR is expected to change existing travel scenario.

- This study examines the variation in the ridership of metro, suburban rail, bus and other public transport systems with and without HSR.
- HSR will also cause change in land use pattern. This study examines such changes at the HSR stations within MMR i.e., at Virar and Boisar, which are about 65km and 110km from Bandra.
- This study assesses the accessibility of peripheral areas of MMR due to the proximity of HSR station and the associated impact on the current intense activity areas of the region.

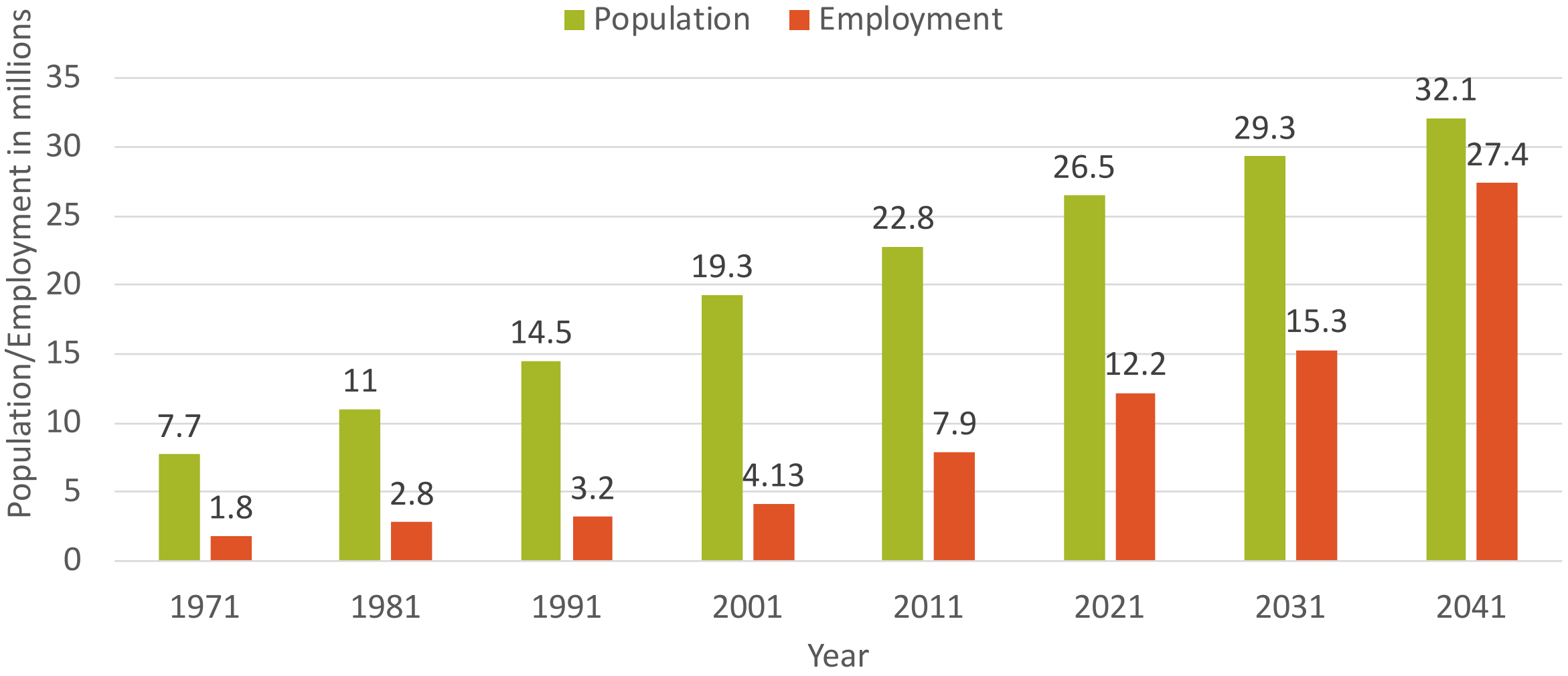
Study Area

- Area – 4355 sq.km., Population – 25.4million, Employment – 11.4million
- 8 Municipal corporations, 15 smaller Municipal councils.
- Spreads over 5 districts of Mumbai city, Mumbai suburban, parts of Thane, Raigad and Palghar
- Commuter share of suburban rail and city bus systems is greater than 70%
- Includes the three proposed HSR stations at Bandra, Thane and Virar.



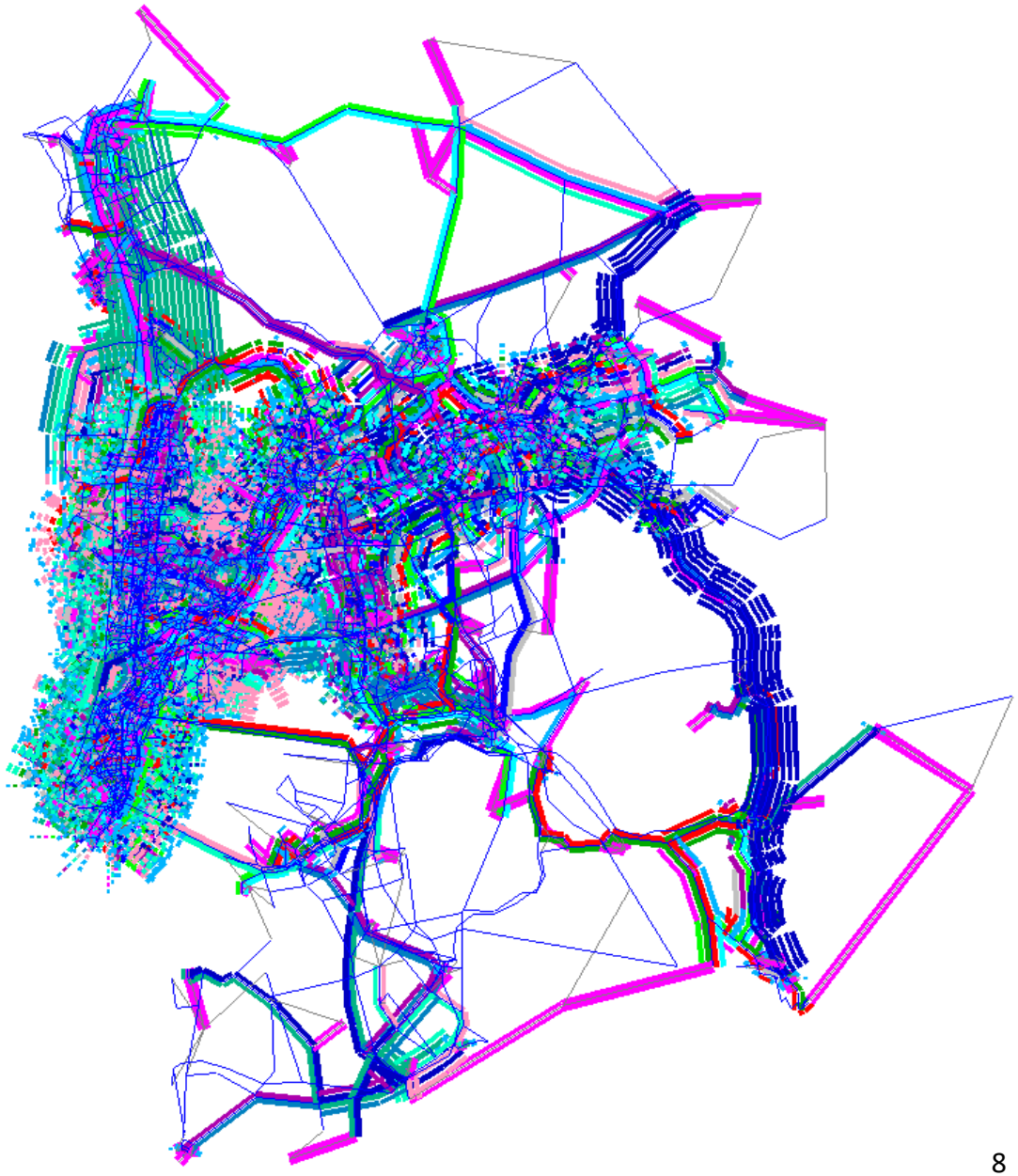
Mumbai Metropolitan Region
(Source: CTS, 2008)

Population and Employment in MMR



PT Route Network in MMR

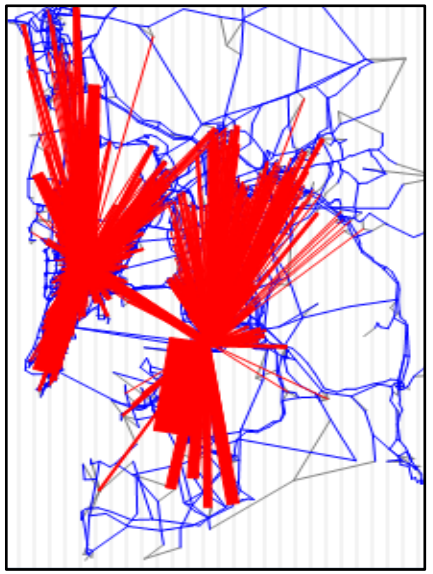
- **Bus routes:**
  BEST–408,TMT–60,NMMT–45,KDMT–70,MBMT–10
- **IPT (Autorickshaw) routes**
- **Suburban rail routes – 107**
- **BRTS routes**
- **Out-station bus routes**
- **Proposed metro routes – 22**



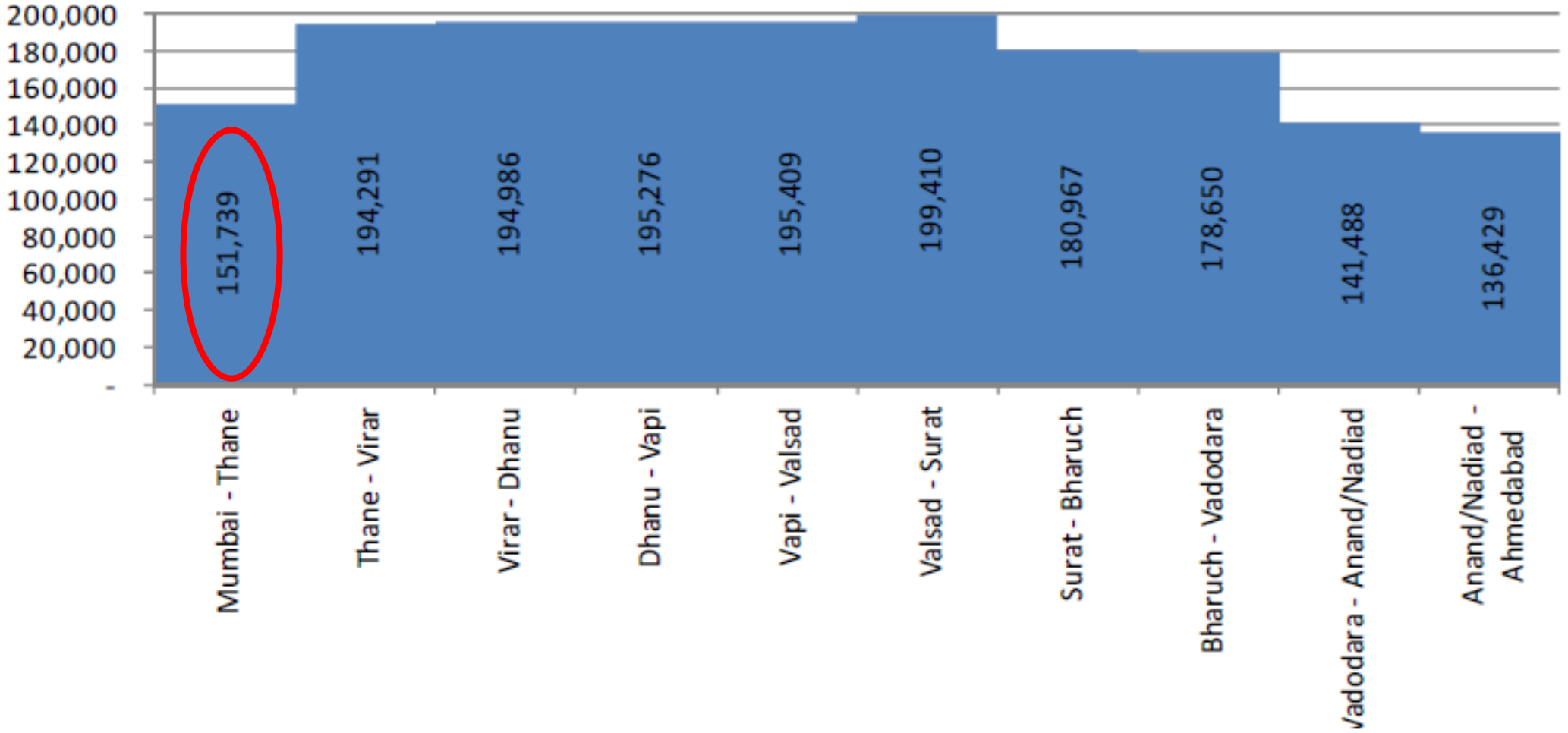
Four Stage Travel Demand Model in CUBE

- Based on Comprehensive Transportation Study (CTS) by MMRDA in 2005
- Consists of calibrated parameters for Trip Generation, Trip Distribution, Modal Split and Trip Assignment
- Continuous updation till current year for various research studies and consultancy projects

Typical Model Applications



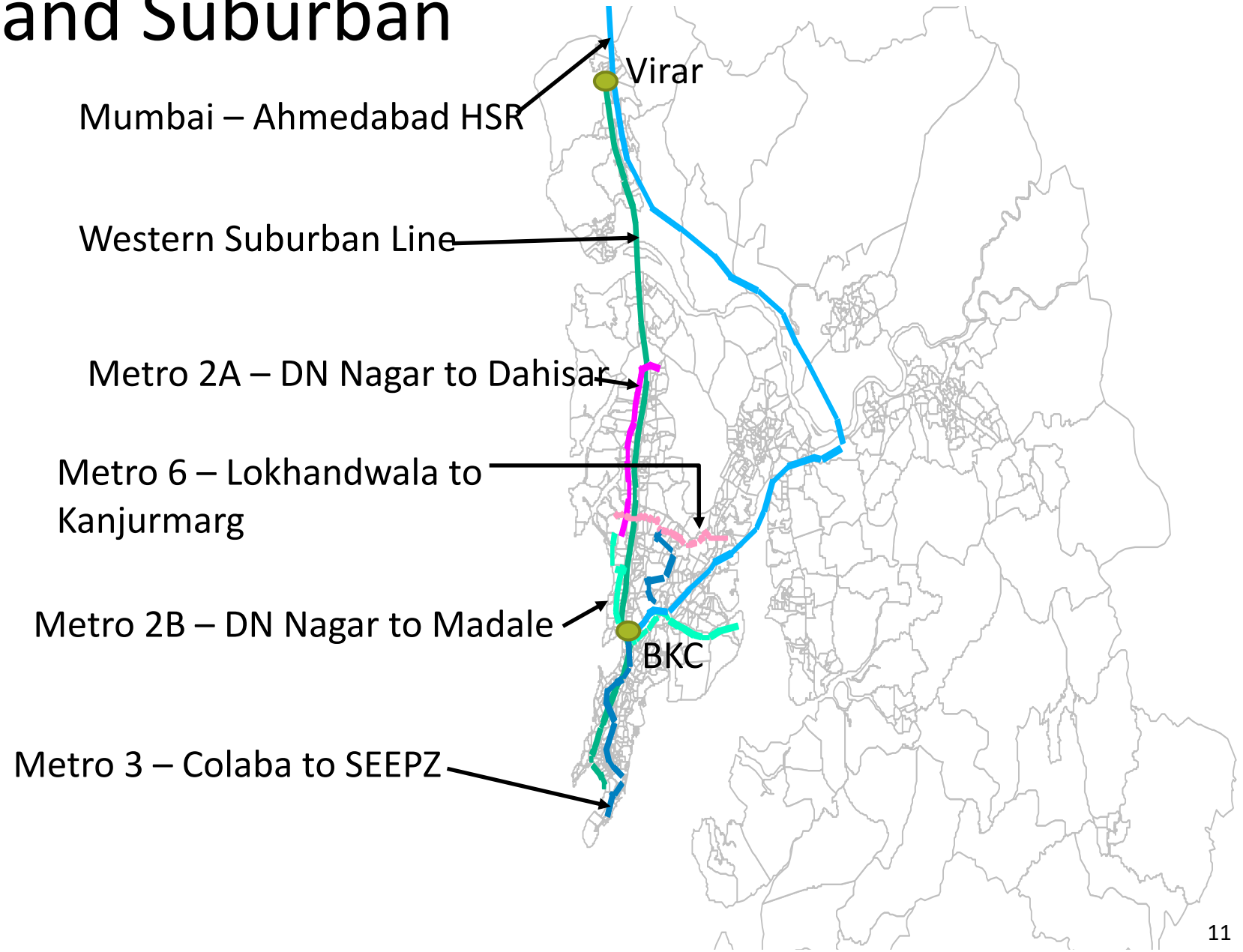
Estimated Daily Ridership of HSR in 2050



(Source: "Preliminary Study on the Formation of High-Speed Railway Project in Western India", JIC, 2013)

Impact on Metro and Suburban

Passengers in peak hour	Western Railway	All Metro Corridors
Without HSR (in thousands)	747	972
With HSR (in thousands)	701	1022
Difference (in thousands)	-46	+50



HSR and Metro Interchange at BKC

- BKC node is proposed to be a metro station in the near future. It is also proposed to be the first station of HSR (from Mumbai). Hence, a large interchanging passengers are observed from the travel demand model.
- It is estimated that the number of passengers using the proposed BKC station during peak hour is about 15,000 and 39,000 for HSR and Metro(Line 2B and Line 3) respectively.
- Such huge demand of passengers needs to be considered during the design of BKC station.

Accessibility Measures

- Accessibility measures previously used –Hansen's Accessibility(Xu et al. ,2018), Weighted average travel time Accessibility (Cao et al.,2013, Kim and Sultana, 2015), Potential accessibility (Cao et al.,2013, Kim and Sultana, 2015), Daily accessibility (Yu and Fan, 2018), Travel time to CBD region (Martinez Sanchez-Mateos and Givoni, 2012).

- General form of Hansen's Accessibility:

$$A_i = \sum_j B_j f(c_{ij})$$

- Form of Hansen's accessibility used :

$$A_i = \sum_j B_j / t_{ij}^a$$

Where,

Bj = the opportunities at zone j for a given purpose

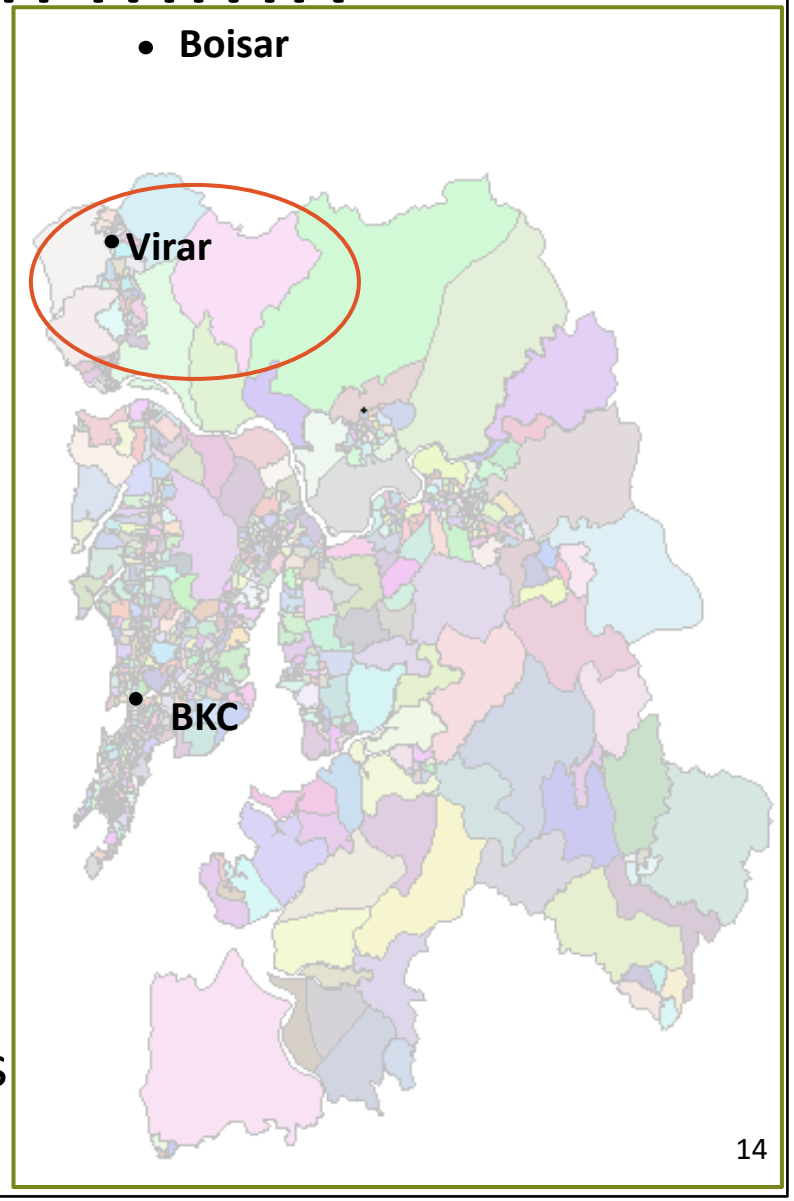
Cij = the travel cost from i to j

f() = some function to represent the deterrent effect of the travel cost

a = some constant, which is taken as 1.

Accessibility of HSR Stations within MMR

HSR Station	Accessibility		
	Without HSR (in thousands)	With HSR (in thousands)	Increment
Virar	226	284	25.5%
Boisar	156	186	19.6%
BKC	589	605	2.7%



- Major increment in Accessibility of peripheral areas will promote rapid development
- No significant increase in accessibility at BKC station since it is already well connected through metro and suburb network.

Proposal for Inclusion of Boisar into MMR jurisdiction

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THE TIMES OF INDIA

With bullet train, MMRDA feels new BKC can be built in Boisar

TNN | Oct 28, 2018, 05.29 AM IST

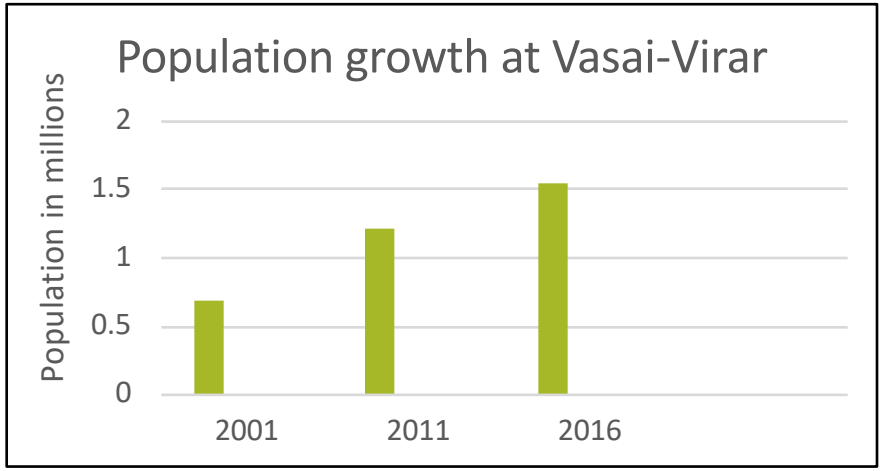
MUMBAI: The Mumbai Metropolitan Region Development Authority wants to expand the region's jurisdiction all the way up to Boisar. "The bullet train has halts at Thane, Virar and Boisar, with its terminus at BKC. Both Thane and Virar are already developed. There is land available in Boisar which we can acquire to set up another BKC. This can be used to set up backup offices and staff quarters. Those working in BKC can travel by the bullet train. The entire distance can be covered in 15-20 minutes," a source said.

Impact on Housing Prices

- Earlier Vasai-Virar region was not a part of MMR. Once the suburban lines were extended till these regions, a rapid development has been observed which is evident with the increase in population from 0.5 million in 2001 to 1.7 million in 2016.
- Pradhan Mantri Awas Yojana is a GOI housing scheme which aims at providing affordable housings to people. Boisar is one of the prime locations selected for this scheme.
- With MMRDA planning to include Boisar in MMR jurisdiction and HSR providing the vital connectivity, a similar trend of rapid development as that of Vasai-Virar is expected.
- The increase in accessibility combined with low prices will change existing travel scenario within MMR and hence people may start residing in such peripheral areas and commute through HSR.

Location	Land Prices (per square feet)
Greater Mumbai	50,000 – 70,000 (INR)
Western Suburban	22,000 – 55,000
Eastern Suburban	14,000 – 38,000
Thane	9,000 – 18,000
Vasai-Virar	3,000 – 5,200
Boisar	1,200 – 2,800

Source - https://housing.com/dsl/heatmaps/mumbai/buy



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