Enhancing Linkages in City Regions

High-Speed Rail and Station Area Development

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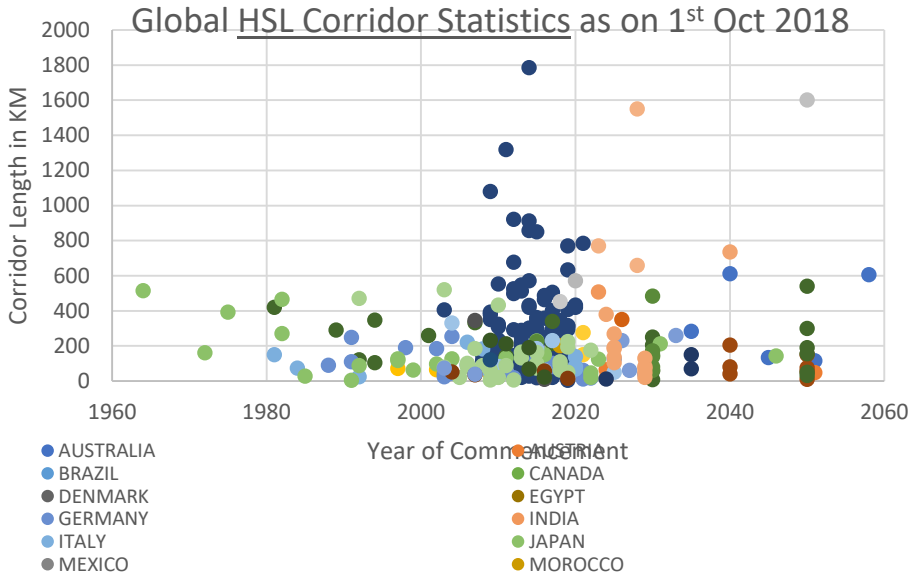
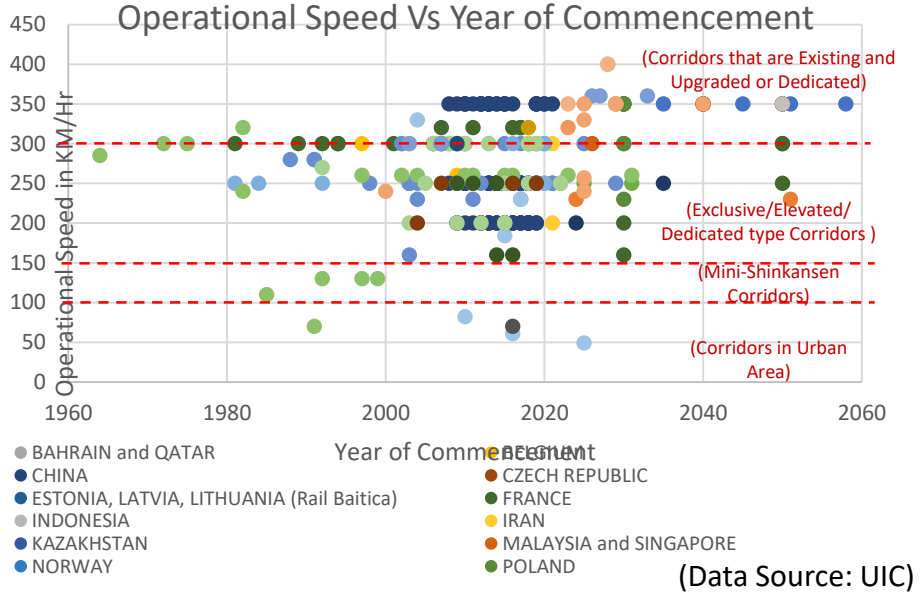
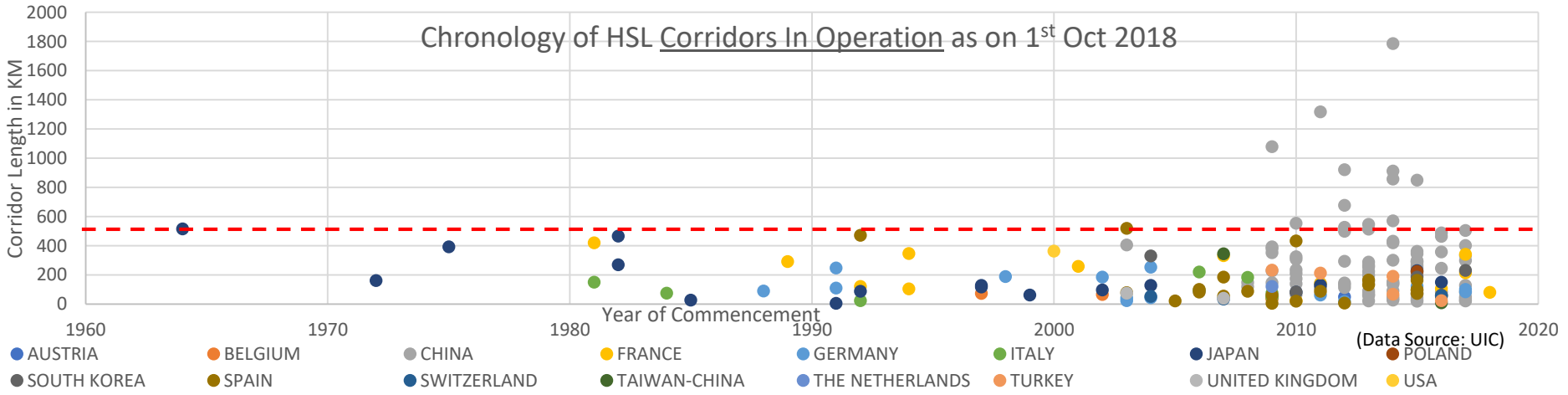




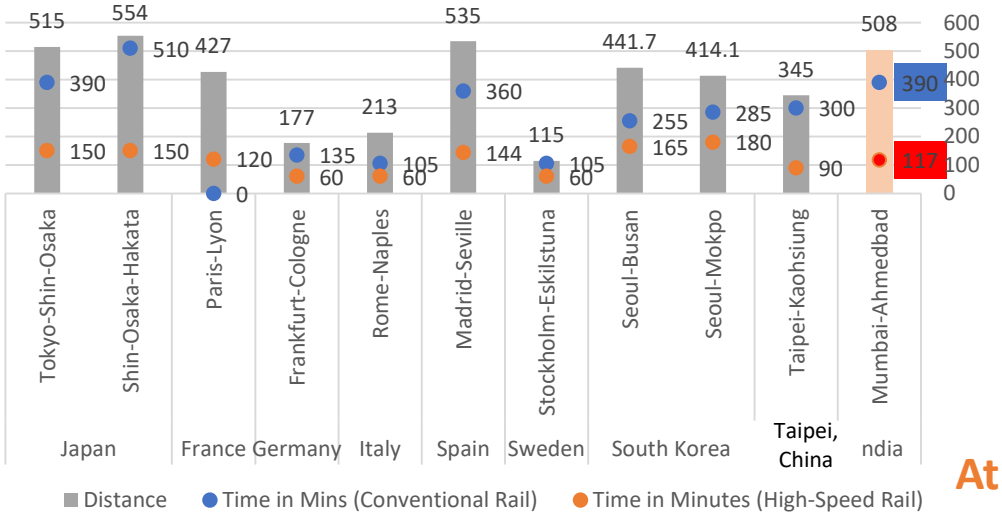
(Data Source: UIC)



(Data Source: UIC)

Direct Effects | Reduced Travel time | Integrated Transport | Station: A connector |

Indirect Effects | Regional | Urban | Station |



(Data Source: Conventional rail time: Various, High-speed Rail time: Author)

At Mega-Regional/Corridor/Inter-urban Level : Reduced Travel time

- Reduced travel time impacts on the modal share of railways in transport market
- Change of Mode Choice

At Serviced City/Urban Level: Integrated Transport

- It is important to remember that HSR is only an element of a total Transport system in an Urban Area
- Integrated Transport is not only beneficial to the cities but also the cities and towns in the surrounding region
- It is desirable that an urban region be linked to a network of HSR link, with regional services

operating in harmony with HSR through:

1. Seamless Connections : Reducing Transfer time : Better door-door time
2. Time-Table matching : Increased Frequency : Higher efficiency of the complete system
3. Types of Integrations:
    - HSR-Airport
    - HSR-Conventional Railways System & Express buses
    - HSR-Urban Transport Networks

At Station Area Level : Connector/Gateway

- The railway station is a node which supports the transfer between modes.
- In a HSR station: The ideal state is for seamless transfer.
- The design of the Station should reduce “Transfer Resistance”; defined by all possible transfer routes (M. Yin (2015))
- To enable the transfer a railway station must provide:
    - Secure Access
    - Loading and standing bay for all modes of transports to stop or park
    - Spatial orientation for passengers
    - Waiting areas and Information support
    - Ticketing, lost and found etc.

HSR changes the Absolute and Relative Accessibility of different cities

HSR changes in relative accessibility of centers, HSR also influences the :

- Choice of location for individuals and for firms

A greater development gap is observed between connected and the unconnected stations:

- Population
- Employment and labor force
- Economic activities:
  - Tourism
  - Business & Knowledge-Intensive economy
  - Wholesale and Retail

Redistribution and relocation along the HSR Corridor

- '**Spillover**' Effect
- '**Straw**' or '**Backwash**' Effect

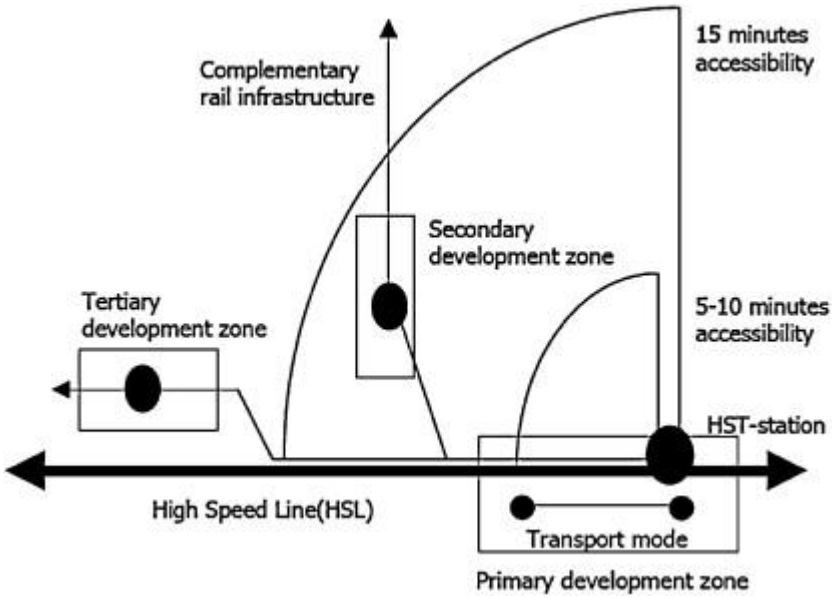
Reconstruction of Urban-Regional system and dynamics

- Commuter HSR and new Metropolitan area
- New Metropolitan Process: Some metropolitan activities may relocate and take on a more sub-urban role compared to traditional role, which is more polarized towards serving its surrounding region.

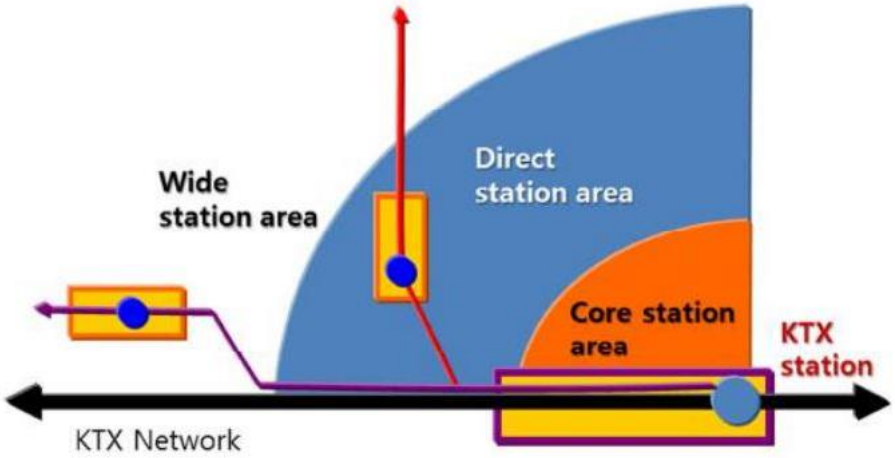
Long distance HSR can link a Functional Urban Region (FUR)

- Economic integration along the corridor in the short, medium and long term:
  - Short Term : Integration of regional Labor & Commercial Markets
  - Medium Term: Relocation of Households and Firms along the Corridor
  - Long Term: Could completely evolve in to a new travel pattern

How should we define a Station area?



(Source: Schutz (1998), Later adapted by Pol, P. M. J. (2002).)



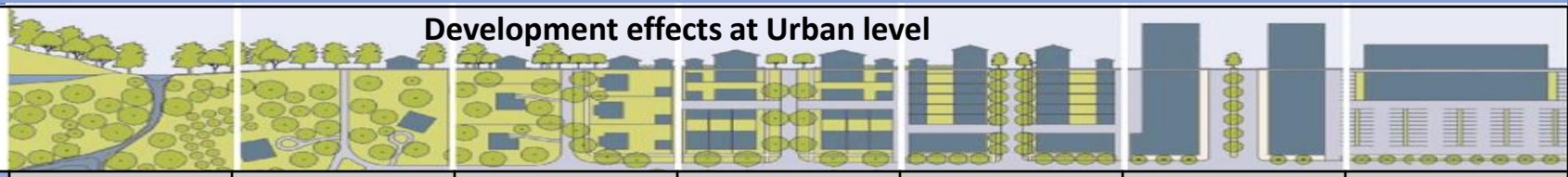
Concept for KTX station Area Development (Source: KOTI Report)

	Primary development zone	Secondary development zone	Tertiary development zone
Accessibility to and from the HSR station	Direct 5–10 min on foot or by seamless transport	Indirect <15 min, by complementary transport modes (including travel and transfer time)	Indirect >15 min, by complementary transport modes (including travel and transfer time)
Location potential	Location for high-grade (inter)national functions	Secondary location for high-grade functions. Specialized functions related to specific location (cluster)	Variety of functions depending on specific location factors
Building density	Very high	High	Depends on specific situation
Development dynamic	Very high	High	Modest

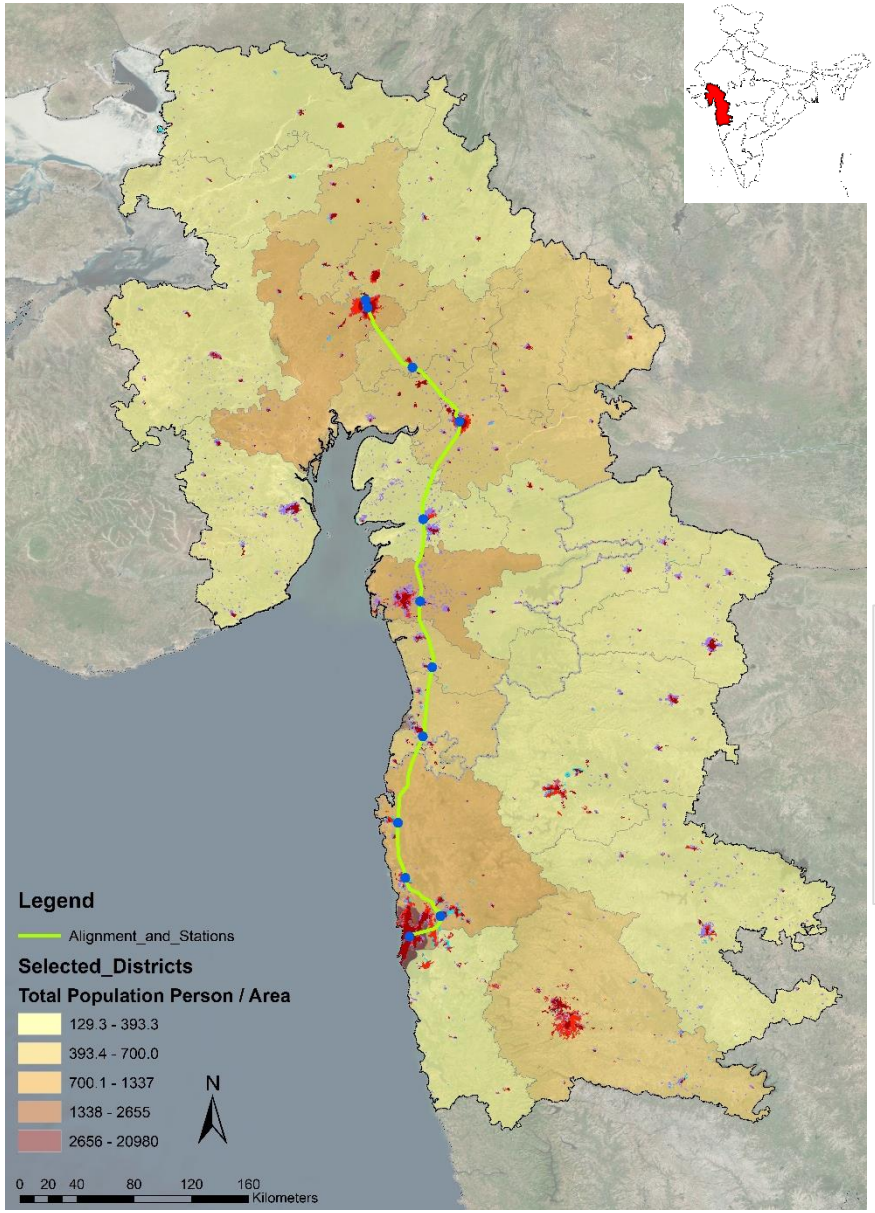
(Source: Schutz (1998))

Source	Definition
Defined station areas based on transport land use features	
Bertolini (1996)	Station as NODE and PLACE • NODE: a (potential) connection to several of the material and immaterial flows that create value in the current — informational (Castells,1989) mode of development. • PLACE: an area of the city that is permanently and temporarily inhabited; a dense and diverse conglomeration of uses and forms accumulated through time that may or may not share in the life of the node.
Wulfhorst (2003)	The interactions between land use in station surroundings, use of station buildings, transport interconnection quality and rail transport demand.
Peek and Louw (2008)	Combination of four disciplinary approaches: • Connector: a built environment connecting the various transportation modes. • Transportation node: a node characterized by its hierarchical position within the transportation networks it is linked to. • Meeting place: a modern marketplace where people are confronted with urban life in all its multiplicity. • Urban centre: provides a scarce resource of land that accommodates dense and mixed-use developments.
Defined station areas based on functions	
Zemp (2011)	Five functions of railway stations from a multi-stakeholder perspective: • Linking the station's catchment area with the transport network. • Supporting transfers between modes of transport. • Facilitating commercial use of real estate. • Providing public space. • Contributing to the identity of the surrounding area.
Juchelka (2002)	Three functions from the perspective of the potential for urban development • Primary function: interconnecting multiple transport modes (MMI). • Secondary function: commercial, leisure and cultural areas for medium-sized stations. • Tertiary function: an important city centre or centre of commerce for large stations.

Development effects at Urban level



Station Location	Natural	Rural	Sub-Urban	General Urban	Urban Centre	Urban Core	Special District
Type of Development for Station	New	New	New	New/Existing/ Integrated	New/Existing/ Integrated	Existing/ Integrated	New
Accessibility	Low/Nil	Low	Car/ Suburban-Commuter Rail/Feeder Service	Car/Feeder Service	Public/Car/Feeder Service/Metro	Public/Commuter Rail/LRT	Metro/LRT/Walkability
Type of possible Land Development	New-Township depending on the distance from closest CBD	New Town, Industrial, Tourism location	High with tendency to form urban Sub-Centre	High with tendency to form urban Sub-Centre	High Urban Renewal /Redevelopment projects	High Urban Renewal /Redevelopment projects	Low
Types of Investments it may attract	---------	Leisure & Tourism	Tourism, Industrial, Commercial, New residential townships	Commercial, New residential townships, Leisure	Activities associated to the closest CBD	Knowledge-Innovation based activities	Localization of Firms, New Research Facilities
Stakeholders configuration	Railway Operator + Landowner	Railway Operator + Landowner + Developer	Railway Operator + Landowner + Developer + Local body	Railway Operator/s + Landowner + Developer + Investors + Local body	Railway Operator/s + Landowner + Investors + Local body + Private organizations	Railway Operator/s + Landowner + Investors + Local body + Private organizations	Railway Operator/s + Investors + Local body + Private organizations
Examples from JAPAN	---------	Gifu-Hashima	Shin-Yokohama	Shinagawa	Shin-Osaka	Tokyo, Nagoya, Kyoto, Sendai	---------
Proposed Stations in INDIA	Virar	Boisar, Vapi, Nadiad/Anand	**Surat** , Bharuch	Thane, Billimora,	**Ahmedabad**, Sabarmati	**Vadodara**	**Bandra BKC**



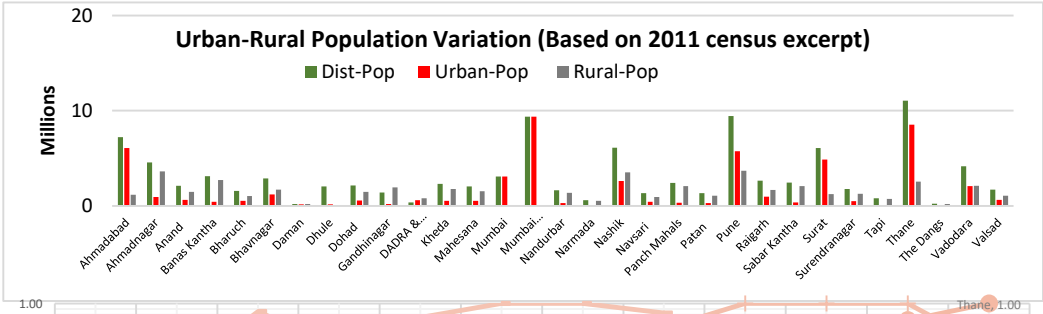
Mumbai Ahmedabad High-speed Rail Corridor (MAHSR)

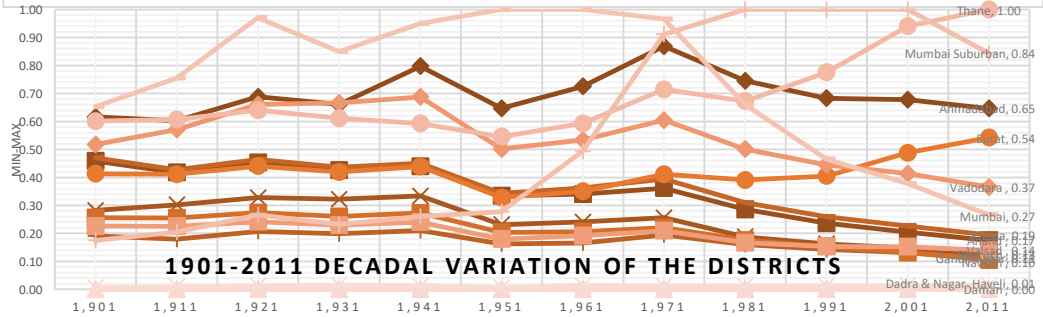
Development of High Speed Rail Corridor in India:

- Indian Railways have proposed five H.S.R routes
- Vision 2020; implementation of one corridor in each Norther, Southern, Eastern and Western Zones of Railways
- MoU signed with JICA and 12th Five Year plan set up National High Speed Rail Authority (NHSRA)
- 1st route to be developed is Mumbai-Ahmedabad H.S.R

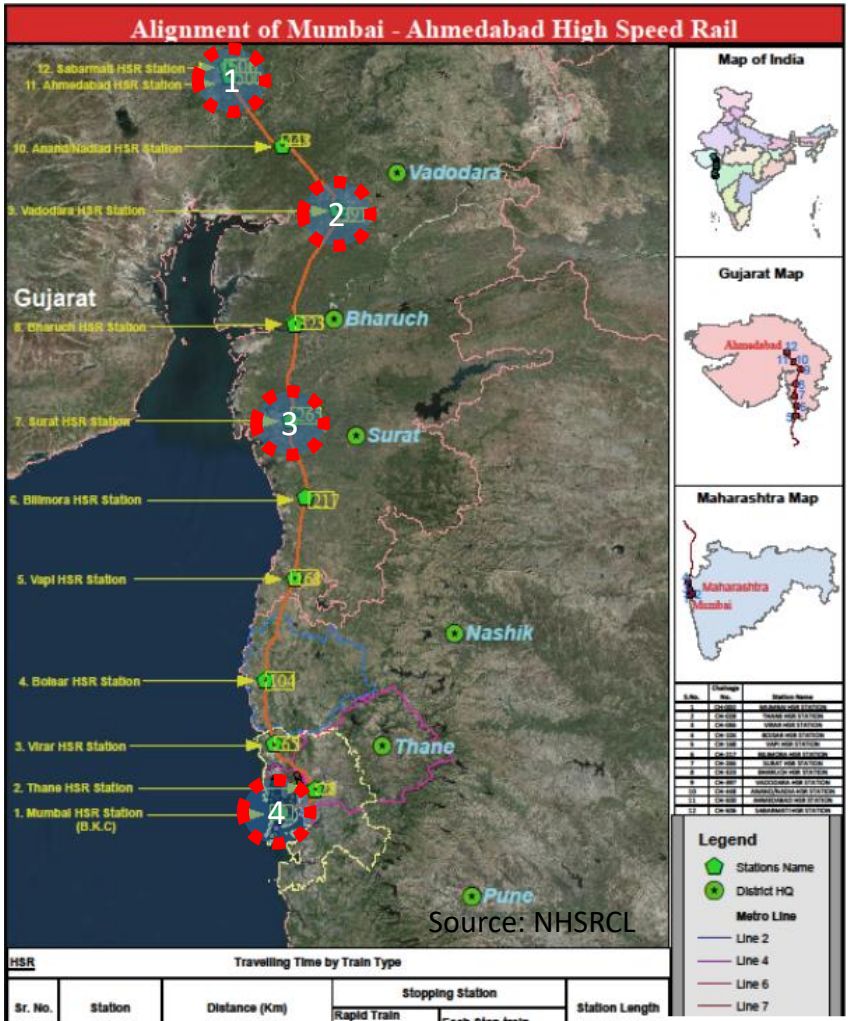
Project Assumptions conclude that:

- Huge potential as industrial and Economic growth zone in India
- High vol. of rail demand is expected in HSR
- Collaboration of Railway development and Town development would be very important.



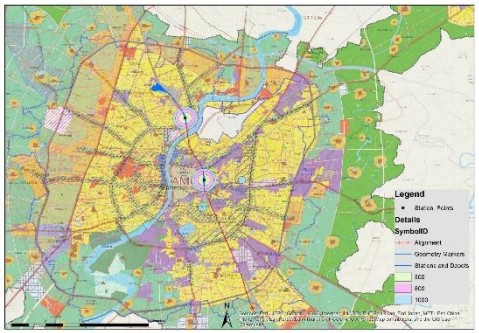


Selected Cases on the Corridor

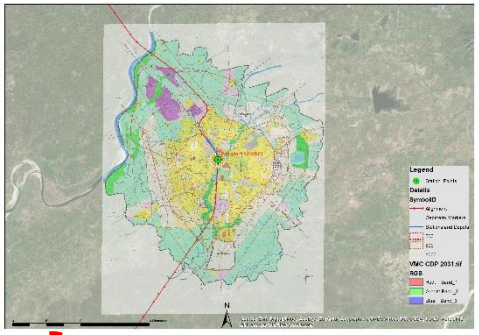


HSR — Travelling Time by Train Type

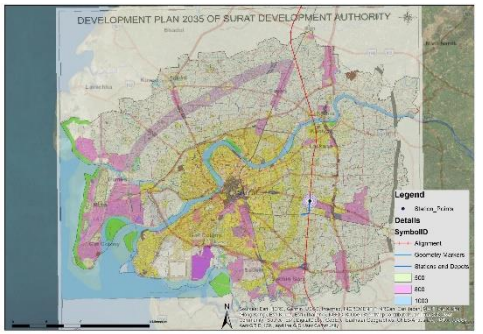
Sr. No.	Station	Distance (Km)	Stopping Station		Station Length
			Rapid Train (Hr)	Each Stop train	
1	BKC	0.00 (0 - 21km Underground)	0.00	0.00	820 m
2	New Thane	27.95	-	0.10	1128 m
3	Virar	65.17	-	0.24	1073 m
4	Boisar	104.26	-	0.39	1319 m
5	Vapi	167.94	-	0.59	1218 m
6	Billimora	216.58	-	1.15	1170 m
7	Surat	264.58	0.58	1.32	1128 m
8	Bharuch	323.11	-	1.52	1319 m
9	Vadodara	397.06	1.32	2.14	2029 m
10	Anand	447.38	-	2.32	1220 m
11	Ahmedabad	500.19	1.59	2.50	1116 m
12	Sabarmati	505.75	2.07	2.58	1117 m



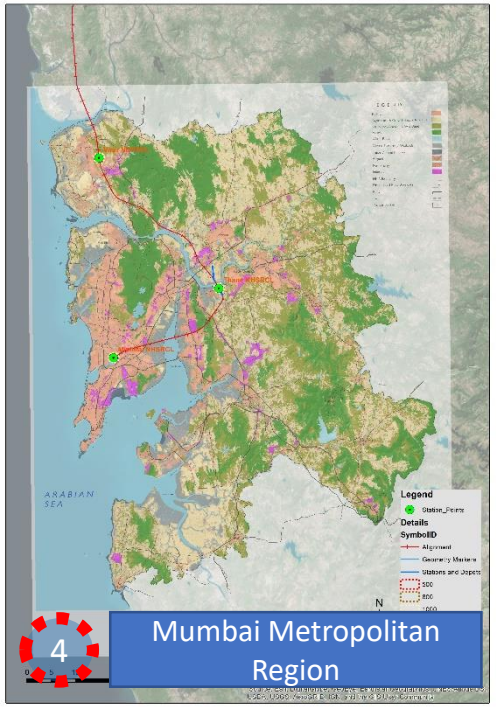
1 Ahmedabad Urban Region



2 Vadodara Urban Region



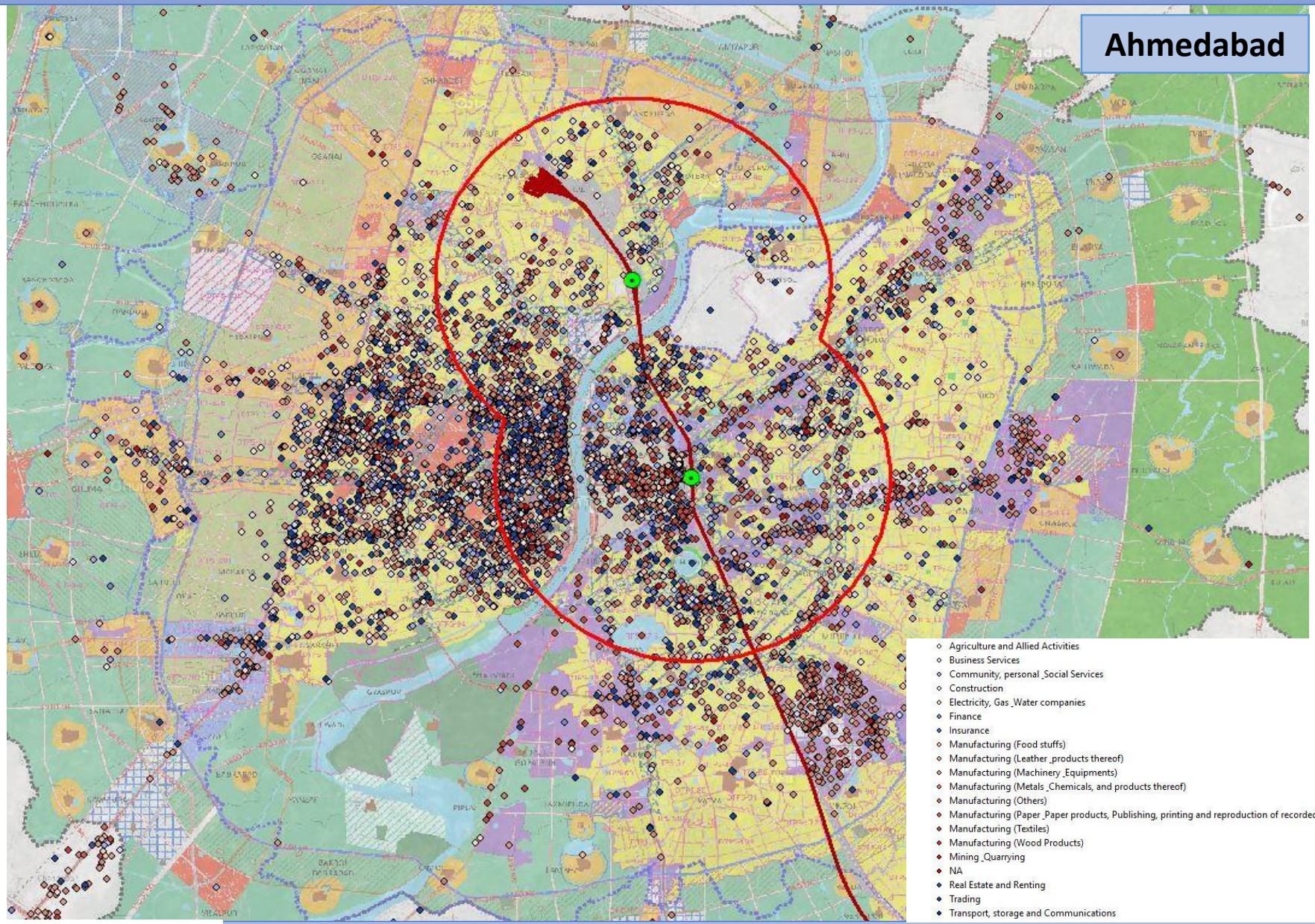
3 Surat Urban Region



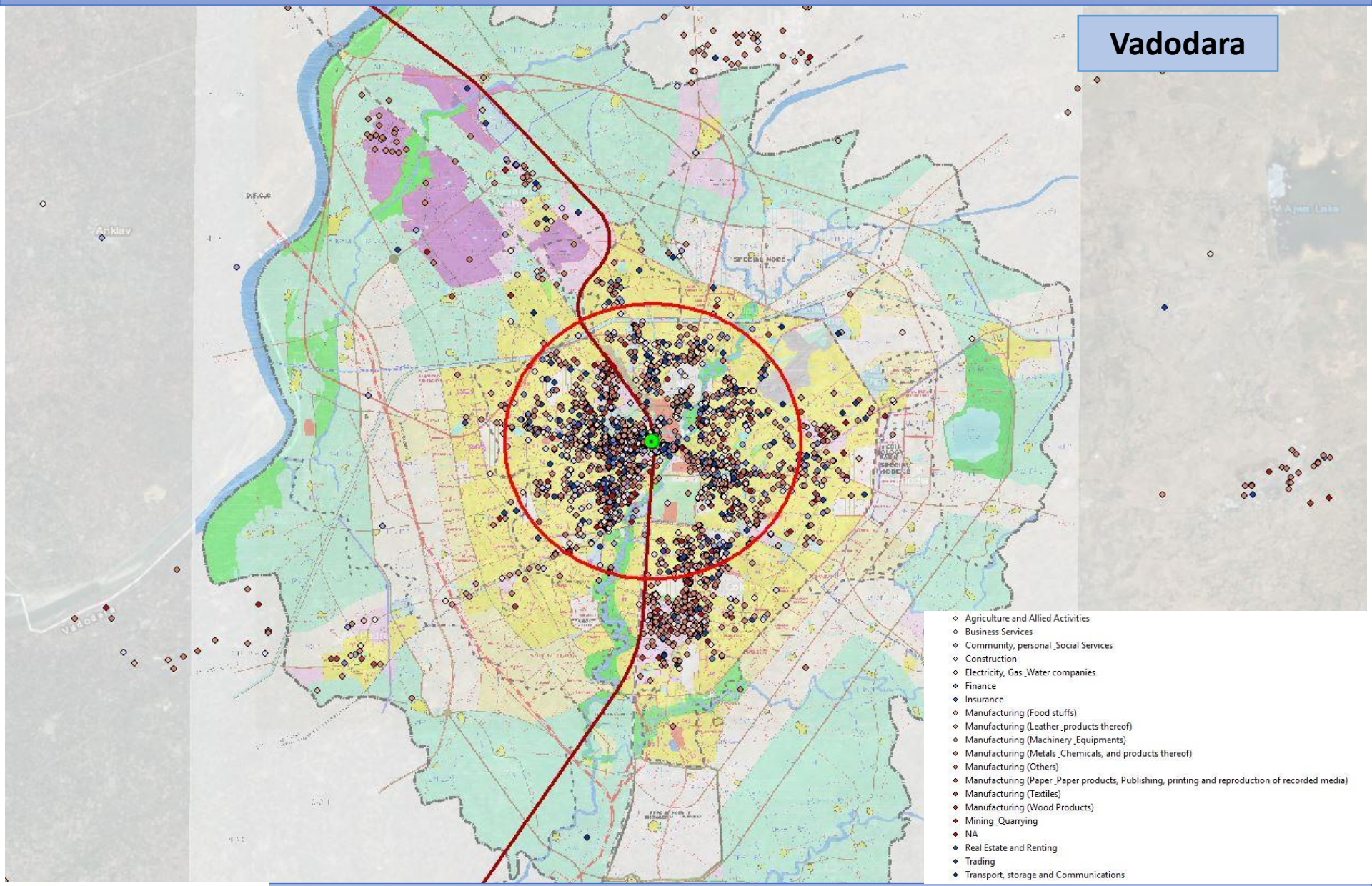
4 Mumbai Metropolitan Region

Summary of Findings

Station Location	Sub-Urban	Urban Centre	Urban Core	Special District
Proposed Stations in INDIA	**Surat**	**Ahmedabad**	**Vadodara**	**Mumbai (Bandra BKC)**
Type of Development for Station	New	New/Existing/ Integrated	Existing/ Integrated	New
Accessibility	Car/ Suburban-Commuter Rail/Feeder Service	Public/Car/Feeder Service/Metro	Public/Commuter Rail/LRT	Metro/LRT/Walkability
Type of possible Land Development	High with tendency to form urban Sub-Centre	High Urban Renewal /Redevelopment projects	High Urban Renewal /Redevelopment projects	Low
Types of Investments it may attract	Tourism, Industrial, Commercial, New residential townships	Activities associated to the closest CBD (Maintaining Industrial Ecology)	Knowledge-Innovation based activities	Localization of Firms, New Research Facilities
Prospective Stakeholders	Railway Operator + Landowner + Developer + Local body	Railway Operator/s + Landowner + Investors + Local body + Private organizations	Railway Operator/s + Landowner + Investors + Local body + Private organizations	Railway Operator/s + Investors + Local body + Private organizations
Tools for implementation for Development plans	• Land Pooling and Town Planning Schemes • Area Development • Local Area Plans			• Land Pooling and Town Planning Schemes • Land acquisition • Acquisition of Reserved sites • Acquisition by Granting TDR/FSI
Policy Framework & Guidelines (National Government)	• National Building Code • Urban and Regional Development Policy Formulation and Implementation (URDPFI) guidelines • Motor Vehicles Act • Town and Country Planning Act • Metro Railways Act & National Urban Transportation Policy • Urban Land Ceiling Act • Rent Control Act • Land Acquisition Act Source: TOD Guidance Document, Ministry of Urban Development, Government of India – May 2016			


Ahmedabad
Agriculture and Allied Activities
Business Services
Community, personal _Social Services
Construction
Electricity, Gas _Water companies
Finance
Insurance
Manufacturing (Food stuffs)
Manufacturing (Leather _products thereof)
Manufacturing (Machinery _Equipments)
Manufacturing (Metals _Chemicals, and products thereof)
Manufacturing (Others)
Manufacturing (Paper _Paper products, Publishing, printing and reproduction of recorded media)
Manufacturing (Textiles)
Manufacturing (Wood Products)
Mining _Quarrying
NA
Real Estate and Renting
Trading
Transport, storage and Communications

Vadodara


Agriculture and Allied Activities
Business Services
Community, personal _Social Services
Construction
Electricity, Gas _Water companies
Finance
Insurance
Manufacturing (Food stuffs)
Manufacturing (Leather _products thereof)
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Manufacturing (Metals _Chemicals, and products thereof)
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Manufacturing (Textiles)
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Real Estate and Renting
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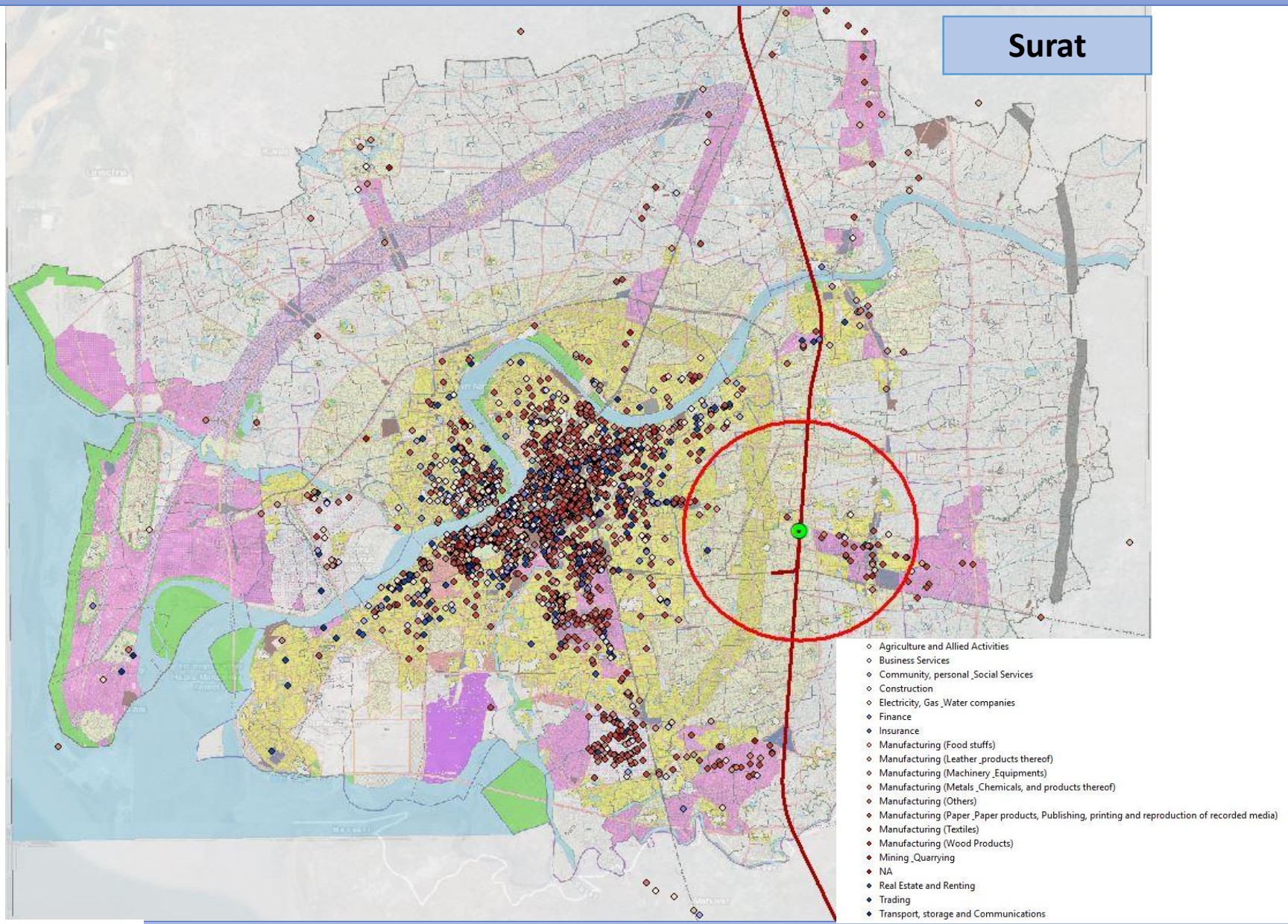
Transport, storage and Communications


Surat
Agriculture and Allied Activities
Business Services
Community, personal _Social Services
Construction
Electricity, Gas _Water companies
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Manufacturing (Food stuffs)
Manufacturing (Leather _products thereof)
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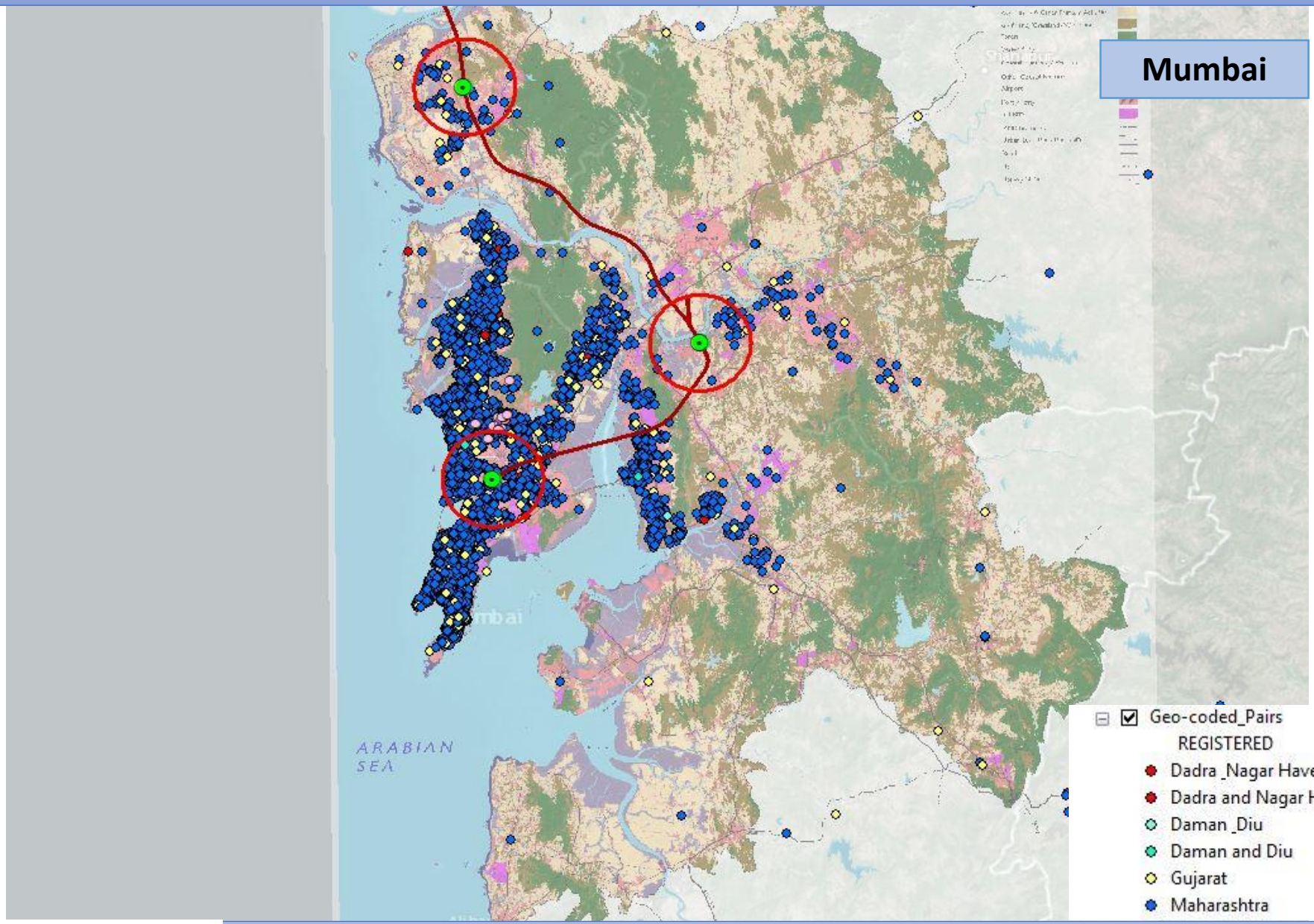
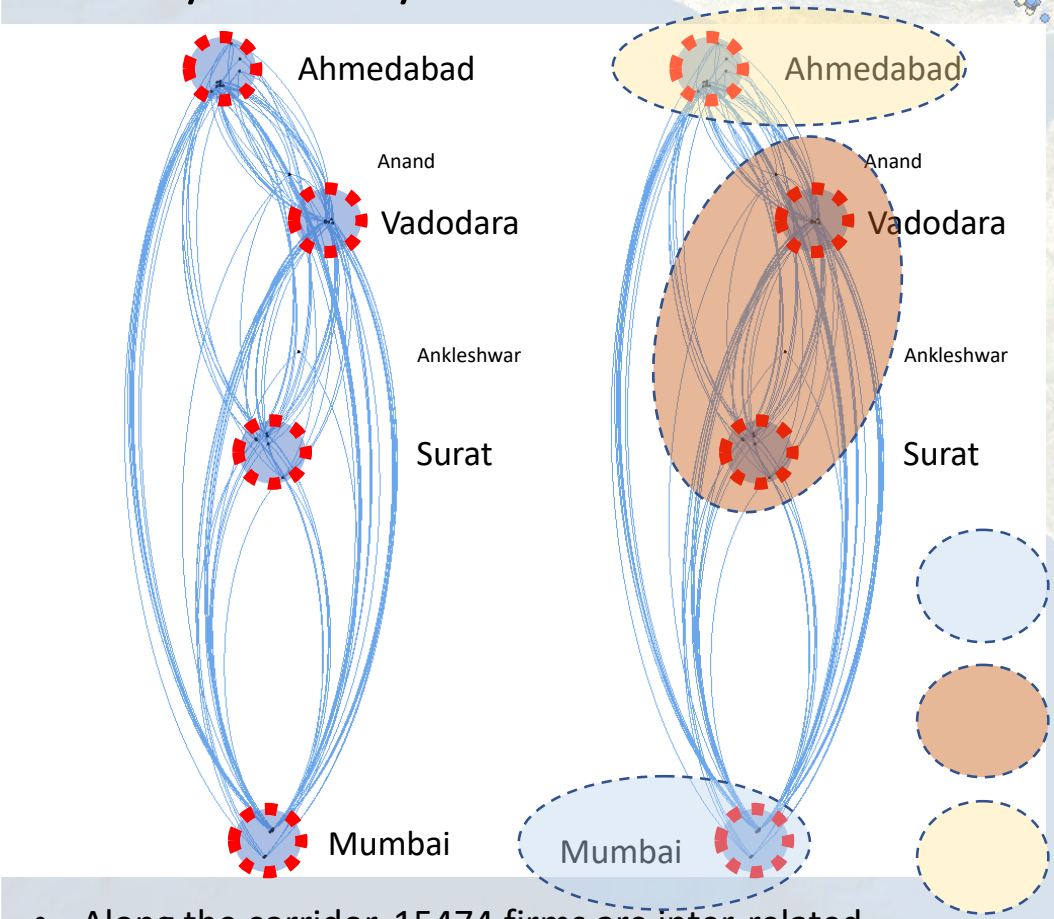

Mumbai
ARABIAN SEA
Geo-coded_Pairs
REGISTERED
Dadra _Nagar Haveli
Dadra and Nagar Haveli
Daman _Diu
Daman and Diu
Gujarat
Maharashtra

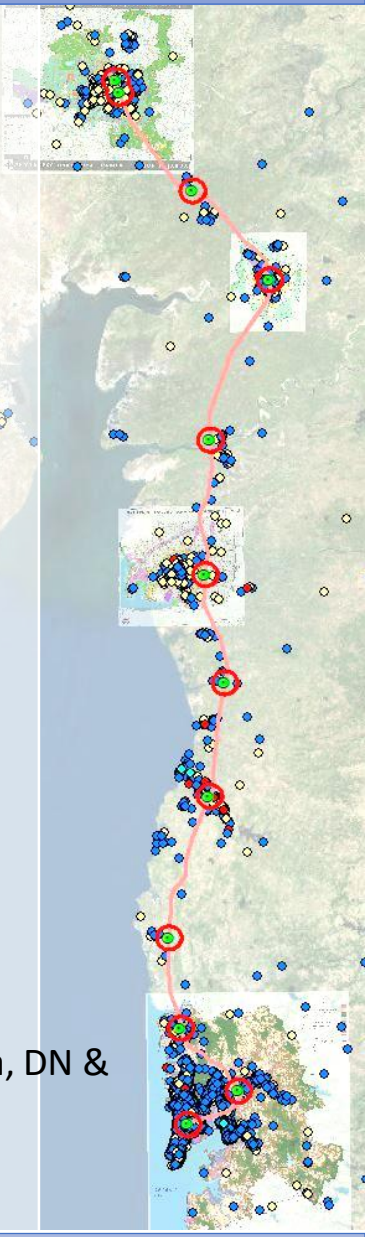
Poly-centricity of the cities : Branch network along the corridor



High Concentration of H.Q.s and corporate offices of major firms

Manufacturing facilities of the firms located in Cities

High Concentration of branches of corporate offices of major firms



- Along the corridor, 15474 firms are inter-related.
- Data has been collected for a total of approx. 410,000 firms (States of Gujarat, Maharashtra, DN & DD)
- Findings suggest the corridor is poly-centric with interdependent functions and specializations.

Summary of Findings

- Rapidly Developing Cities like Surat tend to be on-board for development. Channelizing growth for own benefit by creating a poly-centric plan, by pushing the station location in peripheral locations.
- Cities of national importance like Mumbai, have been developed over time and Urban area is very densely developed- adding to the urban development is not possible.
- Industrial Hubs like Vadodara need to channelize new footfall in the city there by inviting the alignment in the city core.
- Redevelopment and removal of dilapidated sites will be the prime focus for Ahmedabad as the unused railway goods yard will be redeveloped in to a business district.
- Understanding of the System of Cities is important for a policy framework