CONCLAVE ON
EMERGING OPPORTUNITIES
IN MASS RAPID TRANSIT SYSTEM
IN UTTAR PRADESH

MASS TRANSIT SYSTEM IN FOUR MAJOR CITIES OF UTTAR PRADESH

LUCKNOW METRO RAIL CORPORATION

30th April 2015

RITES
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(A Government of India Enterprise)

COVERAGE

- About RITES Ltd.
- Background
- Four cities – a Snapshot
- Priority MRTS Corridors in Four Cities
- System Selection
- Institutional Arrangements
- Timelines

ABOUT RITES LTD.

- Leading International Consultants in Transport Sector
- Established in 1974
- Experience in 62 Countries
- ISO 9001 Certified
- Registered with International Funding Agencies
- Regional Offices All over India

SERVICE AREAS

TOTAL TRANSPORT CONSULTANT FROM CONCEPT TO COMMISSIONING :

- Railways
- Urban Transport
- Highways & Bridges
- Airports
- Ports & Harbors
- Inland Water Transport
- Ropeways

URBAN TRANSPORT SPECTRUM

- Comprehensive Mobility Plans (CMP) / Comprehensive Traffic & Transport Studies (CTTS), Multimodal Integration Studies
- Traffic Engineering & Management Studies
- Bus Planning & Operation Studies
- Feasibility Studies & DPRs for Mass Transit Systems
- Financial and Economic Appraisal
- Transport Policy at City, Regional and National Levels
- Detailed Design & Project Management

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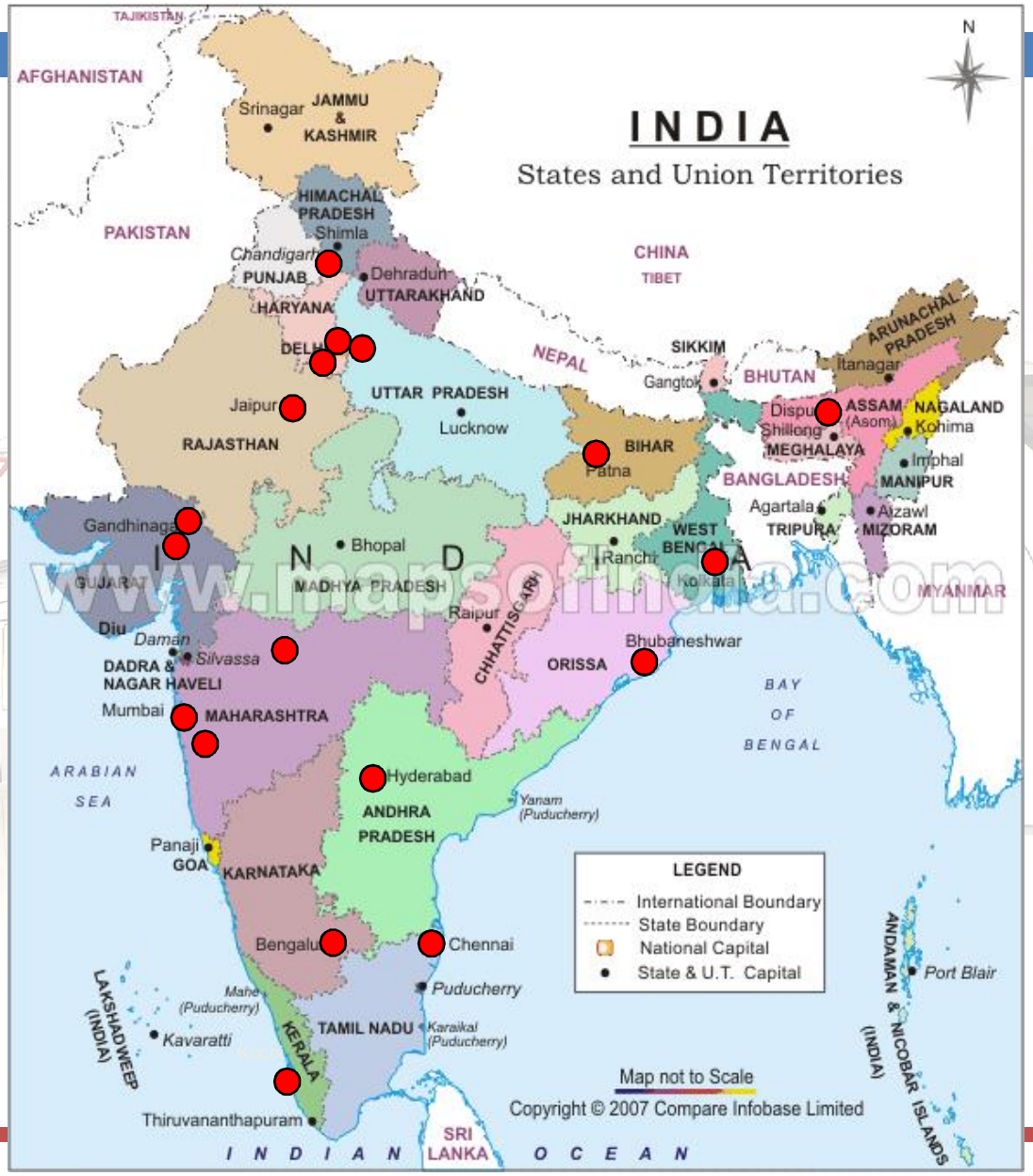
EXPERIENCE IN MRTS PROJECTS



EXPERIENCE IN MRTS PROJECTS

SN	PROJECT NAME	CLIENT
1	Feasibility Study and DPR of Rail Based MRTS in Guwahati	Guwahati Metropolitan Development Authority
2	Feasibility and DPR for Kochi Metro Phase II	Kochi Metro Rail Corporation
3	Technical Feasibility and DPR for Metro Rail in Patna	Urban Development, Govt. of Bihar
4	DPR for MRTS / RRTS between Ahmedabad and Dholera - Special Investment Region	Delhi Mumbai Industrial Development Corporation Limited
5	DPR for Integrated Transport Corridors (ITC)/ Bus Rapid Transport (BRT) Corridors along various Roads in Delhi	PWD Delhi
6	Techno – Economic Feasibility for Monorail in Patna	Ministry of Railways, Railway Board
7	Techno-Economic Feasibility Study and DPR of Mass Transit Connectivity between Dwarka Metro Station and Nangloi via Baprola	Delhi State Industrial and Infrastructure Development Corporation Ltd
8	Techno-Economic Feasibility Study and DPR for Mass Transit Connectivity between Shastri Park Metro Station and Kalyanpuri via Laxmi Nagar	Delhi State Industrial and Infrastructure Development Corporation Ltd

EXPERIENCE IN MRTS PROJECTS

SN	PROJECT NAME	CLIENT
9	Technical Consultancy for DPR for New Metro Corridor in Kolkata	Rail Vikas Nigam Limited
10	Traffic Demand Forecast for Phase IV Corridors of Delhi Metro Network	Delhi Metro Rail Corporation Limited
11	Traffic Demand Forecast for DPR for proposed Phase I of Chandigarh Metro	Delhi Metro Rail Corporation Limited
12	Technical Feasibility Study for Monorail:Thane – Bhiwandi – Kalyan	Mumbai Metropolitan Development Authority
13	DPR for Chennai MRTS	Delhi Metro Rail Corporation Limited
14	Integrated Multi Modal Mass Transit Network for Delhi	Transport Department, GNCTD
15	Feasibility Study for Rail Transit Link in NOIDA, Greater NOIDA and Ghaziabad	NOIDA Authority
16	Mass Transit System for Cuttack & Bhubaneshwar	Commerce & Transport Department, Government of Orissa
17	DPR for East-West Corridor of Kolkata Metro	Delhi Metro Rail Corporation Limited

EXPERIENCE IN MRTS PROJECTS

SN	PROJECT NAME	CLIENT
18	DPR for the Mumbai Metro Rail System	Delhi Metro Rail Corporation Limited
19	DPR for Metro Rail System for Ahmedabad and Gandhinagar and Regional Rail System for Ahmedabad	Delhi Metro Rail Corporation Limited
20	DPR for Phase-II of Delhi MRTS	Delhi Metro Rail Corporation Limited
21	DPR for Metro Rail System for Bangalore	Delhi Metro Rail Corporation Limited
22	Detailed Techno-Economic Feasibility Study of Integrated Rail-cum-Bus Transit (IRBT) Corridors in Delhi	Transport Department Delhi
23	DPR for the proposed Mumbai Trans Harbour Metro Rail Link	Mumbai Metropolitan Development Authority
24	DPR for Hyderabad Metro	Delhi Metro Rail Corporation Limited
25	Techno economic survey and DPR for Fast Corridor on CSTM – PVNL Harbour Line on Central Railway	Mumbai Railway Vikas Corporation Ltd
26	Detailed Design and Drawings for provision of third line between Kalyan – Kasara on Central Railway	Central Railway

EXPERIENCE IN MRTS PROJECTS

SN	PROJECT NAME	CLIENT
27	DPR for through metro corridor: Colaba – Mahim – BKC – Airport - SEEPZ	Mumbai Metropolitan Development Authority
28	PET Survey for new corridors in and around the Metropolitan city of Kolkata and submission of Report for Metro Railways Kolkata	Metro Railway, Kolkata
29	DPR for Mumbai Metro Rail Project Phase I and Phase III: BKC – Kanjur Marg with Extension from BKC to Mahim	Mumbai Metropolitan Development Authority
30	Project Development Consultancy and Bid Process Management Consultancy for Implementation of MRTS in Chandigarh in BOOT basis	Chandigarh Administration
31	Feasibility study for Elevated rail corridor from Church Gate to Virar, Mumbai	Ministry of Railways
32	Preparation of Feasibility Report for Mumbai Monorail I & II along with Bid process Management	Mumbai Metropolitan Development Authority
33	Consultancy for Techno Economic feasibility study for Monorail Project Delhi	Transport Department, ISBT, Kashmere Gate, Delhi 110001
34	DPR for Delhi Metro Phase-I	Delhi Administration

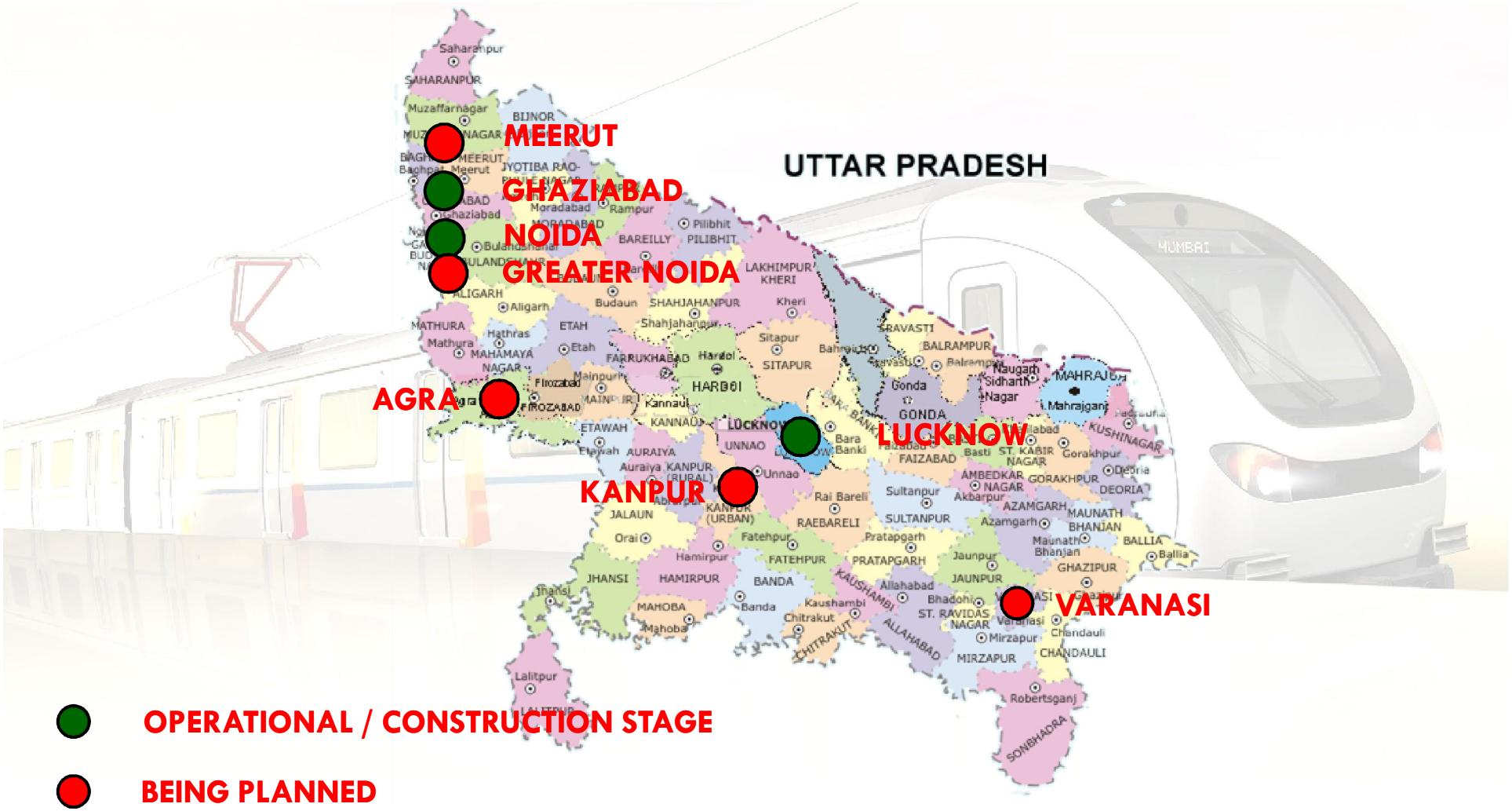
BACKGROUND FOR THE PRESENT STUDY

VISION - To bring 'best-in-class' mobility in the State by providing convenient, safe, reliable, and cost-effective public transport system connecting and creating vibrant urban spaces

MISSION – smart, efficient, economic, seamless and sustainable transport services

GOVT. OF UTTAR PRADESH HAS DECIDED TO HAVE RAIL BASED MASS TRANSIT SYSTEMS IN KANPUR, VARANASI, AGRA AND MEERUT

UTTAR PRADESH - CITIES WITH MRTS



FOUR CITIES – A SNAPSHOT

City	Study Area (Sq. Km)	Population (Lakh)	
		2011*	2021#
Kanpur	1041	34.8	51.0
Agra	520	21.0	25.5
Meerut	565	18.4	21.8
Varanasi	260	15.4	19.2

* Census 2011
\# Master Plan Projections

STUDY STAGES

Stage 1

- City Level Traffic Studies, Travel Demand Modeling & Preparation of MRTS Master Plan

Stage 2

- Preparation of Detailed Project Report for Priority MRTS Corridors

BOTH THE STAGES ARE BEING DONE SIMULTANEOUSLY

STUDY PROGRESS

Kanpur

- Inception cum Options Report submitted
- Primary Traffic & Travel Surveys completed
- Engineering Surveys in progress
- Draft DPR to be submitted by August 2015

Agra

- Inception cum Options Report submitted
- Primary Traffic & Travel Surveys in progress
- Engineering Surveys in progress
- Draft DPR to be submitted by September 2015

Meerut

- Inception cum Options Report to be submitted by 15th May 2015
- Primary Traffic & Travel Surveys in progress
- Draft DPR to be submitted by September 2015

Varanasi

- Traffic & Engineering Studies to be taken up shortly

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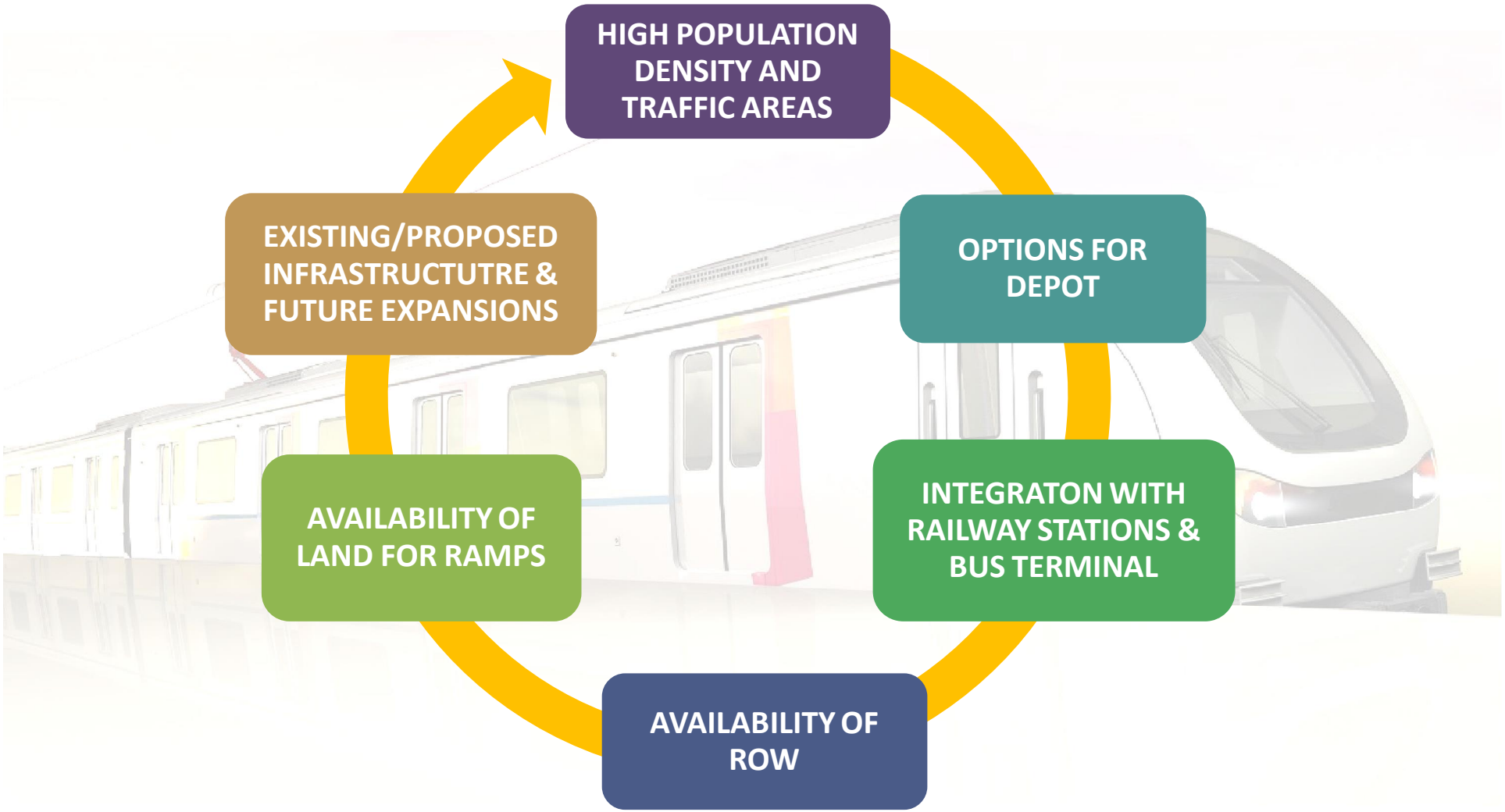
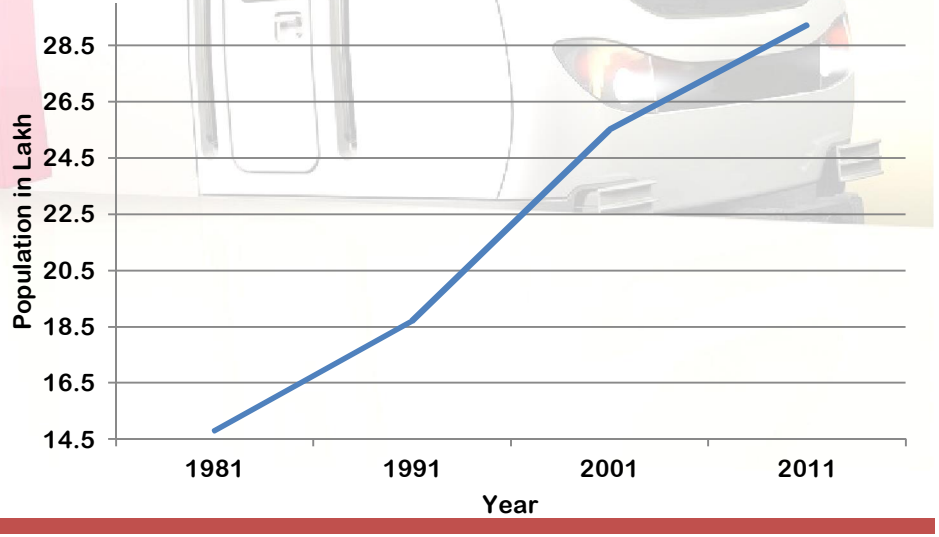
PARAMETERS FOR IDENTIFICATION OF MRTS CORRIDORS



KANPUR – AN OVERVIEW

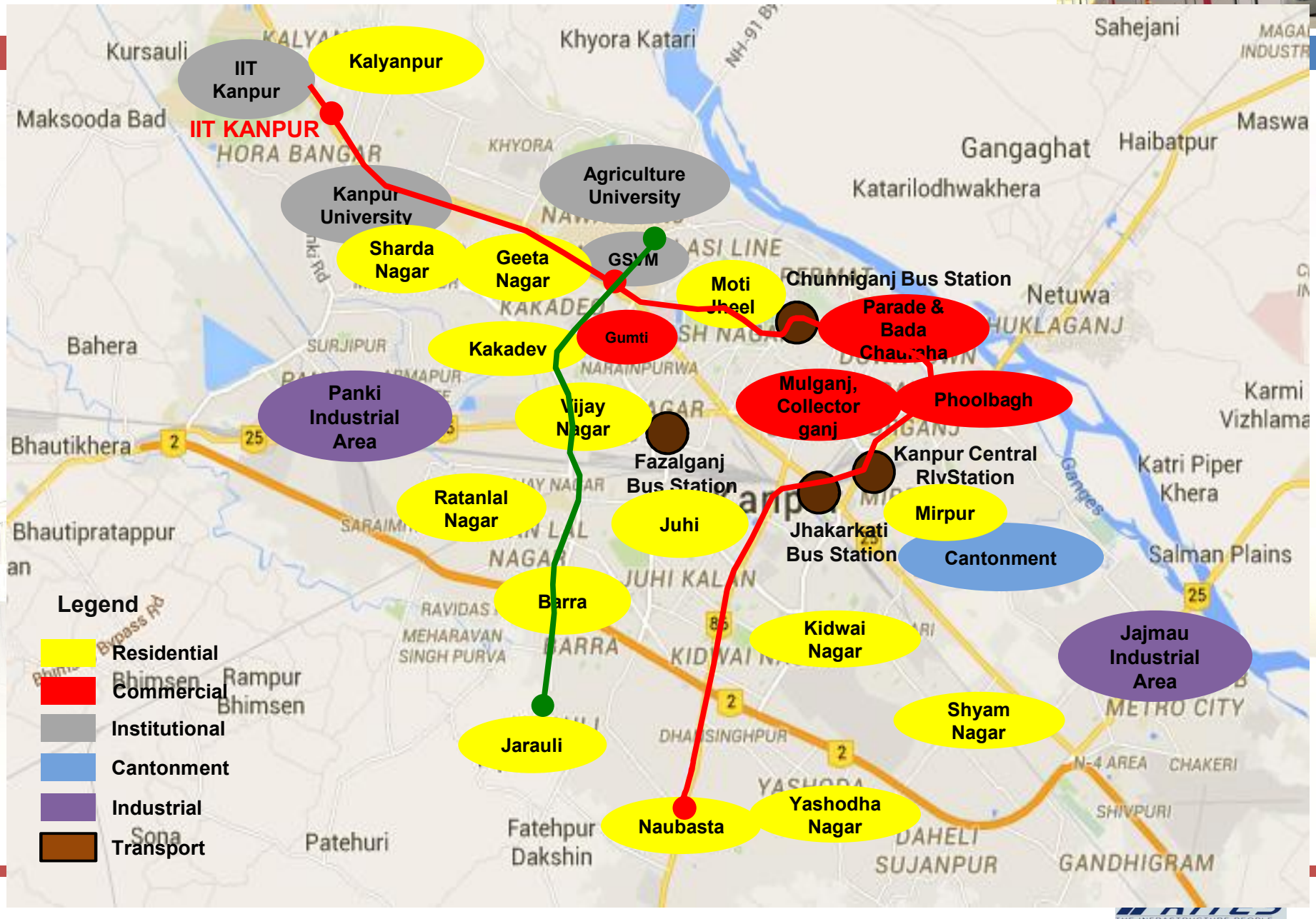
- Largest Urban Agglomeration of UP & eleventh largest of India
- Has linearly developed along river Ganga and GT Road.
- One of the oldest industrial townships of India
- Industrial Centre with mills, leather factories, ordinance establishments and arm factories
- An Institutional Hub

Year	Urban Population	% Decadal Growth
1981	14.8	-
1991	18.7	26%
2001	25.5	36%
2011	29.2	15%

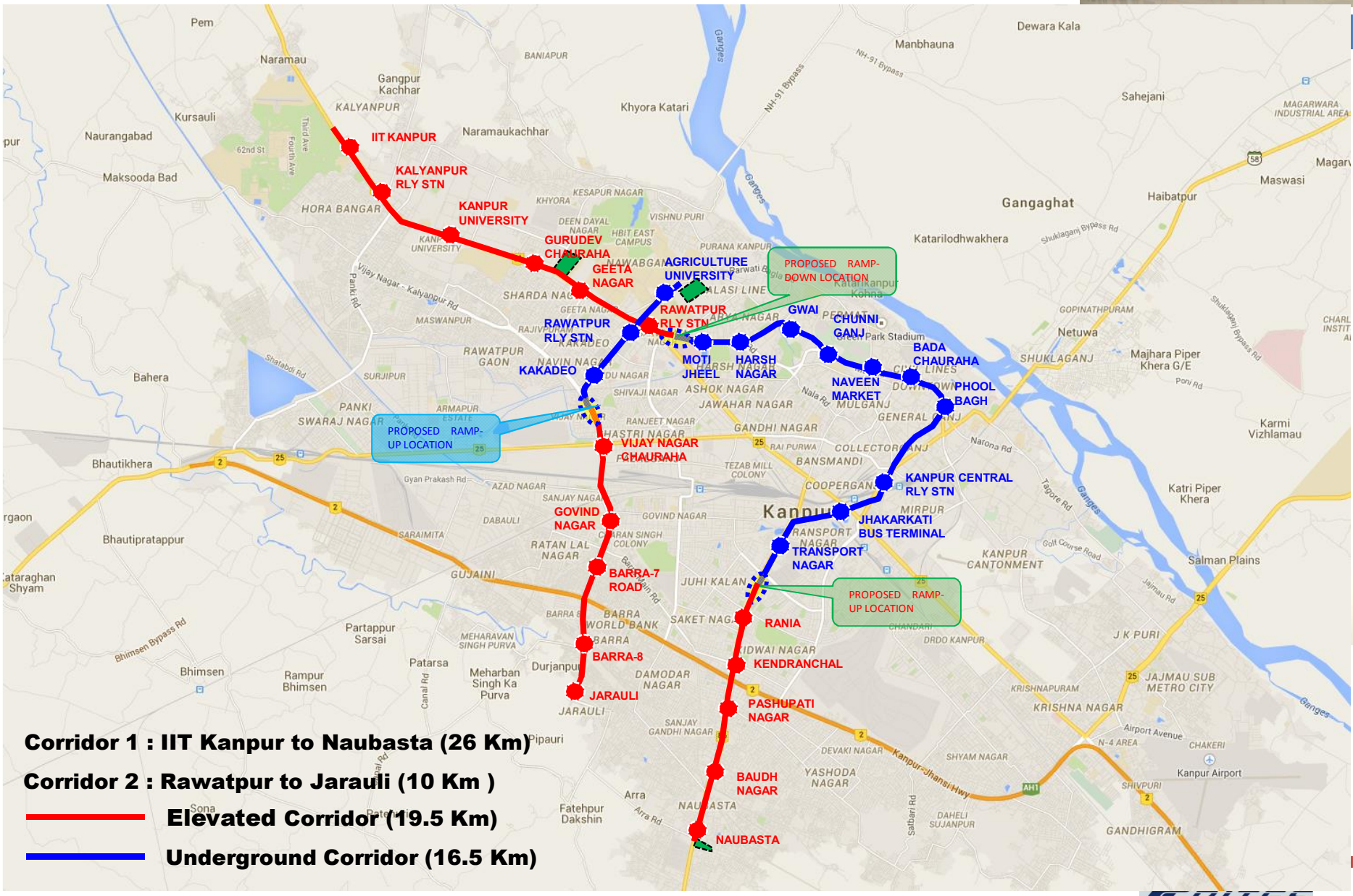


KANPUR - TRAFFIC CHARACTERISTICS

ATTRACTION CENTERS – KANPUR



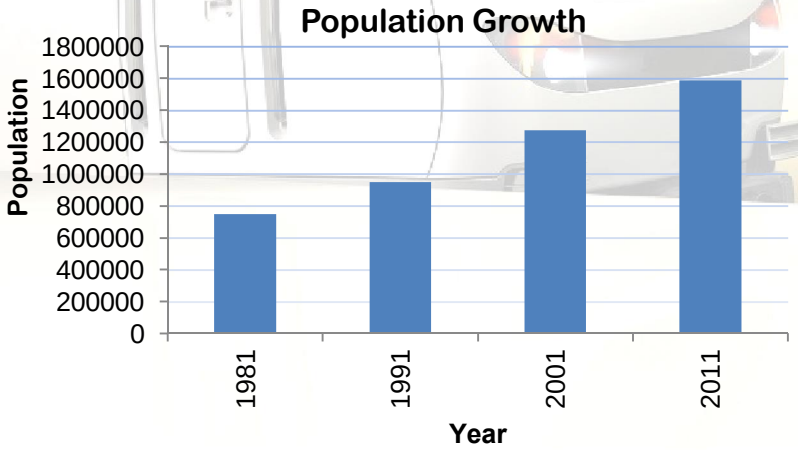
PRIORITY MRTS CORRIDORS - KANPUR



AGRA – AN OVERVIEW

- 3rd most populous city of Uttar Pradesh
- Tourist Attractions - Taj Mahal, Agra Fort, Sikandara and Fatehpur Sikri
- Known for Leather Products, Carpets, Handicrafts, Zari and Zardozi (embroidery work), Marble etc.

Year	Urban Population	% Decadal Growth
1981	7.5	-
1991	9.5	26.9%
2001	12.8	34.5%
2011	15.9	24.4%



AGRA - TRAFFIC CHARACTERISTICS

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ATTRACTION CENTERS – AGRA

Sikandara
SIKANDRA
Dayalbagh Educational Institute
Mohammad Pur
ISBT & Transport Nagar
Dayal Nagar
Ghatwasan
Trans Yamuna Colony
TYC PH-II
Rambagh
Rishi Puram Colony
Sanjay Place
Industrial Estate
Avas Vikas Colony
B.R. Ambedkar University
Loha Mandi
Raja Ki Mandi Railway Stn.
ST. JOHN'S COLLEGE
S.N. Medical College
Chanakya Puri
Hing Ki Mandi
Agra Fort
Kothi Meena Bazar
Panch Sheel Colony
Taj Mahal
Idgah Railway Stn.
HOTEL TRIDENT
Sadar Bazar
Agra Airport
Agra Cantt Railway Stn.
Shaheed Nagar
Agra Cantonment
Army Pub. School
Shamsabad

Legend

- Residential
- Commercial
- Tourist
- Institutional
- Cantonment
- Industrial
- Transport

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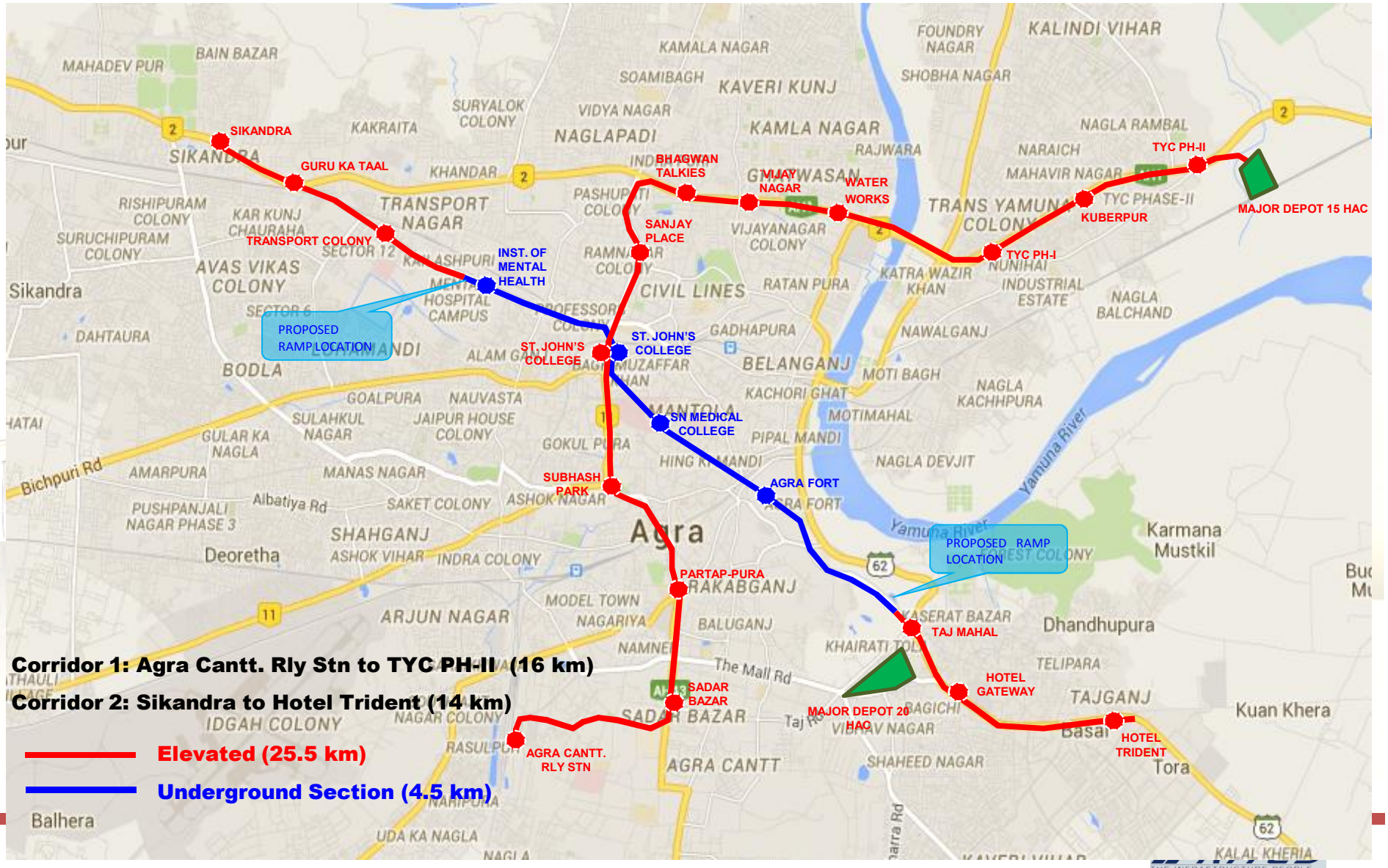
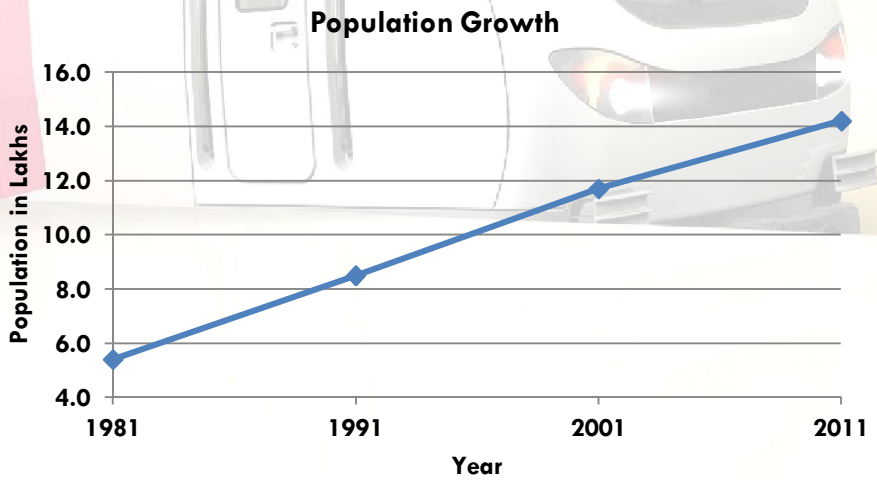
PRIORITY MRTS CORRIDORS - AGRA



MEERUT – AN OVERVIEW

- Located at about 70 km from Delhi and an important urban centre of NCR.
- Proximity to Delhi made Meerut an Urban centre that continues to attract growth.
- One of the major industrial and educational town of U.P. It is also the largest producers of sports goods and musical instruments in India.
- Has developed radially along majorly travel corridors i.e along Delhi – Roorkee Road, Garh Road, Baghpat Road and Hapur Road.

Year	Urban Population	% Decadal Growth
1981	5.4	-
1991	8.5	57%
2001	11.7	38%
2011	14.2	21%



MEERUT - TRAFFIC CHARACTERISTICS

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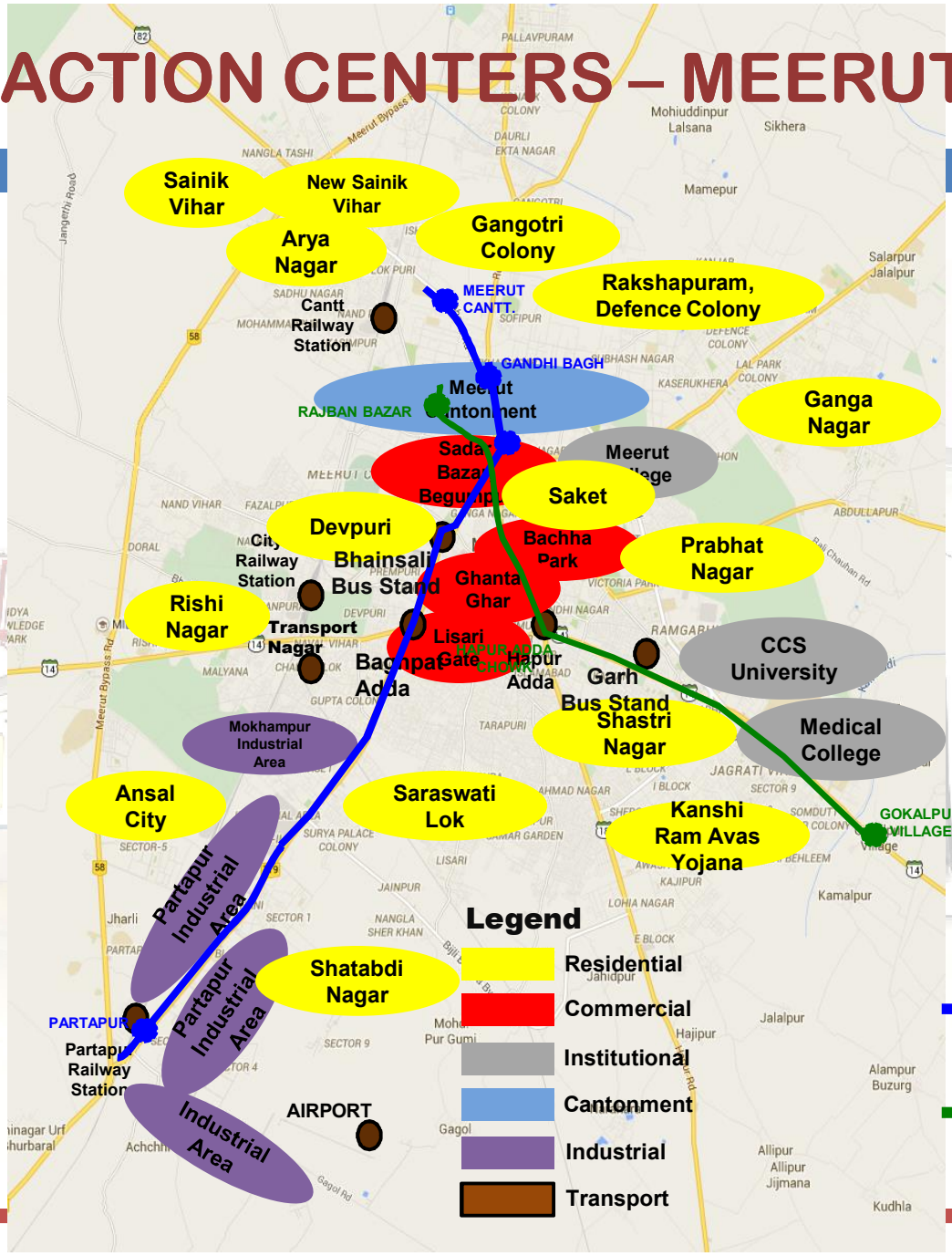
ATTRACTION CENTERS – MEERUT

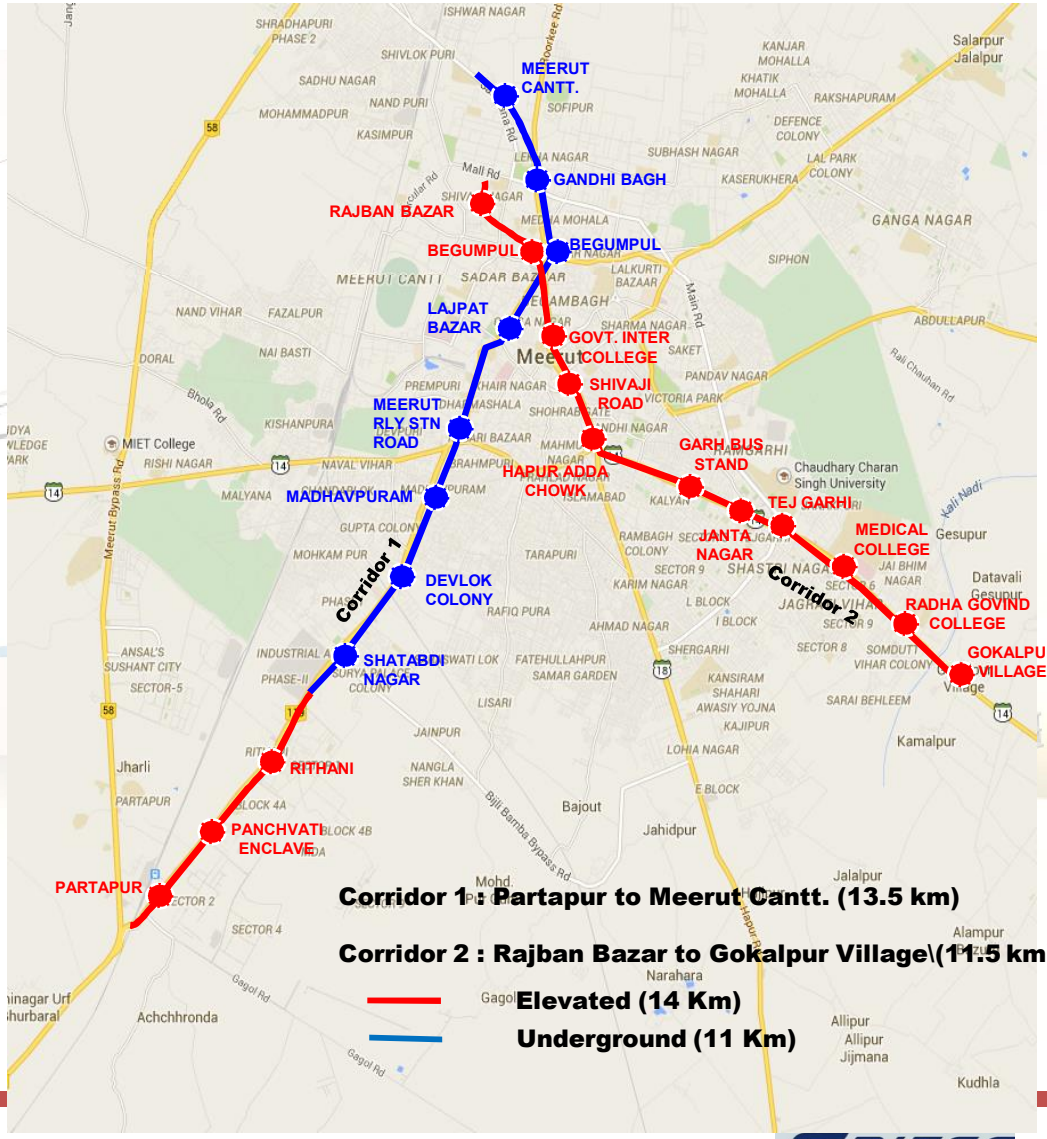


Partapur to Meerut Cantt. (Corridor 1 – 13.5 Km)

Rajban Bazar to Gokalpur (Corridor 2 – 11.5 Km)

MEERUT - PRIORITY MRTS CORRIDORS

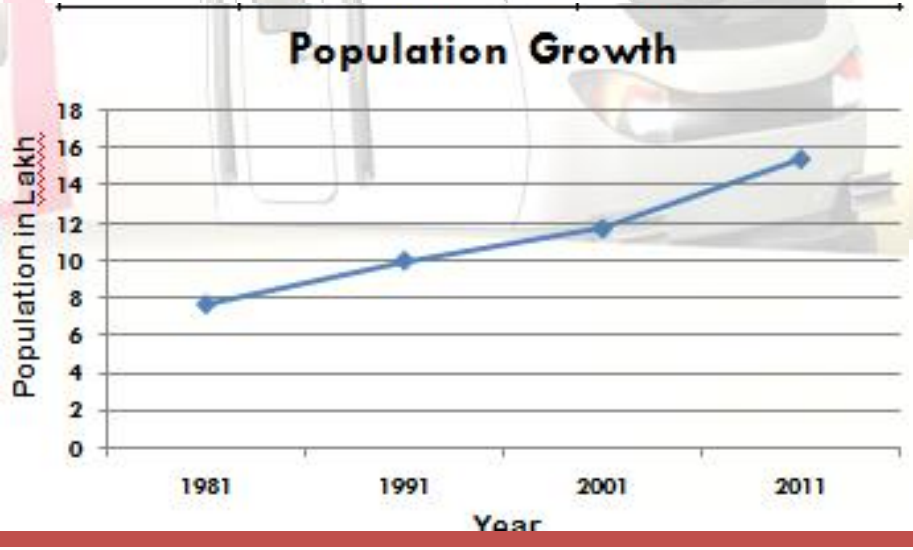
- Corridor 1– Partapur to Meerut Cantt. – 13.5 Km
- Corridor 2 – Rajban Bazar To Gokalpur Village (Via Hapur Adda Along Garh Road) – 11.5 Km



VARANASI – AN OVERVIEW

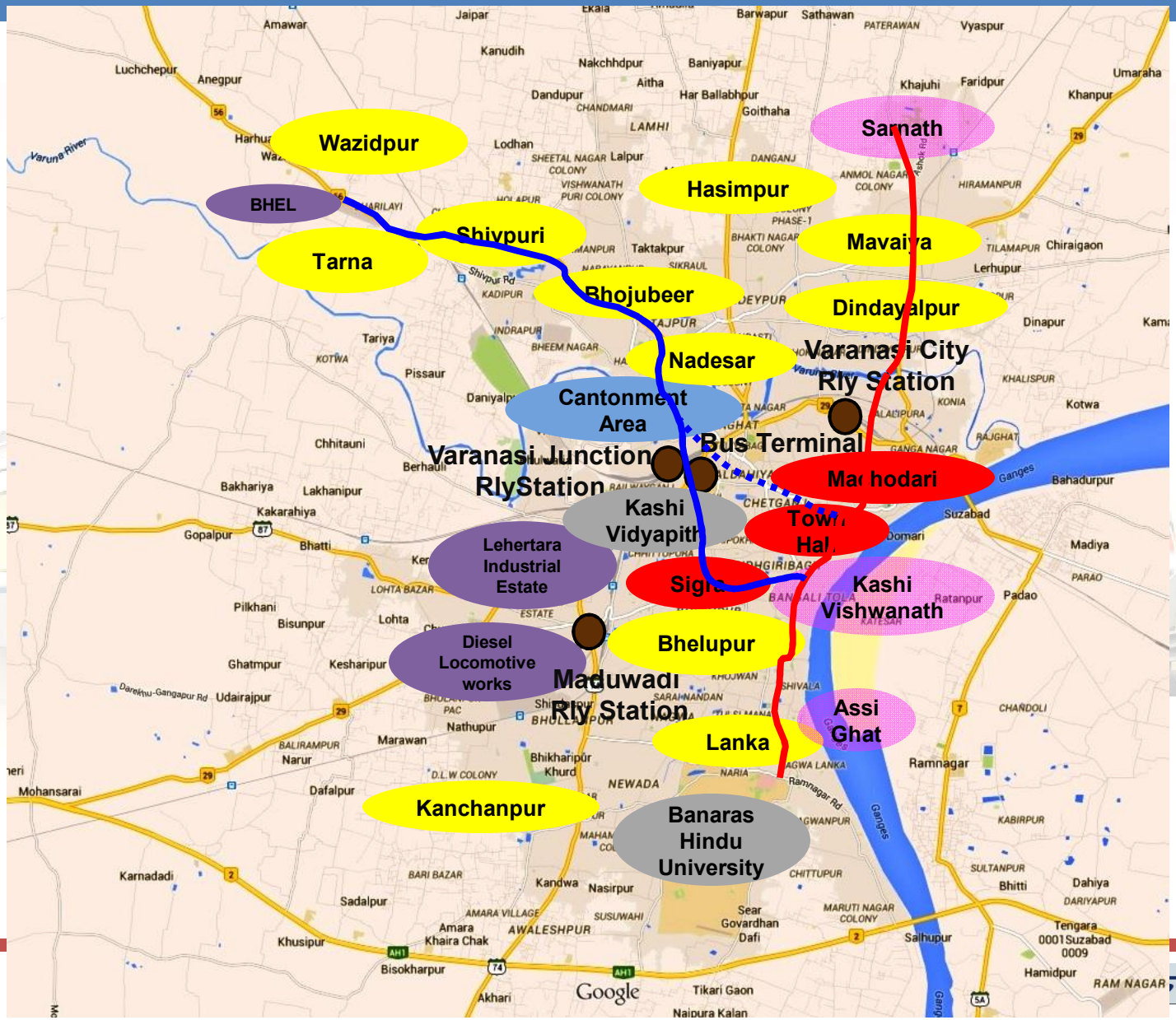
- An Ancient Religious City
- Famous for cultural heritage, music, art, craft and education
- Thousand of tourist visit the holy city due to an important pilgrimage centre
- Sarnath being a Buddhist Pilgrimage attracts a number of International tourists.
- Major commercial and industrial centre of eastern U.P.

Year	City Population	% Decadal Growth
1981	7.7	25%
1991	10.0	29%
2001	11.7	17%
2011	15.4	31%

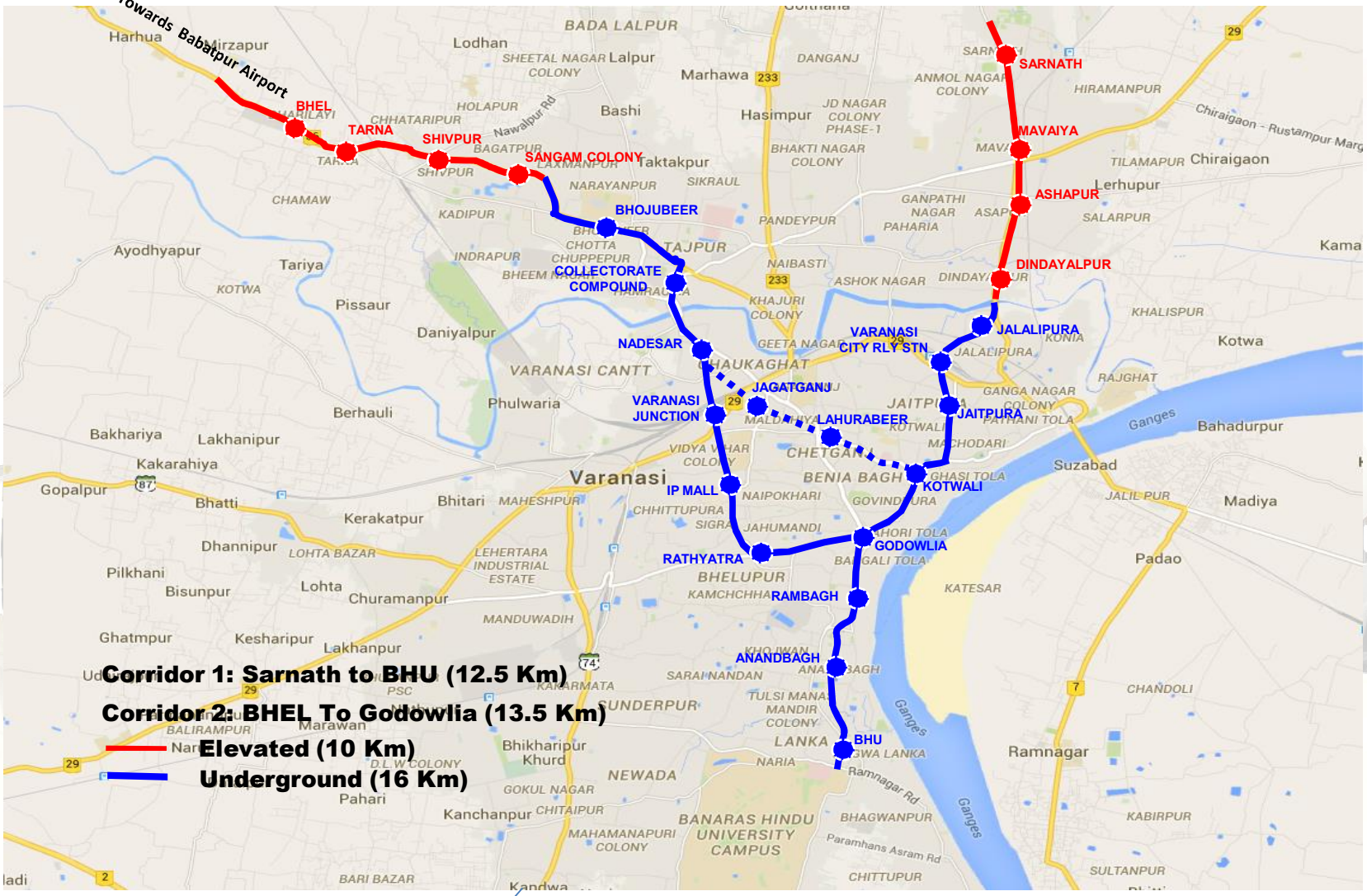


VARANASI - TRAFFIC CHARACTERISTICS

ATTRACTION CENTERS – VARANASI



PRIORITY MRTS CORRIDORS - VARANASI



PRIORITY MRT CORRIDOR IN FOUR CITIES

City	Length (Km)			No. of Stations		
	Elevated	Under ground	Total	Elevated	Under ground	Total
Kanpur	20	16	36	16	13	29
Agra	25	5	30	18	4	22
Meerut	13	12	25	11	12	23
Varanasi	10	16	26	8	14	22

PRELIMINARY EXPECTED RIDERSHIP ON MRT SYSTEMS

City	Expected PHPDT	
	2021	2031
Kanpur	15000	24000
Agra	10000	15000
Meerut	10000	14000
Varanasi	10000	14000

*based on CMP and initial assessment

SYSTEM SELECTION

- City Characteristics
- Projected Traffic Demand (PHPDT)
- Available Right Of Way (ROW)
- Passenger Carrying Capacity
- CAPEX & OPEX
- Other considerations are:
  - Land-use along the corridor,
  - The location of building lines and
  - The potential for increasing the ROW.

Final Mode Choice is Based on Techno - Economic Considerations

SYSTEM SELECTION

Available Options

Bus Rapid Transit (BRT)

Light Rail Transit (LRT)

Monorail

Metro Rail

SYSTEM SELECTION

CAPACITY OF VARIOUS MODES *

Mode Choices	PHPDT (2021)	Population (2011)
Metro Rail	>=15000	>=2million
LRT (at grade)	=<10000	>1million
Monorail	=<10000	>2million
BRT System	>=4000 & <20000	>1million

* Based on Working Group for Urban Transport for 12th Five Year Plan

SYSTEM SELECTION

COMPARATIVE ANALYSIS OF DIFFERENT MODES

Mode of Transport	BRT	LRT	Monorail	Metro Rail
Grade Separation	At grade	At- grade or Grade sep.	Grade separated	Grade separated
Exclusive ROW	35-45 m	35 - 45 / 20 m	20 m	20 m
Curves & Gradient	25 m & 3%	45 m & 6%	70 m & 6%	120 m & 3%
Passenger Capacity (PHPDT)	upto 10000	10000/ upto 45000	upto 20000	upto 90000
Capital cost (Rs Crore / Km)	Rs 60 – Rs 80	Rs 110 / Rs 180 (Elev.)	Rs 180 – 200 (Elev.)	Rs 200 (Ele.) – Rs 400 (U.G.)

All grade separated rail based transit modes viz. Metro, LRT, Monorail have passenger carrying capacity in line with expected traffic demand in 4 cities

SYSTEM SELECTION

BRT and at grade LRT have limitations of right of way and lower carrying capacity, Hence not preferred

Mono Rail System

- Implemented in few countries worldwide & only at Mumbai in India
- Generally adopted for small lengths & works as a feeder to Metro Rail
- Capital Cost required is comparable but O&M Cost is higher than Light Metro Rail System, Hence not preferred

Metro Rail System

- Offers advantage of state of the art, proven, safe & reliable technology available with standardization & indigenization
- Already implemented in various Indian cities viz. Delhi, Kolkata, Mumbai, Bangalore, Jaipur etc. & under implementation in Chennai, Hyderabad, Kochi, Lucknow, Nagpur etc.

METRO RAIL SYSTEM IS BEING CONSIDERED FOR KANPUR (6 CAR RAKE) AND LIGHT METRO SYSTEM FOR VARANASI, AGRA & MEERUT (3-4 CAR RAKE)

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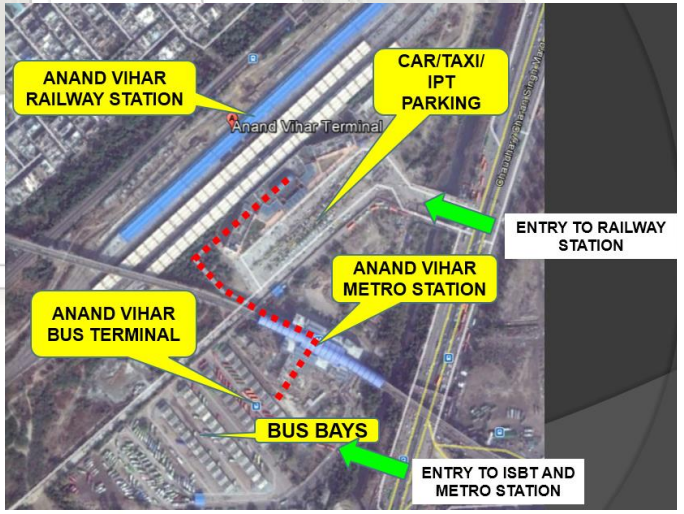
MRT SYSTEM COST FOR 4 CITIES

City	Corridor Length (Km)		Approx.Cost (Rs. Crore)
	Elevated	Underground	
Kanpur	19.5	16.5	10500
Agra	25.0	5.0	6500
Meerut	13.0	12.0	6500
Varanasi	10.0	16.0	7500

CHALLENGES IN MRTS DEVELOPMENT

- Ridership Assessment
- Land availability in Urban Areas
- Timely Implementation
- Financing of MRTS is capital-intensive and mostly not amenable to PPP mode
- Effective Multi-modal Integration
- Last Mile Connectivity



INSTITUTIONAL ARRANGEMENTS

- Complete Government Funding-Owning
- Special Purpose Vehicle (SPV) / Corporate Model
- Public Private Partnership (PPP) Model
- Private Sector

COMPLETE GOVT FUNDING-OWNING

Metro Railway, Kolkata

- First Metro Rail in India
- Wholly owned and operated by GOI
- 25.1 km constructed from 1972 to 2010
- Extensions under consideration
- Funds constraints and lack of corporate efficiency

SPV / CORPORATE MODEL

- A Special Purpose Vehicle (SPV) is set up for implementation of the project and for its subsequent Operation & Maintenance.
- Government of India and State Governments have equity and subordinate debt contribution.
- Remaining project cost through Loans (JICA Loan or Loan from Financial Institutions, property development etc.)
- Being followed in Delhi, Bangalore, Kochi, Chennai, Nagpur, Mumbai & Kolkata

PPP MODEL

- PPP model of financing is arrayed across a spectrum ranging from BOT where private sectors have complete involvement to other tailor made models where both private and public sector assume separate responsibilities
- PPP Model is eligible for Viability Gap Funding (VGF)
- PPP Models applied in Mumbai Metro, Hyderabad Metro, Delhi Airport Metro

PRIVATE SECTOR

Gurgaon Rapid Metro

- Rapid Metro Gurgaon Ltd.
- Owned by IL&FS Ltd
- India's first fully privately financed metro
- Length- 5.1 km
- Cost – Rs 1229 Crore
- Operation started from Nov 14, 2013
- Extensions under progress

MRTS IMPACT TO THE CITY

- Stimulus for Urban Renewal - Maximizes growth of City by enhancing its competitive position and facilitating employment growth
- Improves Visual Aesthetics on Roads
- Reduction in congestion on roads
- Promote quality of life through safe, healthy and natural environment
- Eco- friendly, runs on electricity, minimizing air & noise pollution

TIMELINES

Tasks	Expected Timelines
▪ Preparation of DPR	September 2015
▪ Approval of DPR	December 2015
▪ GoI Approval	June 2016
▪ Funding / Institutional Arrangements	December 2016
▪ Start of Construction	January 2017
▪ Completion of Construction	December 2020
▪ Commercial Operation	April 2021

THANK YOU

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