# Assesment of Physical Infrastructure Planning Around Multimodal Transport Hub

Thesis Submitted in Partial Fulfilment of the requirements
for the award of the degree of

**MASTERS OF URBAN PLANNING**

By
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**1230152002**

Under The Guidance of
**Prof. Kunwar Ghanshyam Yadav**

**SCHOOL OF ARCHITECTURE & PLANNING,**
**BABU BANARASI DAS UNIVERSITY**
**FAIZABAD ROAD, LUCKNOW ,U.P-226028**

**2023-2025**

# BABU BANARASI DAS UNIVERSITY, LUCKNOW

Report of M.Tech./M Pharma/M.Arch. Thesis/Dissertation Evaluation

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Department: SCHOOL OF ARCHITECTURE & PLANNING

Thesis Title: **ASSESMET OF PHYSICAL INFRASTRUCTURE PLANNING AROUND MULTIMODAL TRANSPORT HUB**

Thesis Supervisor(s): **KUNWAR GHANSHYAM YADAV**

Remarks: Satisfactory/Not Satisfactory (in case of not satisfactory give comments)

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Sign of Thesis Supervisor Sign of External Examiner

_____ _____

Sign of Head of Department Sign of Dean of School

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Convener

**BABU BANARASI DAS UNIVERSITY, LUCKNOW**

**CERTIFICATE OF THESIS SUBMISSION FOR EVALUATION**
(Submit in Duplicate)

1. Name : **ALOK VERMA**

2. Enrollment No. : **12301520016**

3. Thesis title: **ASSESMET OF PHYSICAL INFRASTRUCTURE PLANNING AROUND MULTIMODAL TRANSPORT HUB**

4. Degree for which the thesis is submitted: **Masters of Urban Planning**

5. Faculty of the University to which the thesis is submitted
   **School of Architecture and Planning**

6. Thesis Preparation Guide was referred to for preparing the thesis. ☐ YES ☐ NO

7. Specifications regarding thesis format have been closely followed. ☐ YES ☐ NO

8. The contents of the thesis have been organized based on the guidelines. ☐ YES ☐ NO

9. The thesis has been prepared without resorting to plagiarism. ☐ YES ☐ NO

10. All sources used have been cited appropriately. ☐ YES ☐ NO

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# EXECUTIVE SUMMARY

This assessment report presents a comprehensive evaluation of the physical infrastructure planning surrounding the proposed/ongoing Multimodal Transport Hub (MMTH). The objective is to analyze the existing infrastructure, identify critical gaps, and recommend actionable strategies for integrated, sustainable, and future-ready development.

The assessment covers various key domains including road connectivity, pedestrian pathways, public transit integration, utility services, land use alignment, and intermodal accessibility. The findings reveal that while core transportation linkages are under development or in place, there exists a significant need for coordinated infrastructure upgrades to support seamless multimodal integration.

- **Road Network & Accessibility**: Existing arterial and sub-arterial roads are insufficiently designed for projected traffic volumes. Poor intersection design and inadequate signage pose safety and efficiency challenges.
- **Pedestrian & Non-Motorized Infrastructure**: Sidewalks, crossings, and cycling tracks are either missing or poorly maintained, discouraging sustainable mobility.
- **Public Utilities & Services**: Water supply, drainage, power lines, and street lighting are under capacity or lack spatial coordination with transport infrastructure.
- **Land Use & Development Control**: Uncoordinated land use planning is causing fragmented development and congestion around the hub, reducing long-term viability.
- **Last-Mile Connectivity**: Critical shortfalls in feeder services, such as buses, e-rickshaws, and shared mobility, impede efficient modal transfer.

The study recommends a phased infrastructure upgrade plan, emphasizing:

- Smart road infrastructure and traffic management systems.
- Transit-oriented development (TOD) zoning and incentives.
- Multi-agency coordination mechanisms for utility integration.
- Improved accessibility and inclusive design for differently-abled users.
- Real-time data systems for operational monitoring.

By addressing these infrastructural and planning challenges, the MMTH can catalyze urban regeneration, promote modal shift to public transport, and enhance overall mobility efficiency in the region. This assessment serves as a guiding document for stakeholders including urban planners, transport authorities, municipal corporations, and funding agencies to enable informed, resilient infrastructure planning.

# ACKNOWLEDGEMENTS

I would like to express my deepest gratitude to the individuals who have contributed to the completion of my Master's thesis in Urban Planning. Their unwavering support and encouragement have played a crucial role in my academic journey.First and foremost, I am immensely grateful to my thesis guide, Porf. Kuwar Ghanshyam Yadav. His invaluable guidance, expertise, and unwavering support throughout this research endeavour have been instrumental in shaping the direction and quality of my work. His continuous encouragement, insightful feedback, and patience have truly been a source of inspiration for me.

Furthermore, I would like to acknowledge the role of my mentor, Dr. Mohit Kumar Agarwal. His extensive knowledge, constructive criticism, and valuable insights have significantly contributed to the development of my research. His unwavering dedication and unwavering support have been invaluable, and I am deeply grateful for his mentorship.

I would also like to express my gratitude to my friends and loved ones who have been there for me throughout this journey. Their unwavering support, understanding, and encouragement have provided me with the strength and motivation to overcome challenges and persevere. Their presence has brought joy, laughter, and solace during the demanding times of thesis work.

Lastly, I would like to extend my appreciation to all the individuals who have directly or indirectly contributed to my growth as a researcher and planner. Your collective efforts have played an integral role in shaping my academic and personal development.

To everyone mentioned above and to those not mentioned individually but who have been a part of my journey, please accept my heartfelt gratitude for your unwavering support, guidance, and encouragement. This thesis would not have been possible without each and every one of you. Thank you for being a part of this significant milestone in my academic life.

(Ar. Alok Verma)

# UNDERTAKING

I, ALOK VERMA, the author of the thesis titled "**ASSESMET OF PHYSICAL INFRASTRUCTURE PLANNING AROUND MULTIMODAL TRANSPORT HUB**", hereby declare that this is an independent work of mine, carried out towards fulfilment of the requirements for the award of the Masters in Urban & Regional Planning at the Department of Architecture and Planning, BBDU, Lucknow. The work has not been submitted to any other organization / institution for the award of any Degree/Diploma.

…….

Alok verma
Enroll. No.12301520016, Master of Urban Planning (2024-2025)
Department of Architecture and Planning
Date: June,2025

# Physical Infrastructure Planning around the Multimodal Transport Hub

## Introduction:

- Transportation is a very important Infrastructure enabling Urban Mobility at both micro & macro levels. Transport is a medium which allows people to access what they want whether it be for education, jobs, goods or any other purposes. Transport promotes development in a global sense at the same time has an impact at individual level as well. Transport conditions in a country reflects its type of development.

- Public Transportation is a shared passenger transport service which is available for use by general pubic & runs on fixed routes, timings & fares. They carry large no. of people at a time & hence are proved very efficient especially those public transport services which run on fixed dedicated corridors which are free from road traffic due to private vehicles. Use of public transport is a very sustainable approach as it controls air & noise pollution & uses less oil resources compared to private vehicles.

- **Government of India is investing a lot of money for Transport Development in the** country to promote more & more usage of Public Transport to control pollution & vehicular traffic, for promoting economic development & for making transports affordable by all class of people. India has several types of Transport facilities such as Buses, Taxis, Rickshaws, Train, Metro, Airways, Waterways connecting both Inter States & Intra State.

- Ahmedabad is experiencing a rapid growth in terms of educations, industrial development, housing schemes, job opportunities, planned Special Investment Regions, proposed Transport Corridors etc. These has led to travelling daily or for short intervals from one place to another with in Ahmedabad & other parts of Gujarat to & fro. This has led to an increase in the demand & dependency on Transport. In such situation a single mode of transport will not be sufficient to fulfil the daily demand. Ahmedabad has GSRTC, Railways, Airways as inter city public transport & BRTS, AMTS & Auto Rickshaws for intra city public transport. The different modes of transport being used must be well integrated with each other so that travelling becomes smooth the passenger have an easy experience while using Public Transport.

- Metro Project is being developed in Ahmedabad. Government is investing a huge amount in it with a PPP. But its very important to integrate Metro with other road services like GSRTC, BRTS, AMTS, Rickshaws, Railways etc to promote mobility. This will be a Sustainable approach & will promote usage of road infrastructure in an integrated, holistic & sustainable manner.

# History of Transport in India:-

1. The history of transportation in India dates back thousands of years. Ancient civilizations in the Indus Valley and the Gangetic plains had well-established trade routes and transportation systems. The Maurya and Gupta empires constructed roads and maintained postal systems for efficient governance and trade.
2. During the medieval period, the Delhi Sultanate and the Mughal Empire expanded transportation infrastructure, including roads, bridges, and caravanserais, to facilitate trade and pilgrimage routes.
3. The British colonial era saw significant advancements in transportation. The British introduced modern transportation systems such as railways, road networks, and ports, primarily for their administrative and trade purposes. The construction of

## AIM:-

The aim of physical infrastructure planning around a **multimodal transportation hub** is to efficiently integrate various modes of transportation (such as buses, trains, subways, bicycles, and pedestrian pathways) to provide seamless and convenient connectivity for passengers. The primary goals of this planning include.

- **Enhancing Connectivity**: Establish smooth transitions between different transportation modes, minimizing travel time and making it easy for passengers to switch from one mode to another.
- **Reducing Congestion**: Streamline the flow of traffic, both for personal vehicles and public transport, to reduce bottlenecks around the hub. Well-planned infrastructure can help reduce traffic congestion in urban areas.
- **Improving Accessibility**: Ensure that the hub is easily accessible to all users, including pedestrians, cyclists, people with disabilities, and public transportation users. This includes well-designed entrances, ramps, and pathways.
- **Promoting Sustainability**: Encourage the use of environmentally friendly transportation modes (like public transit, biking, and walking) through dedicated infrastructure, reducing the reliance on private cars and lowering carbon emissions.

## Objectives:-

1 Integrating different road services like AMTS, BRTS, Metro, Railways, Taxis, Rickshaws etc to make interchange between them easy

2. Controlling traffic congestion, air & noise pollution

3. Easy access to this Hub by all groups of people

4. Discouraging use of private vehicles

5. Promoting commercial activities to generate economy

## Scope & Objectives:-

- Integrating different road services & creating a flexible interchange between them
- Connecting to the site & responding to the existing context especially towards the existing commercial establishments there
- Creating & promoting commercial activities at the Transit Hub to generate economy for the functioning & maintenance of the Transit Hub
-

Planning around a **Multimodal Transport Hub (MMTH)** requires a strategic, integrated approach to ensure smooth connectivity, accessibility, urban development, and sustainability. Here's a structured outline to guide effective planning:

## 1. Objectives of MMTH Planning

- Seamless intermodal connectivity (rail, bus, metro, taxi, non-motorized transport).
- Enhanced commuter experience and reduced transfer time.
- Catalyzing local economic development.
- Promoting sustainable and transit-oriented development (TOD).

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## 2. Key Planning Components

### *A. Physical Infrastructure*

- **Integrated Terminal Design**: Centralized concourse, common ticketing counters, waiting areas.
- **Wayfinding & Signage**: Multilingual, intuitive signs.
- **Accessibility**: Universal access features (ramps, elevators, tactile flooring).
- **Parking & Drop-off Zones**: For private vehicles, taxis, and autos with segregated lanes.
- **Pedestrian Pathways & Skywalks**: Safe, shaded, and continuous routes.

### *B. Traffic & Circulation Planning*

- **Last-Mile Connectivity**: E-rickshaws, bicycles, pedestrian walkways.
- **Traffic Management**: Signal coordination, traffic calming near the hub.
- **Separate Entry/Exit for Modes**: Avoid conflicts between vehicles, especially buses and autos.

### *C. Land Use & Urban Integration*

- **Transit-Oriented Development (TOD)**: Mixed-use development in the vicinity.
- **Zoning Regulations**: To support commercial, residential, and service-based activities.
- **Public Realm Improvements**: Plazas, green spaces, and street furniture.

### *D. Environmental & Sustainability Measures*

- **Stormwater Management**: Permeable pavements, rain gardens.
- **Energy Efficiency**: Solar panels, LED lighting, green roofs.
- **Waste Management**: Segregated disposal and recycling at source.

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## 3. Institutional & Policy Framework

- Coordination between agencies (Railways, Urban Local Body, Transport Dept).
- Single-point authority or SPV (Special Purpose Vehicle) for hub development and O&M.
- PPP models for funding and operations.

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## 4. Technology & Smart Solutions

- **Unified Mobility App**: Real-time schedules, ticketing, and navigation.
- **Surveillance & Safety**: CCTV, emergency help points, lighting.
- **Digital Signage**: Real-time updates on arrivals/departures.

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## 5. Community Engagement

- Public consultations to address local needs.
- Incorporating informal transit stakeholders (e.g., rickshaw unions).

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## 6. Example: Integrated Design Outcomes

- **Metro station with underground pedestrian link to railway terminal**.
- **Bus bays designed next to taxi stands with overhead concourse for seamless movement**.
- **Retail and commercial zones above concourse to activate space**.

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## Conclusion

Planning around a Multimodal Transport Hub must go beyond just transit integration. It's about creating **livable, efficient, and accessible urban nodes** that enhance mobility and quality of life while supporting urban growth.

•


## Methodology:-

- Make public transport the preferable mode of transportation by making it easily accessible, efficient, reliable and safe for maximum number of people.
- Utilize the induced private-sector investment near MRTS nodes to provide funding for public transport improvements as well as provision of social amenities.
- Analyze the potential and opportunities for absorption of more population through infill, redevelopment or re-densification within influence zones.
- Propose the Density projections and corresponding Public Transport Accessibility Levels (PTAL)s for the Influence Zones under study along with connectivity, placemaking and parking demand management strategies and required physical and social infrastructure augmentation - required to facilitate an integrated and unique TOD.
- 
- **CASE STUDY MUMBAI CITY:-**
- 

**Location** : Greater Mumbai - the capital of Maharashtra, is the financial capital of India. The Island City has experienced rapid growth in economic activity and its suburbs are growing faster than the Island City in terms of population distribution and activity location.

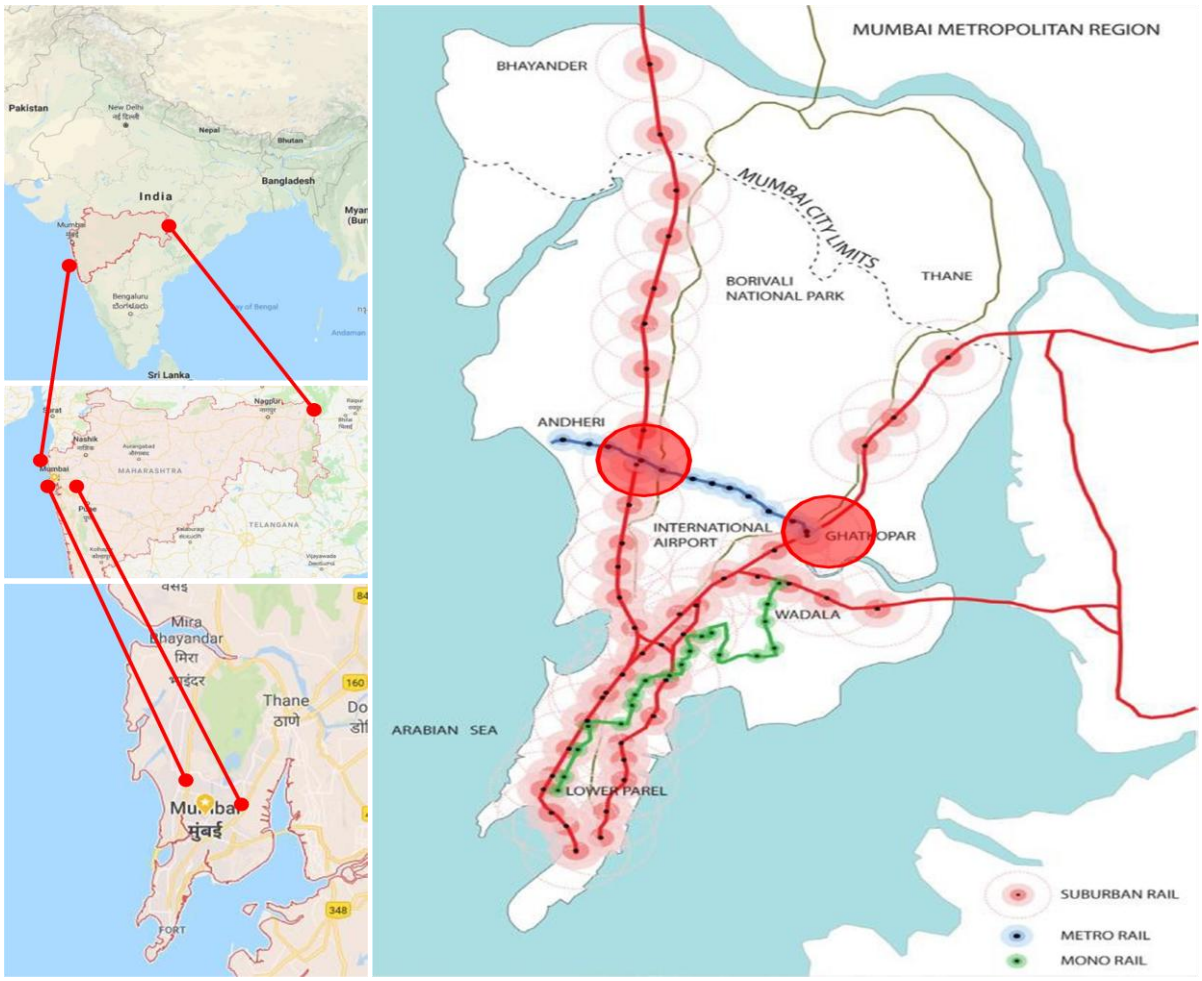
**Transports :** Mumbai transport consists of Suburban Rail system, Bus services, Mono Rail, Metro & Road transports.

**Railways :** Mumbai is served by two of India's zonal railways, the Western Railway (WR) and the Central Railway (CR). The Western Railway line runs northwards from Churchgate terminus station in the Mumbai CBD parallel to the West Coast of the island towards northern and western India. The Central Railway runs from Chhatrapati Shivaji Terminus (CST), located on the eastern side of the CBD (approximately 1 km northeast of Churchgate) and serves a large part of Central and Eastern Mumbai.

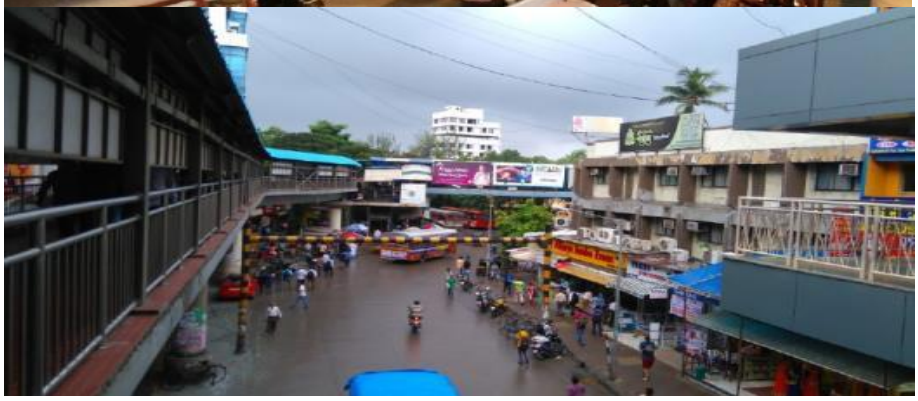
**Bus transports :** All routes within Mumbai are provided by BEST. Bus routes from Mumbai City to New Mumbai are provided by BEST and MSRTC. Routes from other points in Greater Mumbai to New Mumbai and Thane are provided by BEST, MSRTC and TMT.

**. Mumbai Metro :** Is a rapid transit system serving the city of Mumbai, Maharashtra, and the wider MMR urban agglomeration. The system is designed to reduce traffic congestion in the city, and supplement the overcrowded Mumbai Suburban Railway. Mumbai Metro consists of 7 lines. Line 1

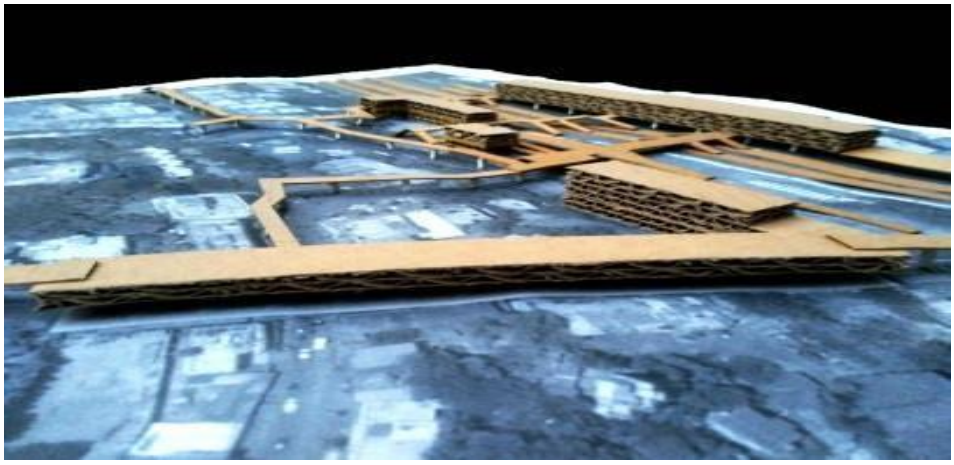
also called Versova – Andheri – Ghatkopar corridor (VAG) is operational while other lines are under construction & approval

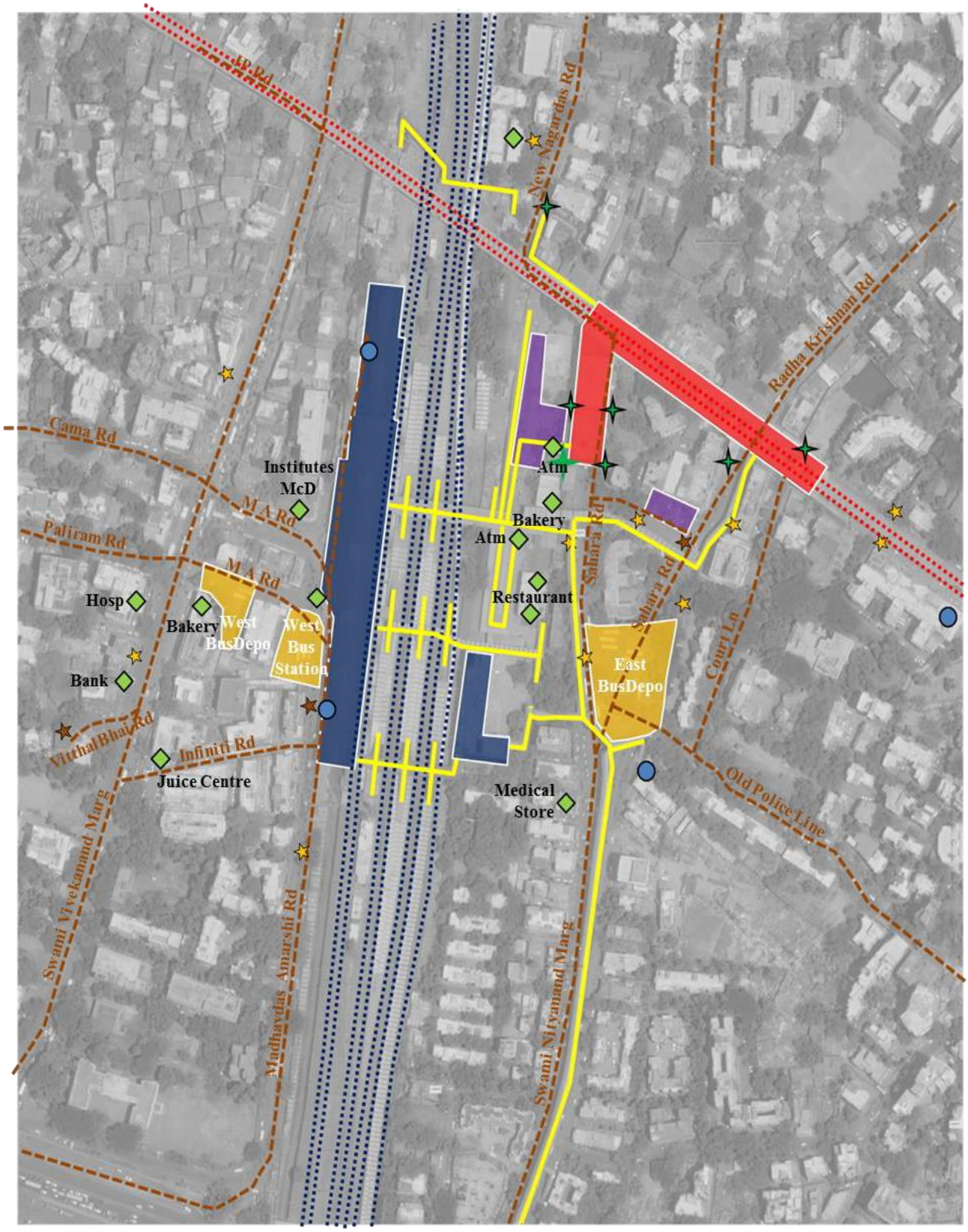



1. **ANDHERI METRO & RAILWA Y STATION**




Top-10
Google




LP Rd
New Nagardas Rd
Radha Krishnan Rd
Cama Rd
Institutes
McD
M A Rd
Paliram Rd
M A Rd
Hosp
Bakery
West
BusDepo
West
Bus
Station
Bank
Vitthal Bhai Rd
Infiniti Rd
Juice Centre
Swami Vivekanand Marg
Madhavdas Amarshi Rd
Atm
Bakery
Atm
Restaurant
Sahara Rd
Sahara Rd
East
BusDepo
Couri Ln
Old Police Line
Medical
Store
Swami Nityanand Marg

## Andheri Metro Station

**Location :** Andheri, Maharashtra
**Completion :** 2014
**Area :** 5,000 sqm approx
**Owner :** Mumbai Metro ne Private Limited
**Platforms :** 2
**Tracks :** 2
**Daily passenger traffic :** 72,125 in February 2017

**Introduction**

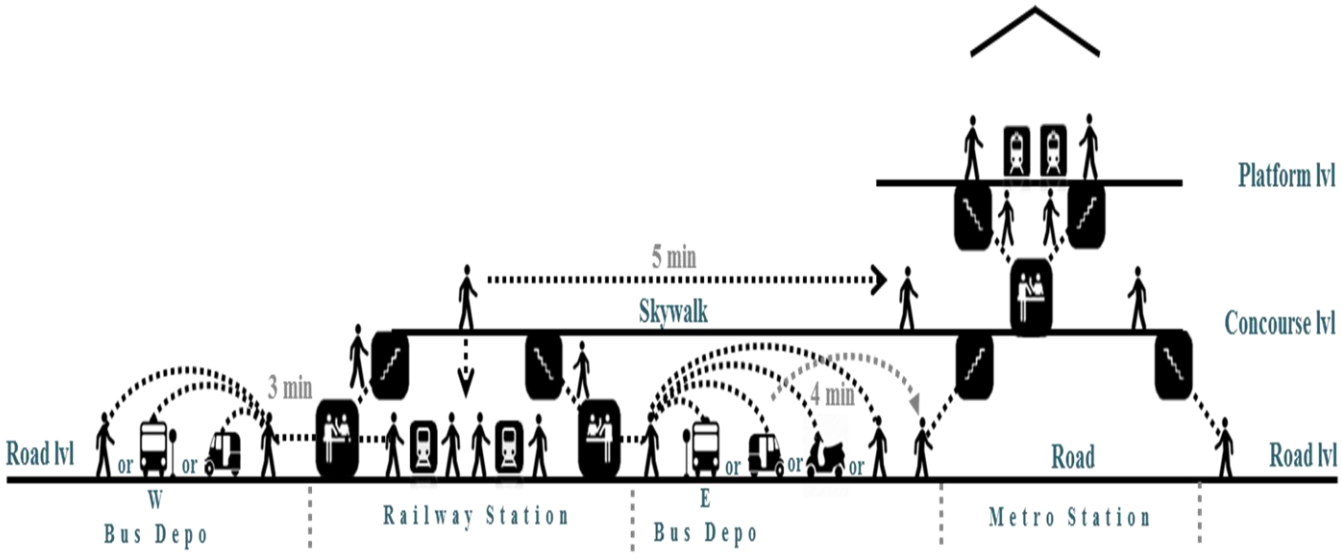
- The station is in Andheri East near the Andheri station of Western Railway.
- Station centerline passes through open land on the north of alignment by the side of New Nagardas Road.
- This is an elevated station and side platforms are approximately 13 m above the ground.

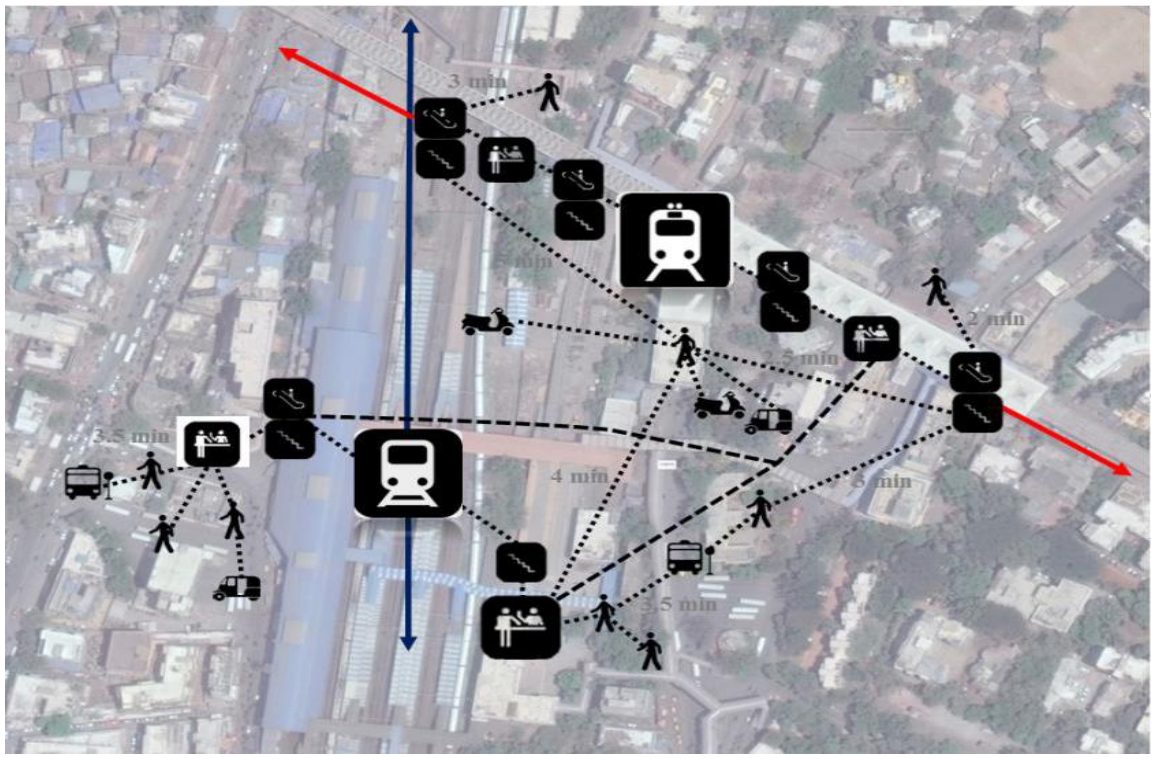
**Approach**

- Road under the station is proposed to be widened as proposed by MMRDA in its Development Plan and realigned to match the alignment of the rail tracks and the station structure. Three lanes on each direction have been planned within the ROW.
- Entry / exit stairs are provided on both side of the road beside the station structure.
- Northern Entry/Exit structures are linked to existing Foot Over

Bridge on Western Railway main line at concourse level.

- Southern Entry/Exit Structures have been provided on New Nagardas Road near Police station above the intersection.

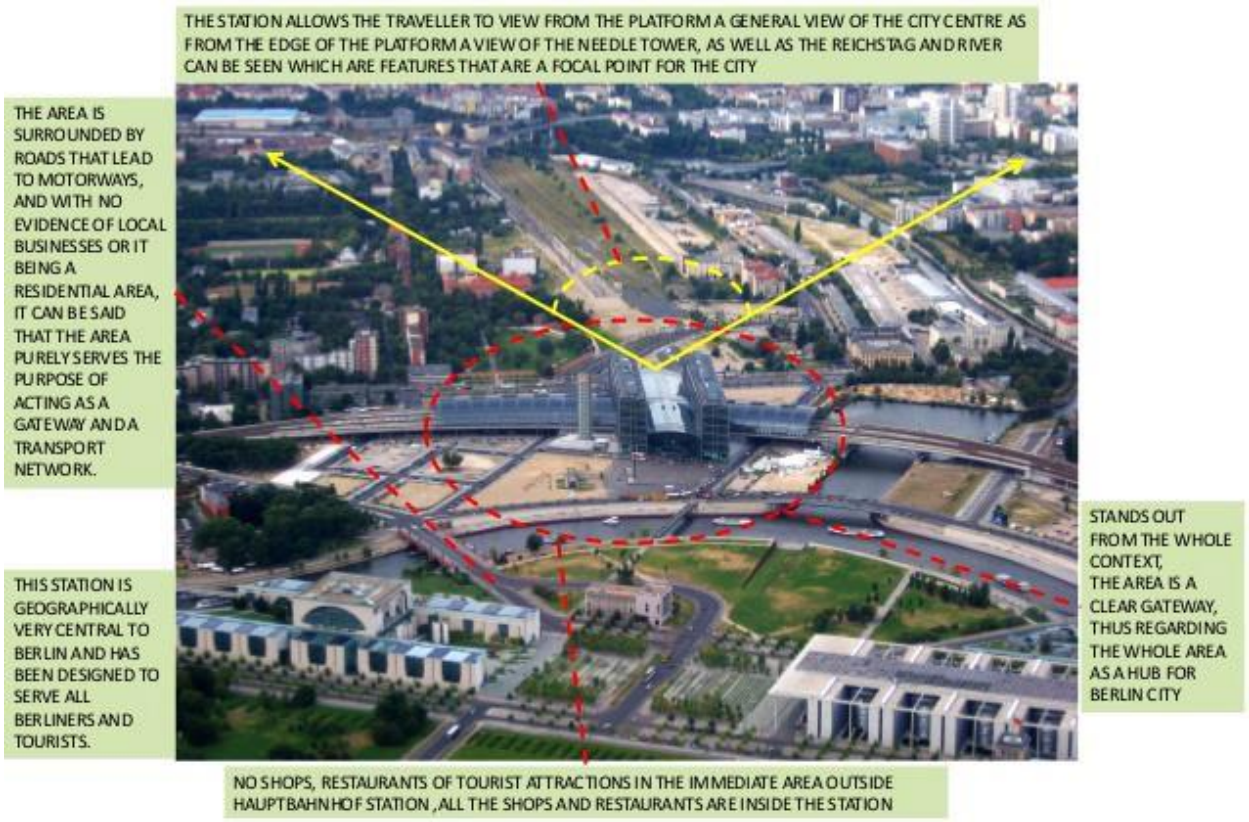



3 min
5 min
2 min
5 min
3.5 min
4 min
3 min
3.5 min
Metro Train
Metro Route
Railway
Railway Route
Pedestrian
Bus Stop
Bus Depo/ Bus Station
RickShaw Stop
Taxi Stop
2 Wheeler Parking
4 Wheeler Parking
Cycling
Ferry Stop
Ticket Counter
Stair
Escalator


EXIT Gate 5A&5E


No entry

# BERLIN CENTRAL STATION. GERMANY

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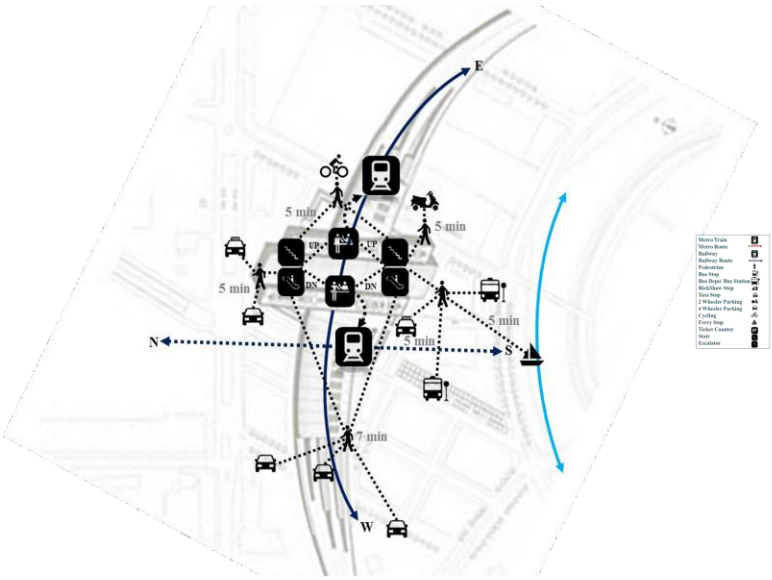
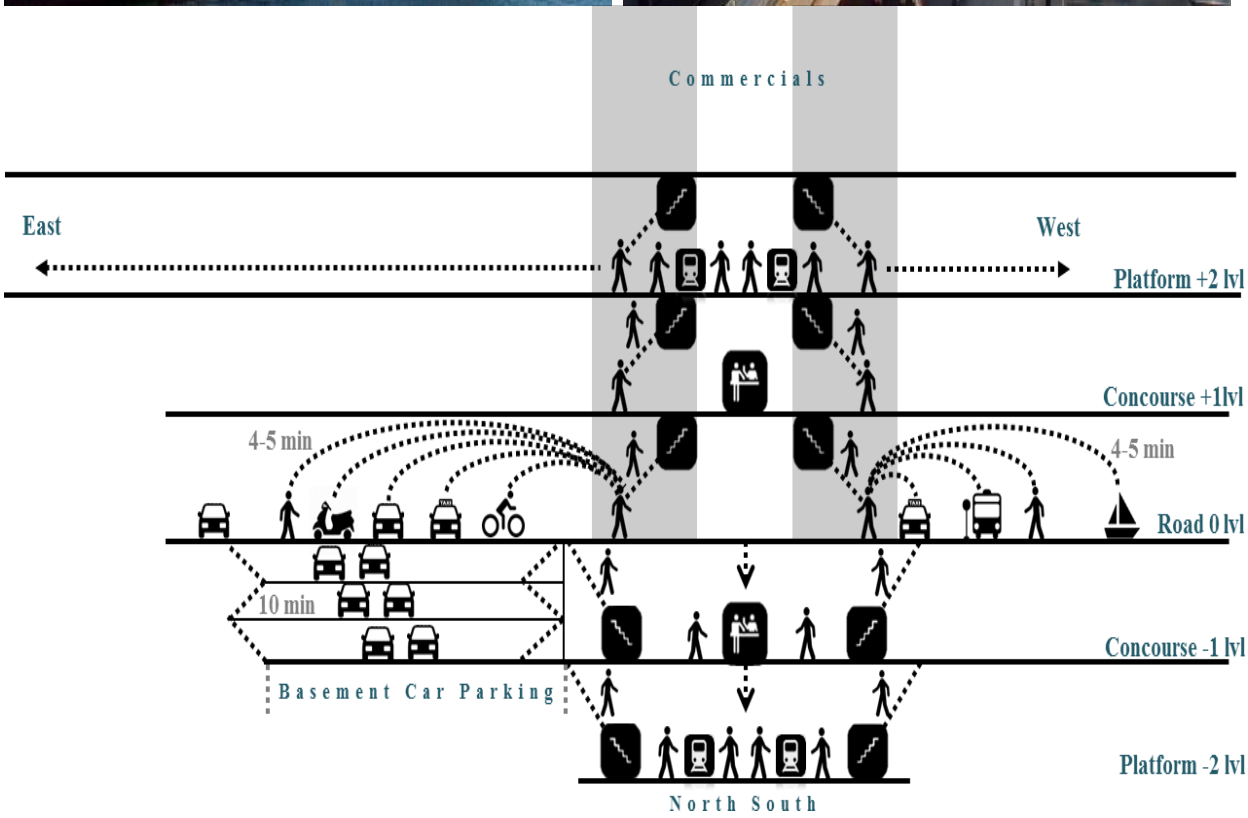
1. **Approach to Station**



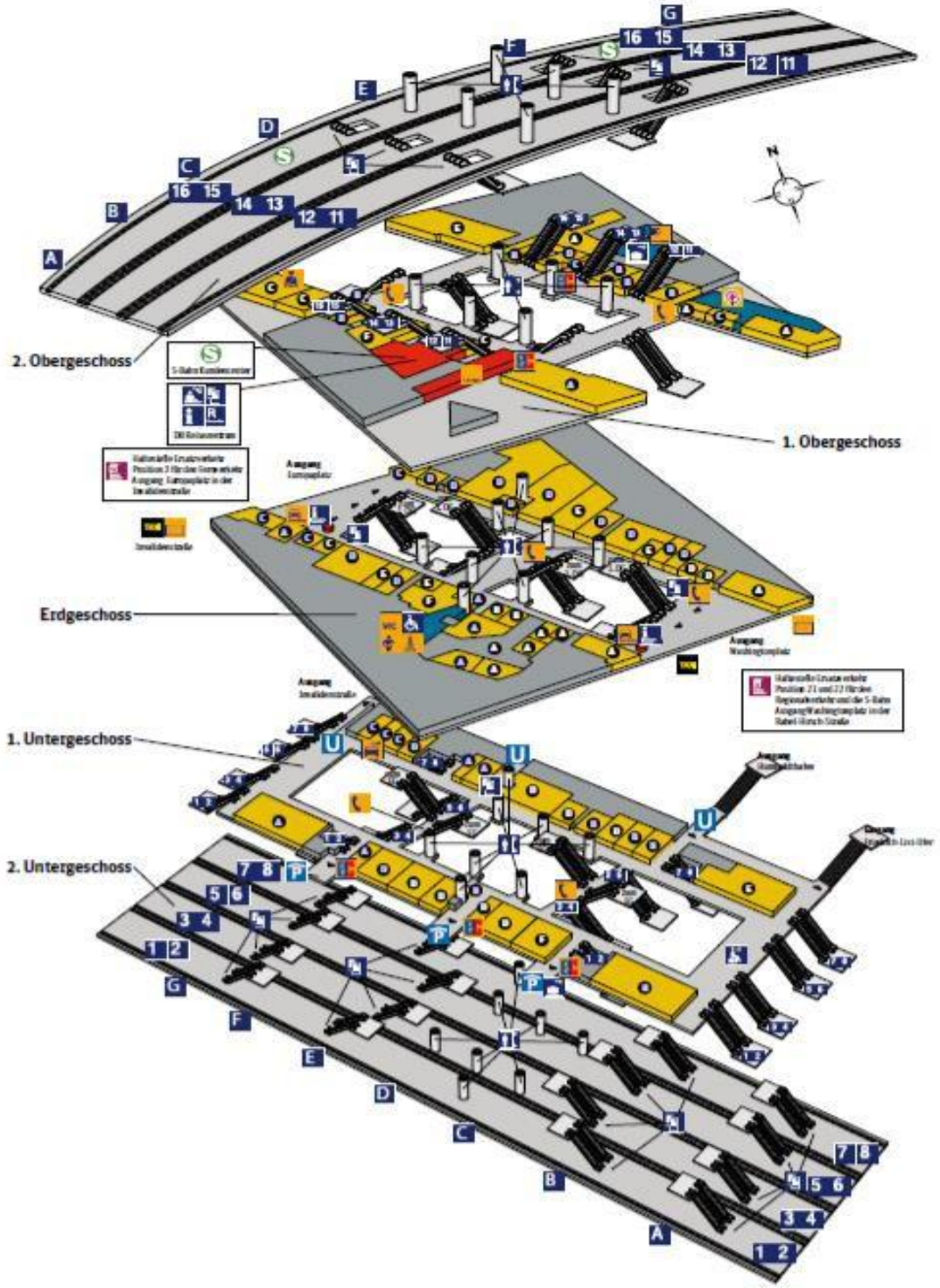


DB


VATTENFALL


Commercials
East
West
Platform +2 lvl
Concourse +1lvl
4-5 min
4-5 min
Road 0 lvl
10 min
Concourse -1 lvl
Basement Car Parking
Platform -2 lvl
North South

1. **Different levels in Berlin Central Station**



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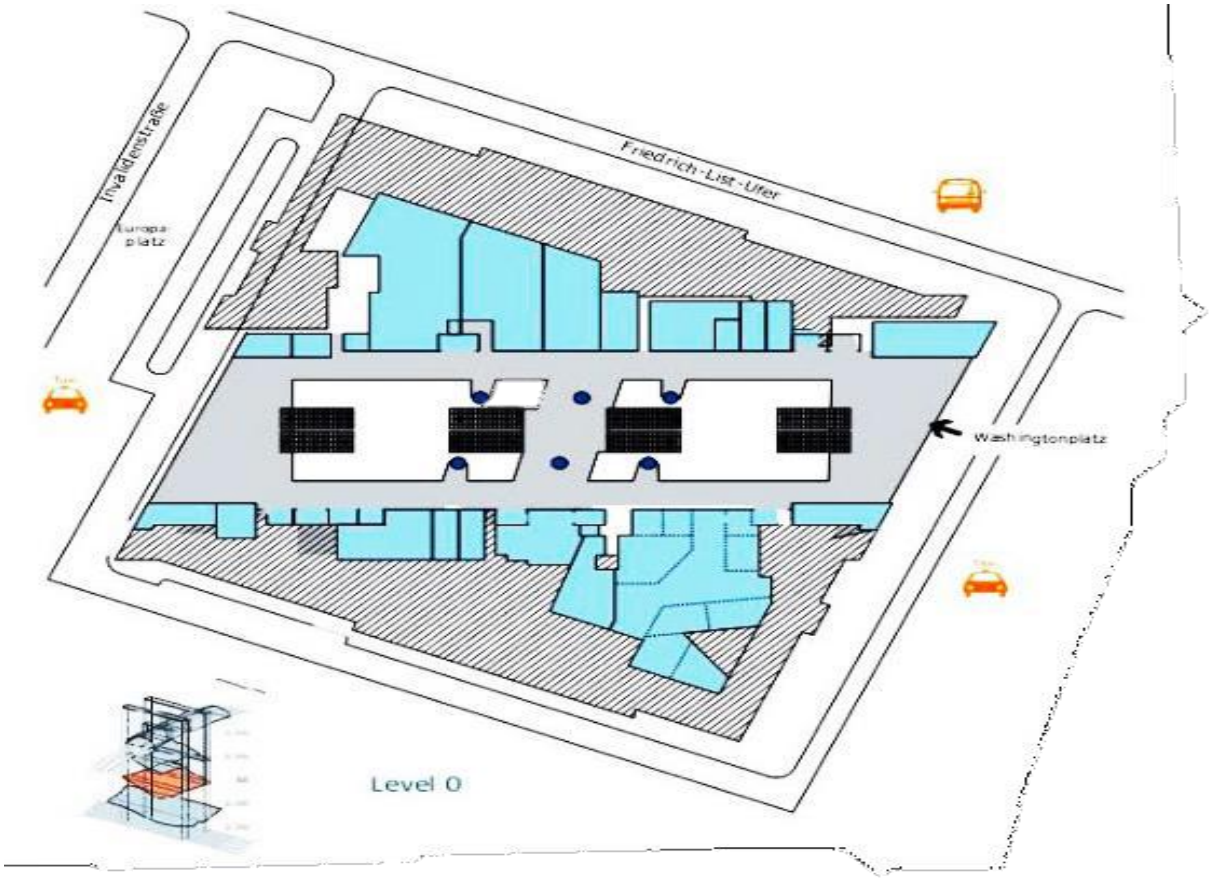
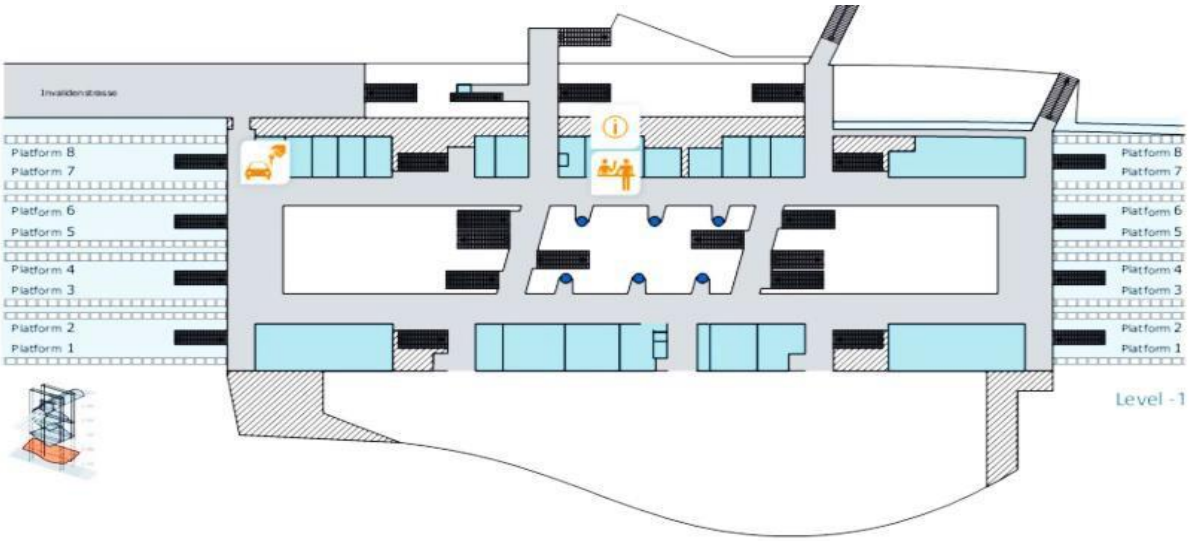
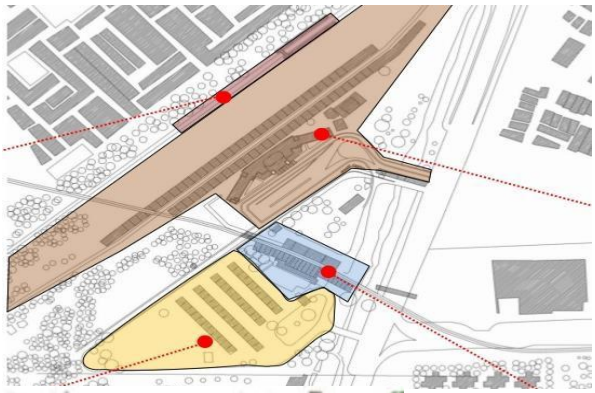


# LITERATURE CASE STUDIES

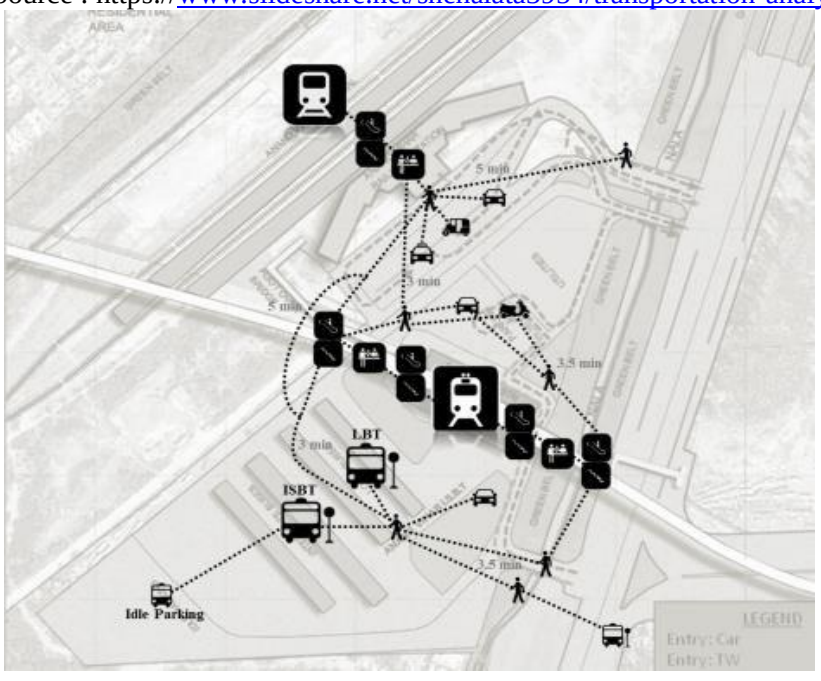
# ANANDVIHAR TRANSIT HUB

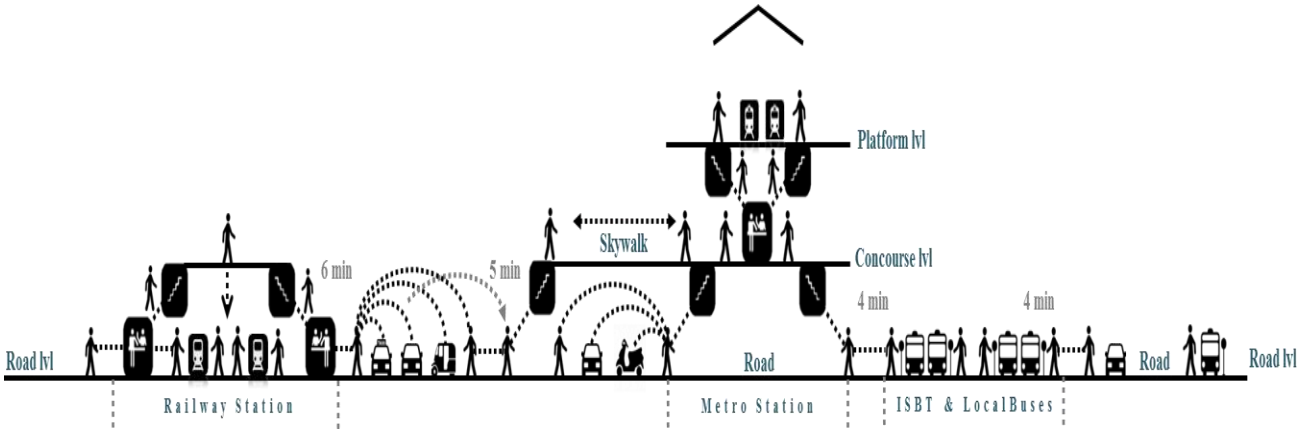



**Approach to Station**

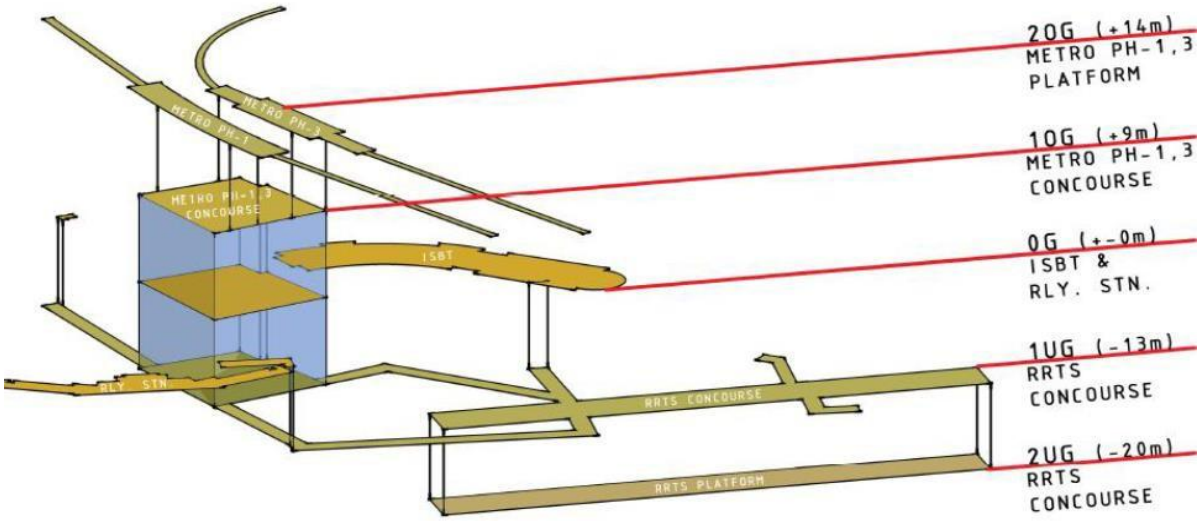
Different Modes Of Transport Integrated At Anand Vihar Transit Hub, Delhi

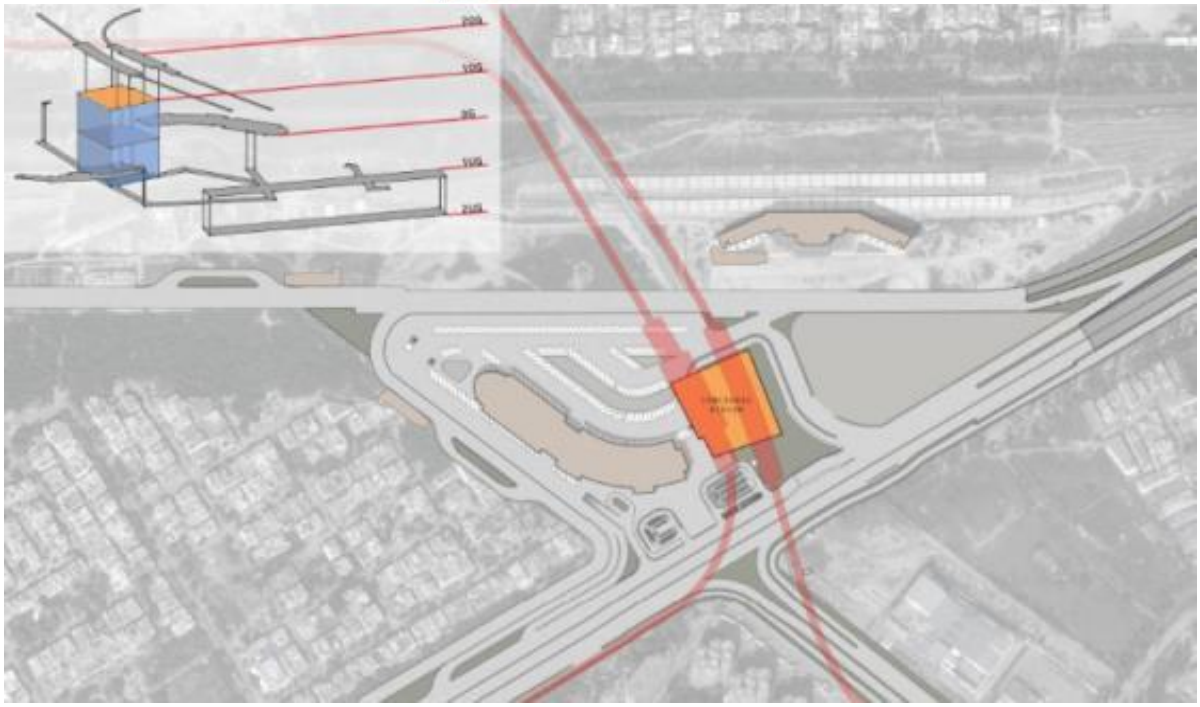
Source : https://www.slideshare.net/snehalata3954/transportation-analysis-at-anand-vihar




# Different levels in Anand Vihar Transit Hub



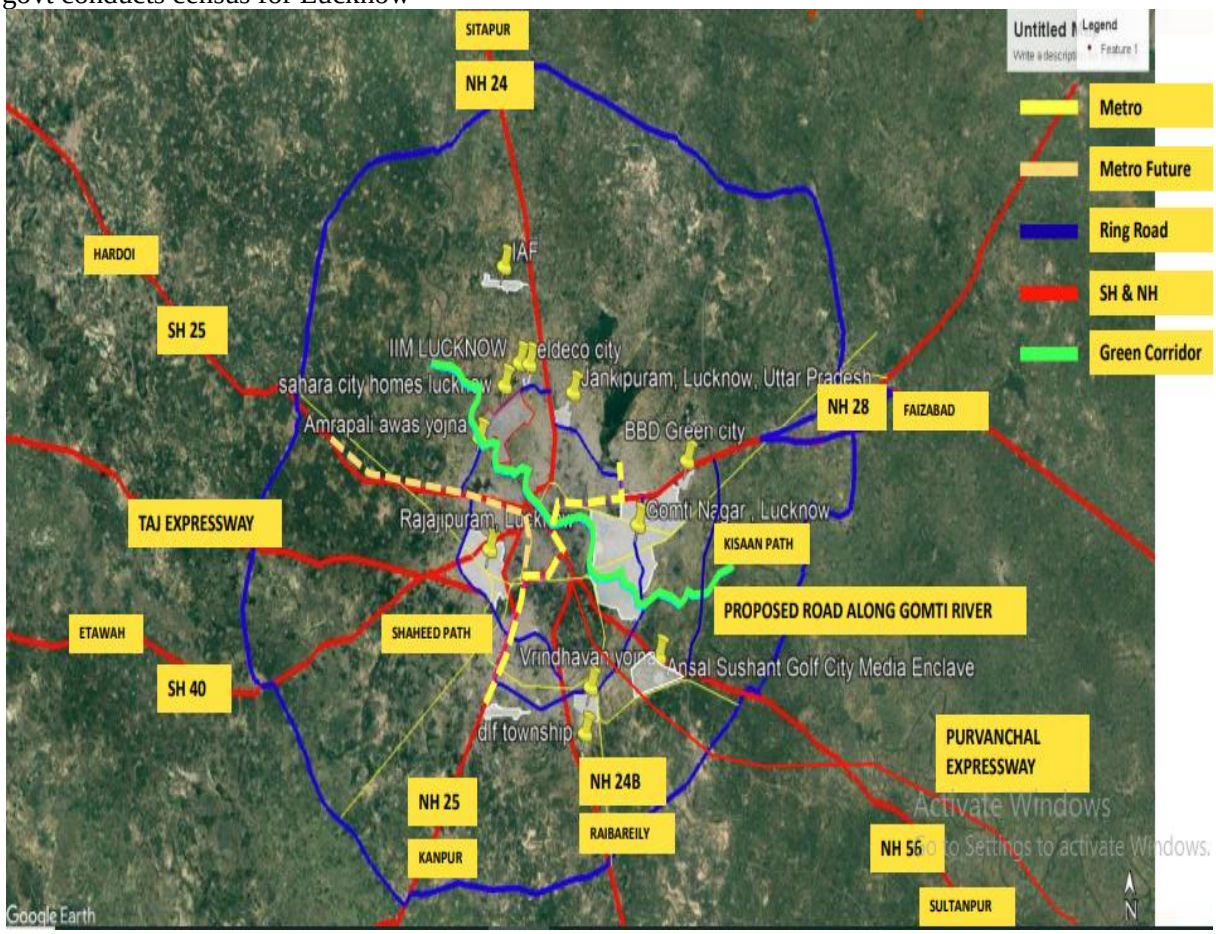



# SITE STUDY
# LUCKNOW CITY

Lucknow, the capital of Uttar Pradesh, is a vibrant metropolis renowned for its rich history, cultural heritage, and modern development. Often referred to as the "City of Nawabs," it stands as a testament to the grandeur of its past and the dynamism of its present.

**Location:** Situated in northern India on the banks of the Gomti River, Lucknow serves as the administrative headquarters of both the Lucknow district and division.

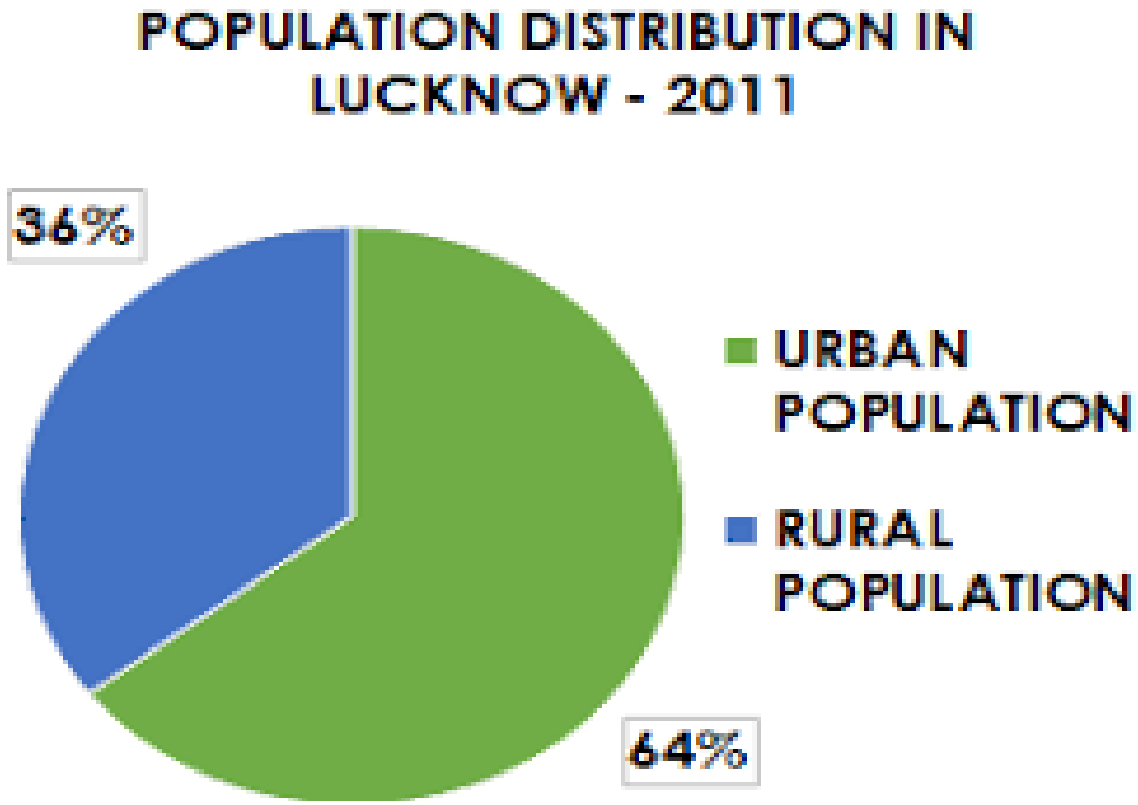
**Area:** The city spans approximately 631 km²
**Population:** As of 2025, the metro area population is estimated at 4.13 million, making it the most populous city in Uttar Pradesh.
**Languages:** Hindi is the official language, with Urdu as an additional official language and Awadhi as a regional dialect.
The current estimate population of Lucknow city in 2025 is 4,120,000 , while Lucknow metro population is estimated at 4,245,000 . The last census was conducted in 2011 and the schedule census for Lucknow city in 2021 was postponed due to Covid. The current estimates of Lucknow city are based on past growth rate. Once govt conducts census for Lucknow



**Population:** As of 2025, the metro area population is estimated at 4.13 million, making it the most populous city in Uttar Pradesh

Lucknow Future Population 2021-2031

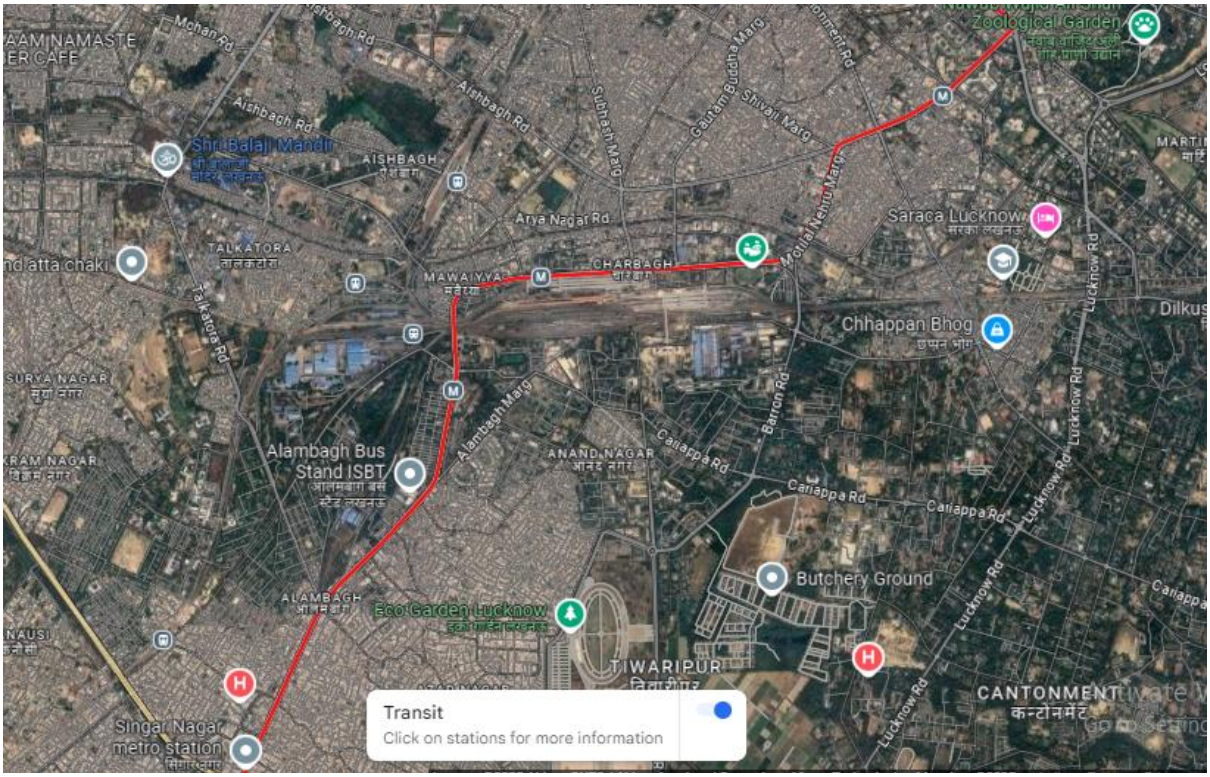
| Lucknow | City | Metropolitan |
|---|---|---|
| 2011 | **2,817,105** | 2,902,920 |
| 2021 | **3,662,000** | 3,773,000 |
| 2022 | **3,771,000** | 3,886,000 |
| 2023 | **3,884,000** | 4,002,000 |
| 2024 | **4,000,000** | 4,122,000 |
| 2025 | **4,120,000** | 4,245,000 |
| 2026 | **4,243,000** | 4,372,000 |
| 2027 | **4,370,000** | 4,503,000 |
| 2028 | **4,501,000** | 4,638,000 |
| 2029 | **4,636,000** | 4,777,000 |
| 2030 | **4,775,000** | 4,920,000 |



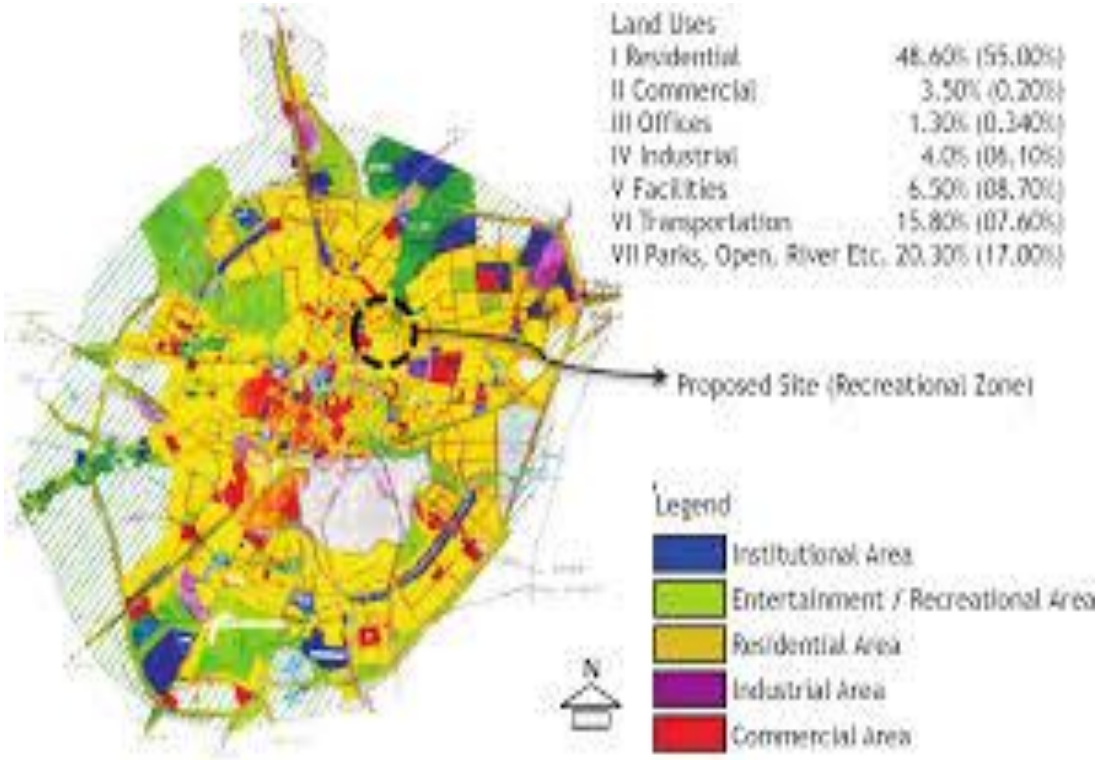
## METRO

The **Lucknow Metro** is a mass rapid transit (MRT) system in Lucknow, Uttar Pradesh, India. The metro is owned and operated by the Uttar Pradesh Metro Rail Corporation (UPMRC). The frequency of the metro's services is around 5 - 7 minutes. The Lucknow metro covers a distance of 22.87 km with 21 stations, of which 17 are elevated and four underground

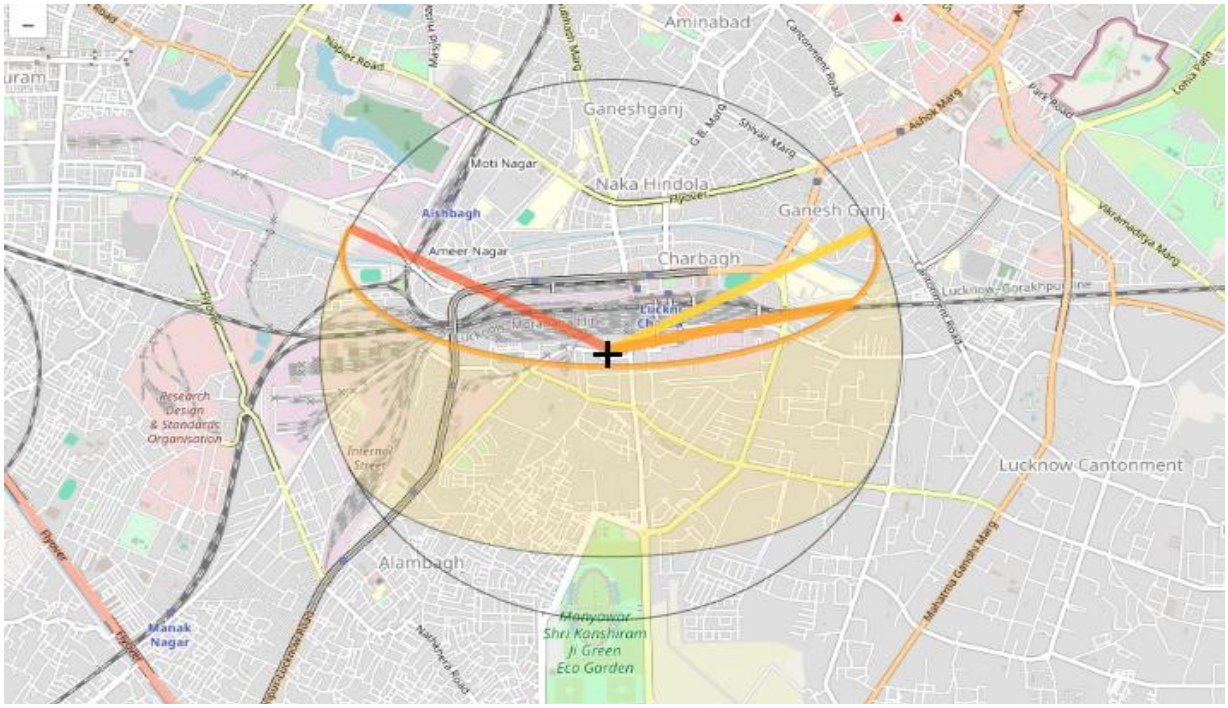
**SITE ANALYSIS**
**LOCATION LUCKNOW**

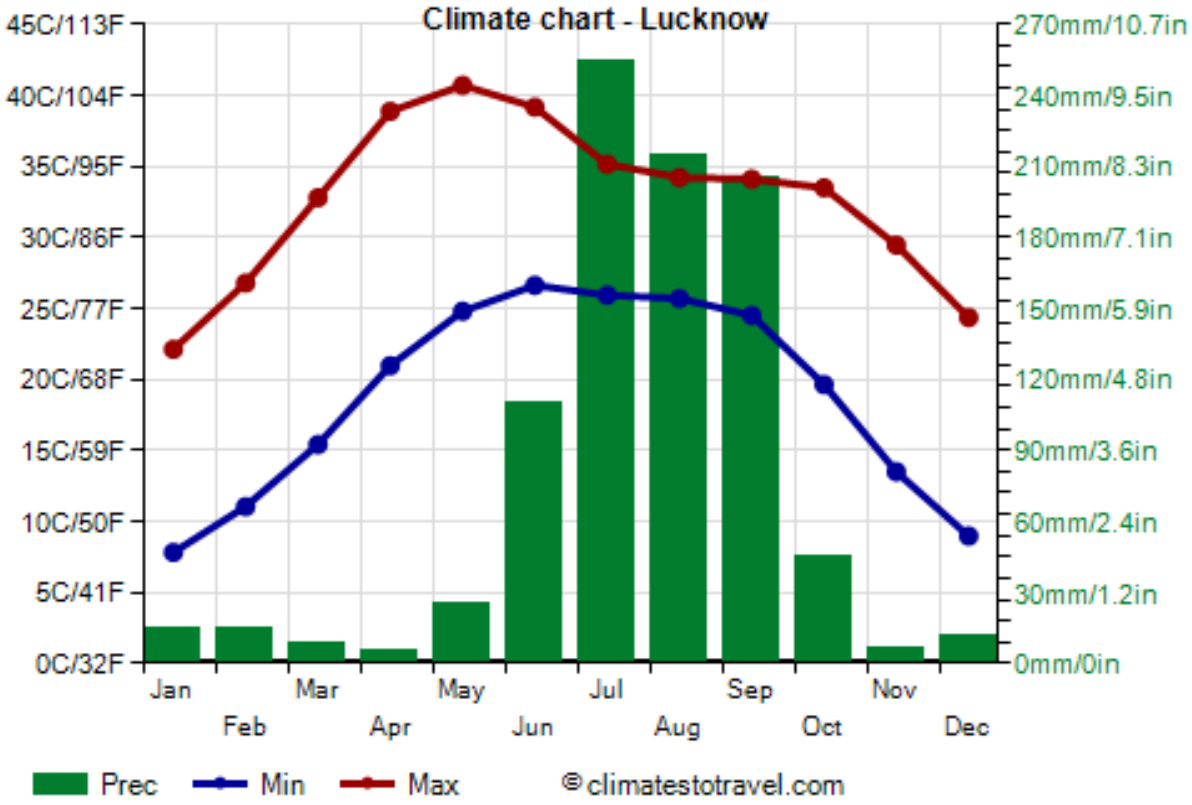

Zoological Garden
Shri Balaji Mandir
AISHBAGH
Arya Nagar Rd
Saraca Lucknow
TALKATORA
CHARBAGH
Chhappan Bhog
Alambagh Bus Stand ISBT
ANAND NAGAR
Butchery Ground
ALAMBAGH
Eco Garden Lucknow
TIWARIPUR
CANTONMENT
Singar Nagar metro station
Transit
Click on stations for more information

# LAND USE MAP


Land Uses
I Residential 48.60% (55.00%)
II Commercial 3.50% (0.20%)
III Offices 1.30% (0.340%)
IV Industrial 4.0% (06.10%)
V Facilities 6.50% (08.70%)
VI Transportation 15.80% (07.60%)
VII Parks, Open, River Etc. 20.30% (17.00%)
Proposed Site (Recreational Zone)
Legend
Institutional Area
Entertainment / Recreational Area
Residential Area
Industrial Area
Commercial Area
N

# Climate Analysis :-



# LAND USE ISSUES

Planning Area increased by 1.5 to 2-fold engulfing villages in periphery.
• Land-use division is not according to standards of URDPFI
• No buffer land in the form of agriculture/ green belt outside the proposed urban uses and Parasitic uncontrolled/ unplanned development in the adjoining areas outside the boundary

**SITE PHOTO**

# COMMERCIAL DEVELOPMENT

It is clearly indicated in the map that there is concentration of commercial offices along Kanpur Road. It has become a centre were people daily travel for jobs/ work places & shopping/ leisure activities.

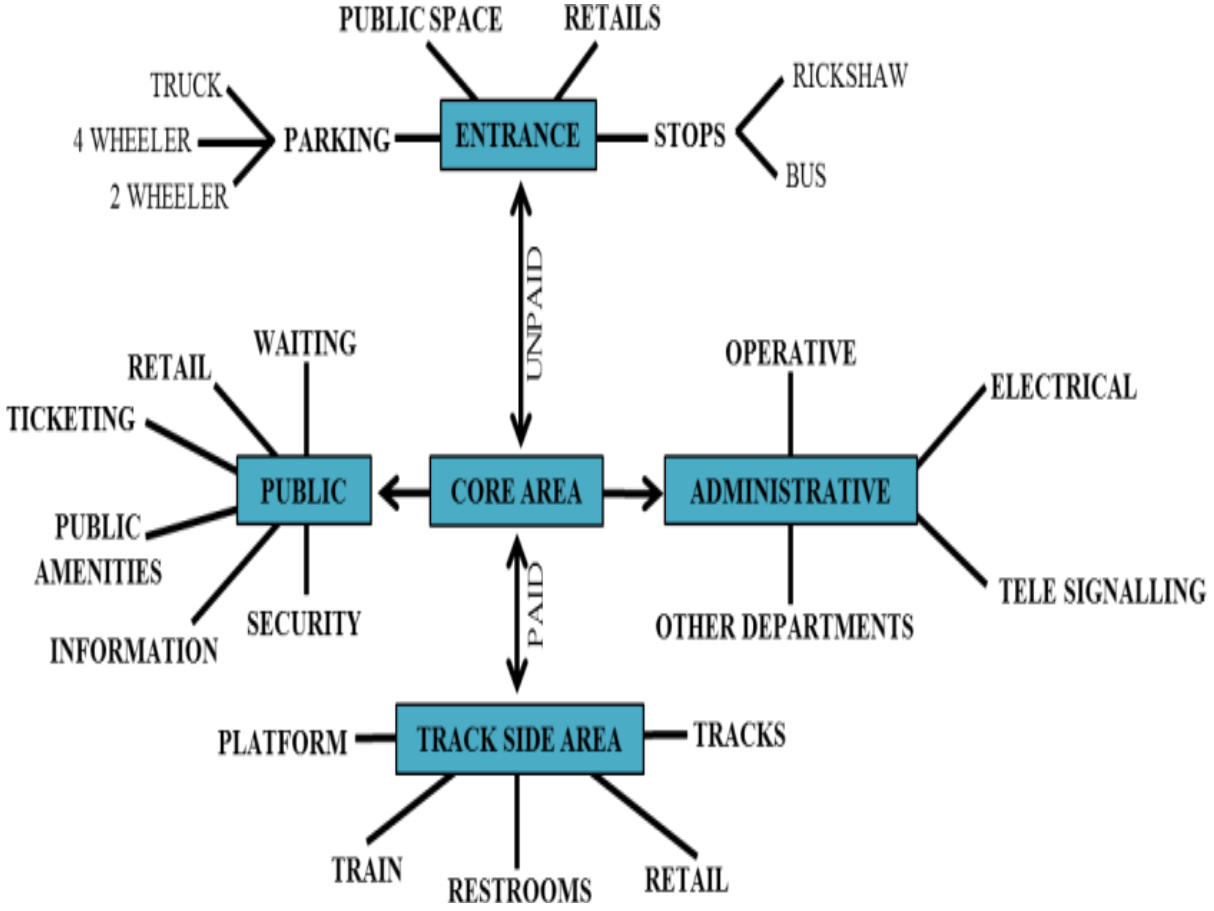
## Issues

OVERCROWDED/ CONGESTED/SATURATED AREAS IN STATIONS.

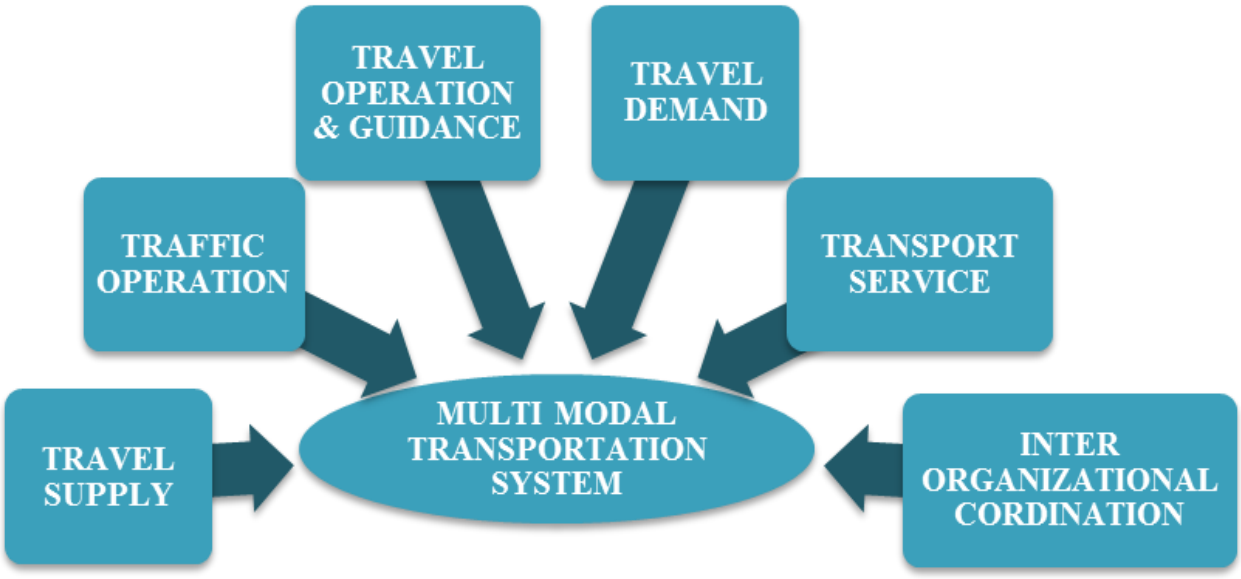
- INADEQUATE PARKING SPACE
- HAPHAZARD DEVELOPMENT AROUND STATIONS
- UNHYGIENIC

## Solutions

- PROPER PLANING ACCORDING TO HEADWAY OF TRAIN TO CONTROL CONGESTION ON PLATFORMS PRROPERLY ESTIMATED PEAK HOUR PASSENGERS MOVEMENT.
- PARKING FACILITIES FOR DIFFERENT VEHICLESMULTI LEVEL PARKING.
- PLANNED DEVELOPMENT AROUND STATIONS.TRANSIT ORIENTED DEVELOPMENT.COMMERCIAL SKYSCRAPES,REVENUE GENERATIONS.
- CLEANING & PROPER REFUSE FACILITIES




Process of Planning and Building of Multi Modal Transport System
Source : Created by author based on datas




Components of Multi Modal Transport System Source : Created by author based on datas

This assessment report presents a comprehensive evaluation of the physical infrastructure planning surrounding the proposed/ongoing Multimodal Transport Hub (MMTH). The objective is to analyze the existing infrastructure, identify critical gaps, and recommend actionable strategies for integrated, sustainable, and future-ready development.

The assessment covers various key domains including road connectivity, pedestrian pathways, public transit integration, utility services, land use alignment, and intermodal accessibility. The findings reveal that while core transportation linkages are under development or in place, there exists a significant need for coordinated infrastructure upgrades to support seamless multimodal integration.

**Key observations include:**

- **Road Network & Accessibility**: Existing arterial and sub-arterial roads are insufficiently designed for projected traffic volumes. Poor intersection design and inadequate signage pose safety and efficiency challenges.
- **Pedestrian & Non-Motorized Infrastructure**: Sidewalks, crossings, and cycling tracks are either missing or poorly maintained, discouraging sustainable mobility.
- **Public Utilities & Services**: Water supply, drainage, power lines, and street lighting are under capacity or lack spatial coordination with transport infrastructure.
- **Land Use & Development Control**: Uncoordinated land use planning is causing fragmented development and congestion around the hub, reducing long-term viability.

**The study recommends a phased infrastructure upgrade plan.**

- Smart road infrastructure and traffic management systems.
- Transit-oriented development (TOD) zoning and incentives.
- Multi-agency coordination mechanisms for utility integration.
- Improved accessibility and inclusive design for differently-abled users.
- Real-time data systems for operational monitoring.

By addressing these infrastructural and planning challenges, the MMTH can catalyze urban regeneration, promote modal shift to public transport, and enhance overall mobility efficiency in the region. This assessment serves as a guiding document for stakeholders including urban planners, transport authorities, municipal corporations, and funding agencies to enable informed, resilient infrastructure planning.

THANK YOU