



April 2012

Comprehensive Mobility Plan for Lucknow



Final Report

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List of Abbreviations

CDP	City Development Plan
CMP	Comprehensive Mobility Plan
ECS	Equivalent Car Space
IPT	Intermediate Public Transport
ISBT	Inter State Bus Terminal
LCV	Light Commercial Vehicle
MAV	Multi Axle Vehicle
NMT	Non-Motorised Transport
PCU	Passenger Car Unit
JnNURM	Jawaharlal Nehru National Urban Renewal Mission
LNN	Lucknow Nagar Nigam
LDA	Lucknow Development Authority
TOD	Transit Oriented Development
TSM	Transport System Management
V/C Ratio	Volume/Capacity Ratio
TAZ	Traffic Analysis Zone

Executive Summary

Background

During the last decade, the urban sprawl in Indian cities has extended far beyond the existing territorial jurisdiction of the city administration resulting in high usage of private modes. Despite substantial efforts, cities are facing difficulty in coping with increase of private vehicles along with improving personal mobility and goods distribution.

The National Urban Transport Policy (NUTP), 2006, therefore emphasises on personal mobility to achieve cost-effective and equitable urban transport measures within an appropriate and consistent methodology. Accordingly, the Comprehensive Mobility Plan (CMP) lays out a set of measured steps that are designed to improve transportation in the city in a sustainable manner to meet the needs of a growing population. This report deals with various facts of the preparation of CMP for Lucknow.

Study Area

The municipal area of Lucknow was 92 Sq Km in 1987 and increased to 163 Sq Km in 2005. The Lucknow Master Plan prepared during 2004-05 for the year 2021 covers an area of 980 Sq Km. Master Plan boundary area defined by Lucknow Development Authority (LDA) has been considered as study area. This includes the existing notified boundaries of Lucknow Urban Agglomeration Area, Lucknow Development Authority Area and Lucknow Nagar Nigam Area. The study area covers an area of 980 sq.km bounded by 26.30 degree & 27.10 degree North Latitude and 80.30 degree & 81.13 degree East Longitude. The Gomti River, meanders through the city, dividing it into the Trans-Gomti and Cis-Gomti regions.

Residential use has grown dramatically in comparison to all other uses, although there has also been notable growth in commercial, industrial and public service land use. The percentage of area under traffic and transportation use has decreased from 10.38% in



1987 to 7.62% in 2004-05. However, a provision of 16% of total land use has been made under traffic and transportation in Lucknow Master Plan 2021.

Mobility Indicators of the City

The number of vehicles in Lucknow has grown by 36% from 2005 to 2009 of which 82% are two wheelers. This has had an impact on the average journey speed, which is less than 15kmph on nearly 65% of the network whereas on the old city the average speed further reduces to 6 to 9 kmph during peak hour. The increased vehicle ownership has also had an impact on the trip rate (PCTR) of a city, which is 1.1 with an average trip length (ATL) of 5 km in 2010. The major composition of traffic comprised of NMVs, IPT modes and two wheelers.

The survey undertaken revealed that majority of roads in the study area (32%) have Right of Way (RoW) between 10-20m, followed by 37% of the roads having a RoW between 20 to 30 meters. In terms of carriageway, nearly 26% of the network has 2-lane carriageway. Footpaths are absent on 53% of the network and 50% of the roads do not have desirable surface quality. The carriageway width is further reduced due to on-road parking across the city. Traffic flow in the city during peak hour shows that an average 1,33,000 PCUs move on the city's network. From the household survey it was observed that of the total trips made, only 10% trips were by Public Transport, 17% were by walk and 42% by two wheelers. The share of cycle is quite high at 16%, followed by 12% by auto.

Challenges Ahead

The problems being faced by the city are due to deteriorated road conditions, insufficient streetlights, unorganized parking, traffic congestion and absence of proper traffic management. Issues identified are:



Landuse - With the radial growth of the city, the Cantonment has gradually been engulfed and is today more centrally located. A Ring Road system is under development to connect the new development areas in the southern, southeastern, and western side. With the entry of private developers, like in other metropolis of the country, Lucknow is witnessing a real estate boom. Additionally entire city has been dependent upon the core area, which has grown to become the lone Central Business District for Lucknow city. This has lead to a large number of trips attracted from all corners of the city towards the central core.

Regional Connectivity - There is a good network of highways that are radiating outwards from the city, however, absence of a proper circular ring road leads to an inconsistent urban growth in the fringe areas of the city

Congestion - Unprecedented growth in vehicles on the roads and a stagnant length of road network are characteristic reasons for increasing congestion. However, components like heavy mixing of slow and fast moving traffic, presence of at-grade railway crossings, parking alongside roads, etc are specific features that also cause congestion in Lucknow city.

Changing Expectations - Like in many other developing cities around the world, with rising affluence, the needs and expectations of the people have increased. This has compelled to re-examine the current policies to cater to the higher expectations of the people and those who care for their living environment, as well as the less privileged and lower income group.

Land use under Transportation - Addition of land for roads will not solve the transport problems in a sustainable way in the long-run, because the demand for road space is insatiable. Hence, the projected increase in travel demand should be met by public transport rather than by personalized modes.

Declining Public Transport Mode Share - Currently the share of public transport is only 4%, resulting in high growth of two wheelers and IPT modes. The trend will have significant implications on the environment in terms of noise, air pollution and congestion. The challenge is to reverse this trend and ensure that our public transport system can cater to the significant increase in daily travel demand.



Lack of Traffic Enforcement - The main arterials of the city are experiencing encroachment by hawkers on the footpaths and on the carriageway by private vehicle users in the form of on-street parking thus reducing the capacity of the road. Due to absence of proper enforcement mechanism, on-street parking takes places on most of the busy roads, resulting to congestion.

NMT - The city witnesses significant number of walk trips, and the composition of traffic reveals large number of slow moving vehicles (cycle rickshaws, animal carts, etc.) moving on the road along with motorised vehicles. Altogether, the share of Non Motorised Transport accounts for 41% of the total trips (Walk-17%, Bicycle-16%, Cycle Rickshaw-8%) of the total trips. Despite this fact, no specific attention has been given to the safety of the NMT users.

Freight System - Being a service industry-based city the development of Lucknow-Unnao-Kanpur Industrial Belt towards Kanpur road will have significant impact on goods movement in Lucknow city. Existing location can support such development only to some extent. The city is in dire need of a freight management strategy as goods mobility is a very important aspect along with mobility for people.

Traffic Management & Control Mechanism - Most of the traffic signals in the city are non-functional. Intersections are with poor geometrics. Activities such as retail sales, boarding and alighting of passengers, take place at the intersection control area, which reduces the traffic handling capacity of the intersection significantly. Besides, the bus stops are also located near to the junctions, which further reduce the capacity of intersections.

The number of traffic police personnel's for managing the city traffic is declining every year whereas, on an average, 40,000 to 60,000 vehicles are being added to the city's road network every year. Thus, there is a need for additional requirement of work force for managing the city traffic along with installation of traffic signals and application of Intelligent Transport System (ITS).

Parking Issues - Due to lack of enforcement and inadequacy of off-street parking, on street parking is predominantly occurring in most of the roads in Lucknow. High parking demand has been observed in many areas of the city which lead to congestion



throughout the day such as Aminabad, Chowk, Hazratganj, Charbagh, Kapoorthala, Patrakarpuram etc. Short-duration on- street parking during peak hours in front of a number of educational institution hampers smooth movement of traffic. Unorganised parking outside commercial places and on road is a common phenomenon in Lucknow city.

Existing Level of Service - LOS is a measure of quality of service in terms of ranking – higher the value of LOS, the lower is the quality and vice versa. Other than pollution level and average travel speed in which Lucknow has scored 2 in overall LOS ranking, in all other parameters, the city's overall ranking is either 3 or 4, meaning poor quality of service. The mobility plan focuses attention in improving the level of service incorporating the policy interaction and selecting appropriate planning strategies.

Planning Strategy

Building on the vision for CMP 2031, mobility strategies have been shaped by three mobility pillars:

- (a) Integrated Land use-Transport Planning
- (b) Bringing a control on movement of personal vehicles
- (c) Encourage public transport system and other sustainable modes

These pillars provide the framework for establishing the direction of the CMP, and for selecting and evaluating individual transportation projects.

Mobility Strategies

The mobility goals for Lucknow need to be addressed through a multipronged approach. Solutions for mobility improvements cannot be achieved by adopting a single strategy. The following strategies need to be adopted to meet the goals set for Lucknow:

- I. Land Use and Transport Strategy
- II. Development of Mobility Corridors
- III. Making Public Transport a choice mode



-
- IV. Promotion of Non-Motorised Transport Strategy
 - V. Efficiency in Freight Mobility
 - VI. Demand Management Strategy
 - VII. Traffic Engineering Measures

- **Land Use and Transport Strategy**

There is a fundamental link between land use and transportation. Supportive land use patterns include the appropriate intensity, configuration, and proximity of housing, jobs, stores, and schools. Land use patterns are also shaped by roads, footpath, sidewalks, rail and other public transportation infrastructure. Locating shops, offices, and services near homes, and ensuring well-connected transportation infrastructure can promote walking, bicycling transit used and greatly contribute to improved accessibility and mobility. In order to provide mobility solutions for Lucknow city, it is important that there is an effective integration between Land use and transport in the entire region.

- **Concepts of Corridor and Nodes**

Conceptually, the development pattern of city are generally organised as:

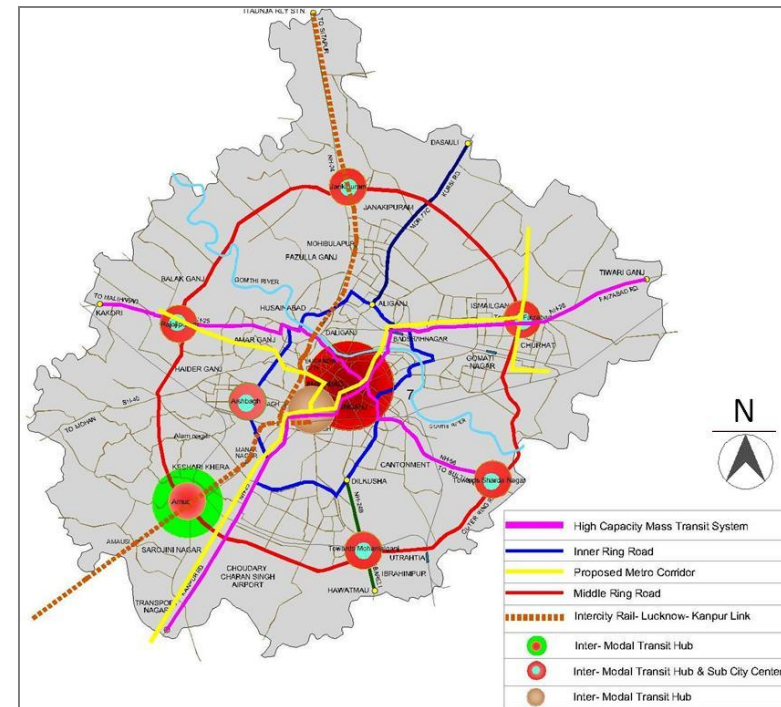
- **Concentric Growth Pattern:** The city expands over a large area with a moderate density through a concentric growth pattern by developing tiers of circular roads.
- **Ring Town Concept:** The urban sprawl of the city is restricted and smaller activity zones are developed around the city, which are connected by a radial road network.
- **Corridor Development Pattern:** Development is channelised along transit corridors to facilitate accessibility and mobility objectives. The end points can be activity generators/nodes.
- **Corridor Node Development Pattern:** The ring town concept and corridor concepts is integrated.

The city of Lucknow is at present in the Corridor-Node Development stage. Thus, a ring radial pattern of development of the city is suitable for sustainability of Lucknow city.

Land Use and Transport Integration Plan

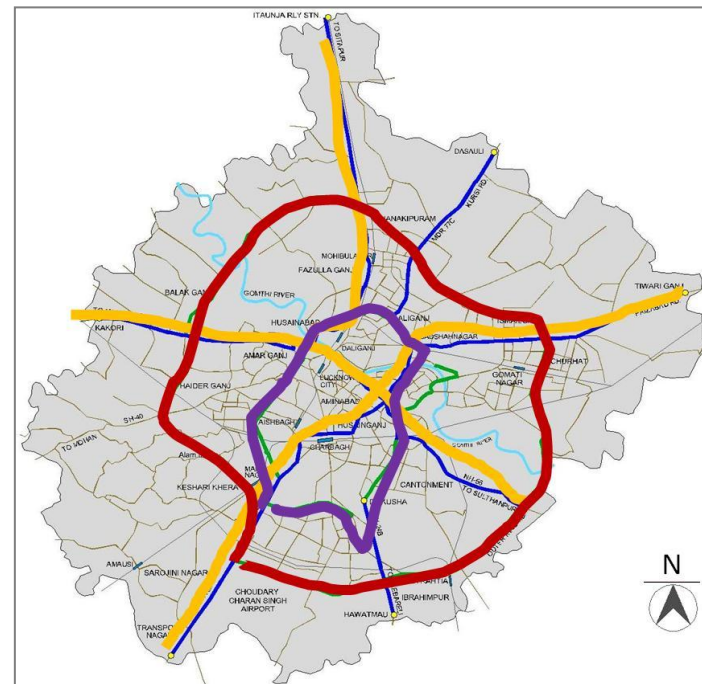
The integrated land use strategy will focus on Accessibility within the LDA, connectivity to the new growth centers and development of areas near arterials. Consequently, based on the land use plans (Master Plan 2021) and transport demand model developed; the framework has been evolved in the following manner:

- Development of a ring-radial road network will allow the city to grow in all the directions as it is growing in recent times. Since in the existing situation there is only one core commercial zone, there has been a heavy flow of trips attracted to the core city area. Thus, transit hub cum sub-city centres have been proposed at the major residential areas based on the Transit Oriented Development principle.
 1. Towards Jankipuram
 2. Towards Faizabad Road
 3. Near Golf City & Sharda Nagar
 4. Towards LDA Colony
 5. Rajajipuram
 6. Aishbagh



- Development of Mobility Corridor with right of way of at least 25 m for mixed traffic conditions and 30 m for carriageway with dedicated public transport bus lane. The mobility corridors for the Study area constitute of radial roads complemented with circumferential roads to form a ring-radial pattern of network.

- Faizabad Road; NH-28
- Kanpur Road; NH-25
- Raebareli Road; NH-24B
- Sultanpur Road; NH-56
- Mohan Road; SH-40
- Malihabad Road; SH-25
- Inner Ring Road
- Middle Ring Road



- To continue and complete the proposed mobility corridor, the following missing links need to be developed in phase I.
 - Link between SH-40 and Kanpur Road of 10 km.
 - Link between Sitapur Road to Faizabad Road of 15 km

- Samta Mulak Chowk to Faizabad Road along Kukrail Nallah of 1.6 km
- Kapurthala Road to NH-24 of 1.5 km

- CMP suggested for widening of the existing roads by removing the encroachments along the carriage way at the identified stretches of the major corridors. Widening of existing regional connectivity roads up to the urban limits are proposed. Also development of New Arterial Road along Nallah Road upto Haider Canal and Kukrail Nallah alignment and development of signal free outer ring road.

Legend

	Kanpur Road- Motilal Nehru Marg-Vidhan Sabha Marg- Ashok Marg-Faizabad Road (Existing Arterial)
	Road Over Haider Canal
	M.G Road-Lohiya Path
	Road Over Kukrail Nallah

Road Name	V/C ratio Base Year (2010)	V/C ratio 2031 Do Nothing	V/C ratio 2031 With Canal Road	Expected Traffic On the Canal Road (in PCU)	Shift from Existing Arterial to Proposed Canal Road
Existing Arterial (Route connecting Kanpur Road-Motilal Nehru Marg-Vidhan Sabha Marg-Ashok Marg-Faizabad Road)	1.7	3.53	1.05	4000	40%

Public Transit Mobility Plan

The public transport management plan is envisioned to be a three tier system which addresses the mobility needs of the people of the city comprehensively. At the topmost tier, the need for a mass rapid system is felt where long distance trips within the city are conveniently addressed and are complimented by safe efficient and economical services. At the second tier, a supplementary public transport means is planned which basically makes use of the existing system in a more organized manner so that it integrates well with the top and the bottom level tiers. Rescheduling and reorganizing the bus system is part of this strategy. It is expected that the

proposed system would improve the public transport share from existing 12% to 30% in Phase III and by including following measures:

- **Development of three tiers of Public Transport system**

The CMP for Lucknow has proposed phase-wise development of public transport system in Lucknow city.

Phase I, Public transport plan for Lucknow includes:

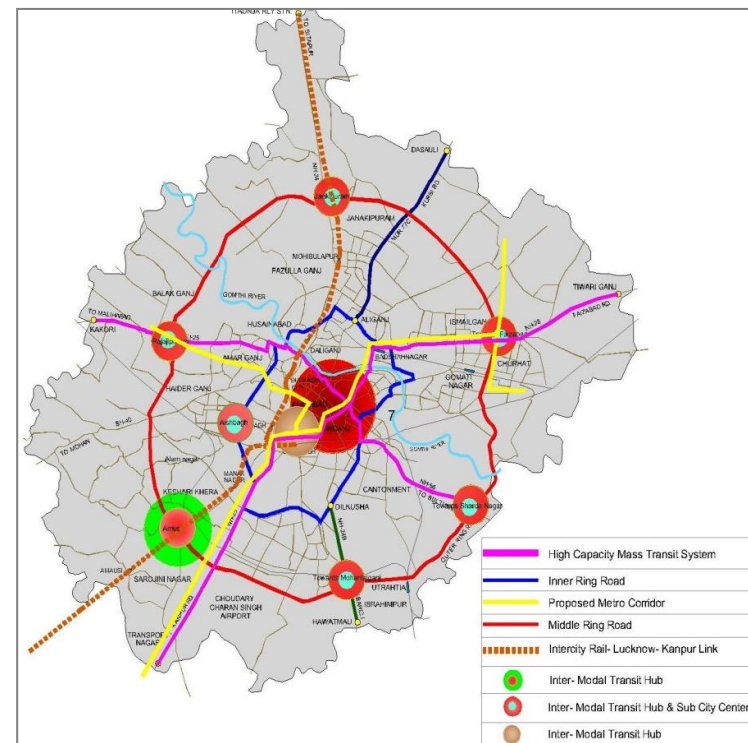
1. Rationalisation of IPT Routes
2. Increase in frequency of city bus service

Phase II, Public transport plan for Lucknow includes:

1. Augmentation of City Bus Service along the existing city bus service routes
2. Conversion of High Density Bus Service into Bus-based Mass Rapid Transit System (MRTS)
3. Development of High Density Bus Service along Inner Ring Road
4. Increased Frequency of Lucknow – Kanpur Intercity Rail Service with upgradation of existing railway station

Phase III, Public transport plan for Lucknow includes:

1. Augmentation of City Bus Service along the existing city bus service



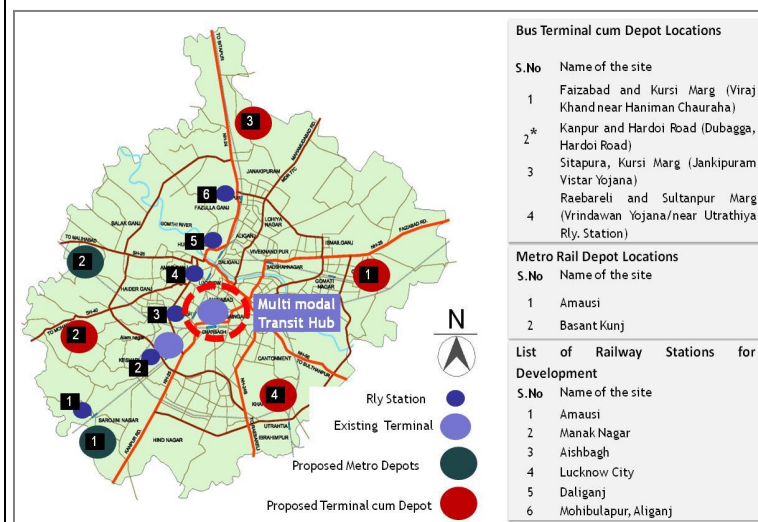
routes

2. Introduction of High Density Bus Service along Middle ring road
3. Introduction of Rail-based MRTS
 - Corridor 1: Amausi to Munshi Pulia via Kanpur Road and Faizabad Road
 - Corridor 2: Final EW Corridor from Lucknow Railway Station to Vasant Kunj

• Public Transport Infrastructure

The infrastructure requirement for Lucknow is classified as:

- A. Infrastructure for bus-based public transport
 - B. Infrastructure for rail based public transport
 - C. Infrastructure for Multi-modal Integration
-
- ### • Infrastructure for bus-based public transport
1. Improvement of Existing depots and terminals of UPSRTC
 2. Development of New Terminal cum Bus Depot at the following locations
 - Faizabad and Kursi Marg (Viraj Khand near Hainiman Chauraha)
 - Kanpur and Hathroi Marg (Dubagga, Hathroi Road)
 - Sitapur, Kursi Marg (Jankipuram Vistar Yojana)



<ul style="list-style-type: none"> ▪ Raibareli and Sultanpur Marg (Vrindawan Yojana/ near Utrathiya Rly. Station) • Infrastructure for rail based public transport <ol style="list-style-type: none"> 1. Improvement of existing railway station 2. Depots for proposed Metro System at Amausi and Basant Kunj • Infrastructure for Multi-modal Integration <p>For multi modal integration, a multi-modal transit hub at Charbagh has been proposed. This multi-modal hub will integrate the existing Charbagh railway station and Charbagh Bus terminal with proposed bus based Mass Transit System and proposed Metro System.</p>	
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Non-Motorized Transport Plan

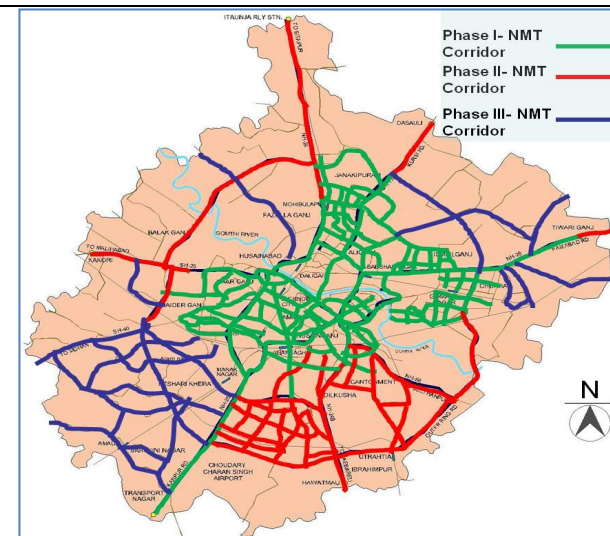
In view of the high share of pedestrian and NMT trips it is envisaged to provide a continuous, encroachment free pedestrian and NMT facilities across the city. The recommendations for the region include:



• Foot Path and By Cycle Lanes

Foot paths and Cycle tracks are to be installed on the proposed mobility corridors, and also the secondary arterials, as a minimum requirement. Additionally, Footpaths should also be installed in all the residential roads, wherever possible.

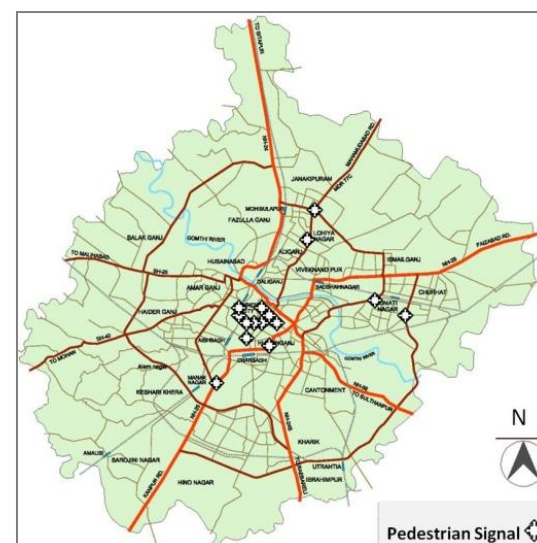
- A minimum usable width of 1.5 meters should be provided for footpath.
- Road Markings in the form of “zebra crossings” at all intersections for designated space for pedestrians to move across roads and other street furniture.
- Barricading of footpath near every intersection for controlled crossing from an allocated vent.

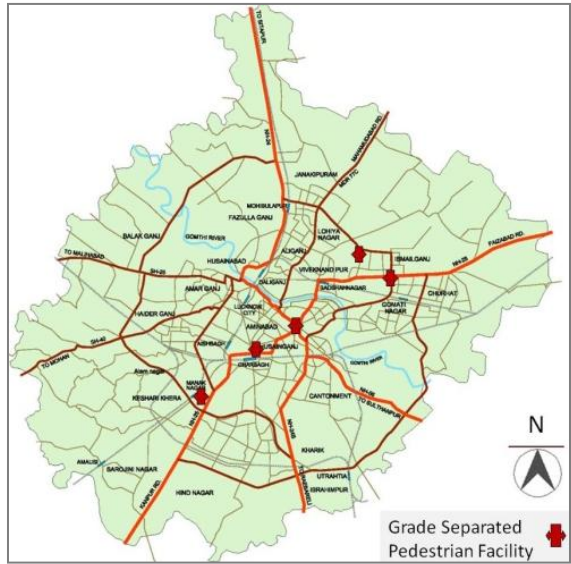


• Pedestrian Phase Signals at Intersections

The following list of intersections has been selected based on the pedestrian volume study for installation of pedestrian only signals along with necessary road markings and barricaded footpaths

- Novelty Cinema Chowk, Lalbagh
- Kaiserbagh Rotary
- Nehru Crossing , Rakabganj
- Ganga Prasad Intersection, Aminabad
- Naka Chowk
- Aminabad Chowk (GB Road)
- Gautam Budha Road Chauraha



<ul style="list-style-type: none"> ○ Medical College Chauraha ○ Nachtara Chauraha (Daliganj Bridge) ○ Huseria Chauraha ○ Engineering Chauraha ○ Parivartan Chauraha ○ Chowk Chauraha ○ Kapoorthala Chauraha ○ Mithaiwala Intersection 	
<ul style="list-style-type: none"> ● Grade separated pedestrian crossing facilities <p>The locations that are recommended for grade separation are</p> <ul style="list-style-type: none"> ○ Charbagh ○ Polytechnic Chauraha ○ Alambagh ○ Allahabad Bank Chauraha ○ Mahanagar Boys 	
<ul style="list-style-type: none"> ● Cycle Rickshaw Management <p>The CMP for Lucknow has proposed the development of modern cycle rickshaw stand in old city areas.</p>	

Freight Management Plan

For freight management plan of the city, the proposal has been worked out in phases.

Phase 1:

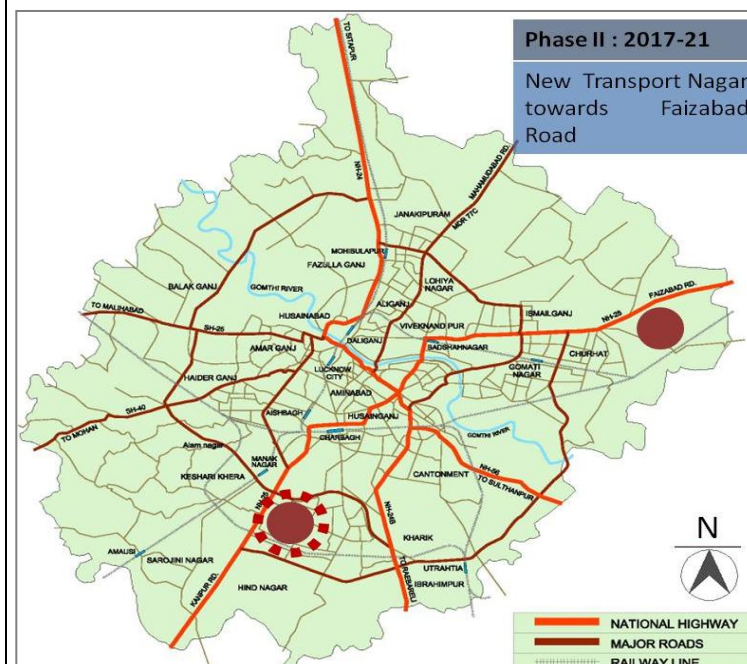
1. Improvement of existing Transport Nagar
 - Segregating loading/unloading lanes
 - Road Improvement
 - Parking Bays
 - Terminal facilities, like public utilities, rest rooms for drivers and labours
 - Weighing Machines
2. Movement Restrictions of heavy vehicles in the city from 08:00 am – 09:00 pm.
3. Abolishing renewal of licenses for old goods vehicles

Phase 2:

1. Development of new goods/truck terminal towards Faizabad Road, in proximity to the Outer Ring Road
2. Identification of a Mobility Corridor for Goods Vehicles, movements to be restricted completely on all other roads
3. Ban on all animal carts being used for goods movement

Phase 3:

1. Setting up of truck terminals at the following locations
 - Towards Deva Road
 - Towards Kurchi Road
2. Segregated high speed outer Bypass Road
3. Promotion of Use of small and medium size vehicles with modern emission controls in the central city areas



Traffic Management

Traffic management proposals consist of improvement of some important intersections, signaling plans, pavement marking and signages, setting up of a Traffic Management Unit and a parking management plan

1. Intersection Redesign

The following intersections need to be taken up for improvement works:

- | | |
|--|---------------------------------|
| 1. Allahabad Bank Chauraha, Hazratganj | 14. Chowk Chauraha |
| 2. Novelty Cinema Chowk, Lalbagh | 15. Kapoorthala Chauraha |
| 3. Kaiserbagh Rotary, | 16. Mafaire Cinema Intersection |
| 4. Nehru Crossing , Rakabganj | 17. High Court Intersection |
| 5. Alambagh Chauraha | 18. Haathi Park Intersection |
| 6. Naka Junction | 19. Times of India Intersection |
| 7. Aminabad Chowk | 20. Dainik Jagran intersection |
| 8. GB Road /Gautam Buddha Road Road | 21. Mahanagar Intersection-1 |
| Chauraha | 22. Mahanagar Intersection-2 |
| 9. Medical College Chauraha | 23. Teli Bagh Intersection |
| 10. Polytechnic Chauraha | |
| 11. Huseria Chauraha | |
| 12. Engineering Chauraha | |
| 13. Charbagh Tiraha | |

2. Signal coordination & optimization

In Lucknow, there are 395 intersections out of which 101 junctions are either manually controlled or through signalisation, or by both. In total, 32 junctions in Lucknow have been signalized, out of which, however, only 6 are fully functional. Additionally, 12 junctions have been recently selected for signalisation. Thus, the CMP for Lucknow has proposed for signalization in all the major junction of Lucknow. Pedestrian crossings signals also need to be installed at these junctions.

3. Pavement Markings and Signage

It is recommended that proper signs should be marked at appropriate locations. Road signs are classified into three categories: Mandatory/Regulatory signs, Cautionary/Warning signs, and informatory signs. It is recommended that signs near schools should be installed on priority basis. Traffic control facilities such as Center line, Traffic lane lines, Stop lines, Pedestrian crossings, Parking space limits, Kerb marking for visibility, Obstruction marking etc. must be provided keeping in view all users of the road and especially for night time driving.

4. Traffic Management Control Centre

A simple real time traffic monitoring equipments are proposed to be installed that result in traffic assessment on various corridors within the city and can be accessed by the users and enforcement agencies on the web. Investment on TMC to be made in three phases, as a first phase, a simple congestion assessment technique to be adopted, the results of traffic updates to be posted on a web portal.

5. Parking Management

1. Parking policy for the city to be developed based on the parking guidelines for residential, commercial, office/educational, hospitals and medical establishments etc.
2. Off street parking facilities to be developed at following locations.
 - Hazratganj
 - Sarojini Naidu Park
 - Dayanidhi Park
 - Lalbagh (Opposite LMC office)
 - Near Charbagh
 - Near Kaisarbagh UPSRTC Workshop
 - Near Aminabad Hanuman Temple
 - Near Thakurganj
 - Chandra Sekhar Azad Park (Indira Nagar)
 - Alambagh Market

Traffic Demand Management

The CMP has identified the following areas for traffic improvement schemes such as creation of one-ways, provision of signages, relocation of parking, IPT Stands, etc. However, the areas identified in this report needs to be further studied and analyzed with detailed schemes and costing for implementation.

1. Qaiser Bagh Bus Stand
2. Chowk
3. Hazratganj / Novelty Cinema
4. Mahanagar
5. High Court
6. Charbagh Railway Station
7. Alambagh Bus Stand
8. Gomti Barrage

Other Plans

A preamble on what the other plans are:

1. Railway over bridges

The list of railway crossings that need immediate respite from congestion by building ROB is as under:

- Daliganj Crossing
- Kukrail Nallah Crossing
- NH-24 B (Near Bhadariya Bagh)
- Daliganj Crossing

2. Grade Separators

The need for grade separators can be warranted if all other means of traffic management, like intersection redesign, signalization, one way system, rotary modification etc (as given in the IRC warrants) do not result in relieving congestion from an intersection. In such a scenario, phased development of grade separators for a list of intersections is given as under:

- Sikandarabagh Crossing
- Along NH-25 near Vijaynagar Colony

3. Education, Enforcement and Public Awareness

- Special traffic drives for making the public aware of the traffic rules
- Imposing 'fines at the spot' procedure for defaulters.
- Organizing road safety programs for :
 - informing the public of new regulations or changes to the traffic regulation system
 - influencing the attitudes towards road safety
 - persuading road users to change their behavior in relation to identified causal factors in road accidents

• Implementation program

The projects identified would be phased depending upon several criteria like the urgency of implementation, ease of implementation, travel demand model and environmental considerations. The phasing is generally done according to Long Term, Medium Term and Short Term projects as under:-

1. Phase I: Short Term Improvements during 2011-2016
2. Phase II: Medium Term Improvements during 2017-2021
3. Phase III: Long Term Improvements during 2022- 2031

Within each phase projects identified also need to be prioritized. As per NUTP, the prioritization of projects is in the following order:

- High priority – this includes Public Transport, Pedestrianisation and Non Motorized Transport
- Medium Priority - this includes Para Transit facilities (IPT), Travel Demand management (TDM), Parking Facilities, Development of Terminal Facilities, and Intersection Improvements
- Low Priority - this includes Road development and Bridges and Flyovers

• Costing

The approximate capital cost, excluding land acquisition, for implementing the mobility plan is about Rs 28,988 Crores. Phase wise costs are as:

- Phase I (2011-2016): Rs. 934 Crores
- Phase II (2017-2021): Rs. 9,382 Crores
- Phase III (2022- 2031): Rs. 18,672 Crores

• Funding Options

The funding from JnNURM is supported by counterpart funding in the form of grants from the State and the ULBs, for which the ratio has been fixed by the Mission for different categories of cities. In the case of Lucknow, the funding pattern is as follows:



- Government of India grant under JnNURM : 50%
- State Government grant under JnNURM : 20%
- Contribution from Cities/ ULBs : 30%

- Alternative Sources of Funding such as Real Estate Development, Dedicated Urban Transport Fund, Viability Gap Funding, Cess on Turnover, Betterment Levy through Value Capture Mechanism, Shops and Establishment Levy.

• Institutional Framework

There are multiple organizations at the city level that are involved in urban and rural planning for the City and Region. With a view to coordinate all urban transport activities in the city. Some of the broad issues related to organizations and their functioning within the city of Lucknow have been listed below:

1. There is no clear segregation between the planning and implementing bodies
2. There is lack of coordination amongst all the departments in the urban transport sector.
3. All departments related to urban transport do not function in coherence.
4. Road projects are implemented in isolation with other projects which should otherwise be an integral part of road development like footpath, cycle tracks, pedestrian facilities etc.
5. There is no control over mushrooming IPT modes in the city, which lead to issues of congestion along with contesting with the buses for passengers.
6. Operation issues in public transport due to poor route and service planning.
7. There is no dedicated organization that is in charge of long term urban transport planning for the city.

It due to this that the need is felt for setting up an umbrella level organization at the city level for overall planning and monitoring Urban Transport in Lucknow city and its immediate surroundings. The city Level UMTA for Lucknow is proposed to be headed by the Divisional Commissioner of Lucknow Division. The constituent members would be heads of various departments of the State Government, having direct or indirect role in planning for transport for all the urban areas within the state.

It is further recommended that a separate collection of funds be generated locally. This fund is meant to be spent locally on development and maintenance of urban transport infrastructure. This fund can be managed by a professional fund manager (appointed by the city level Unified Metropolitan Transport Authority) so that the balances in this fund can earn appropriate returns, in accordance with prevailing market potential.

- **Outcomes**

The outcomes of the projects proposed have been assessed in terms of improvements in the Level of Service (LOS) for the 10 Benchmarks defined by the Ministry of Urban Development, Government of India. Due to the various interventions proposed, the LOS would improve significantly from the existing 3 and 4 to 1 and 2 by 2030.

Overall LOS			
Sl.No	Indicators	LOS - Existing	LOS - Improved
A	Overall Public Transport Facilities City-wide	3	2
B	Overall Pedestrian Infrastructure Facilities	3	2
C	Overall NMT Facilities	4	2
D	Level of usage of ITS Facilities	4	2
E	Travel Speed along major Corridors	2	1
F	Availability of Parking Spaces	3	2
G	Road Safety	4	2
H	Pollution Levels	2	1
I	Integrated Land-use Transport Integration	4	2
J	Financial Sustainability of Public Transport	3	1

1. Introduction



1.1. Background

Lucknow is the capital of India's most populous state Uttar Pradesh and one of the emerging metros of the country. It is known for its cultural extravaganza and many splendors. Located on the banks of the river Gomti, the city of Lucknow is situated at 123 meters above the mean sea level. The Gomti River, the chief geographical feature, meanders through the city, dividing it into Trans-Gomti and Cis-Gomti regions. The densely populated areas of the city are on the southern bank of the River Gomti and several planned residential colonies have been developed on the north of the River. Lucknow has always been a



multicultural city with rich culture, architecture, music, dance, handicrafts, etiquette, and sports. The city once famous for beautiful gardens, rich culture, architecture, music, dance, fine cuisine patronised by Persian loving Nawabs and popularly known as “The city of Nawabs” is now a vibrant city that is witnessing an economic boom and among the top fast growing metropolis of the country. During the last decade, the urban sprawl has extended far beyond the existing territorial jurisdiction of the city administration and continuing to spill over into the fringe areas of the city such as Gomtinagar extension, Gosainganj, Baksi ka Talab etc. The growth of administrative, commercial, educational and residential activities have resulted increase in traffic growth. During the last decade,

the urban sprawl in Lucknow city has extended far beyond the existing territorial jurisdiction of the city administration and is continuing to spill over into the fringe areas. Substantial efforts are being made, but city has been facing difficulty in coping with rapid increase in the number of private vehicles and goods vehicles. Several road widening and network improvement works are undertaken by various agencies/ institutions responsible for planning and development for Lucknow. These programmes are sometimes isolated from each other, with each of them being planned to meet an objective set by the respective programme. It has become necessary to formulate an integrated transportation plan by coordinating concern agencies; and, chalk out programme for development of sustainable transportation system.

1.2. Comprehensive Mobility Plan

As per the National Urban Transport Policy (NUTP), 2006, it is important to focus on personal mobility to achieve cost-effective and equitable urban transport measures within an appropriate and consistent methodology. Ministry of Urban Development (MoUD), Government of India, encourages cities to prepare a Comprehensive Mobility Plan (CMP), which is integrated with a land use plan, as part of a long-term urban transport strategy for sustainable improvements. Thus, CMP needs to be prepared focusing on mobility of people rather than vehicles by way of promoting non- motorised transport (NMT), public transport (PT) and intermediate public transport (IPT). Accordingly this report has been prepared scientifically formulating a transportation roadmap (i.e.) Comprehensive Mobility Plan- a vision document for future, including suitable investment programme for Lucknow city's transportation system.

1.3. Objectives

Followings are the broad objectives set while preparing Comprehensive Mobility Plan for Lucknow city:

- Developing Integrated land use transport system
- Promotion of Public Transport and Non-motorised Transport (NMT) system

-
- Provision for parking spaces
 - Plan for Freight Mobility
 - Adoption of usage of Intelligent Transport System (ITS) facilities
 - Ensure Road safety
 - Achieve Reduction in Pollution levels
 - Develop short-term strategies such as traffic management and engineering solutions
 - Develop medium and long-term measures including investment programmes
 - Financial sustainability of public transport

1.4. Methodology

The methodology followed in this study is shown in the form of flow chart in **Figure 1-1**. The flowchart shows various facets of study in a sequential manner, starting from defining objectives to outcome of the study covering surveys, analysis, modeling, planning strategies, mobility planning, etc.



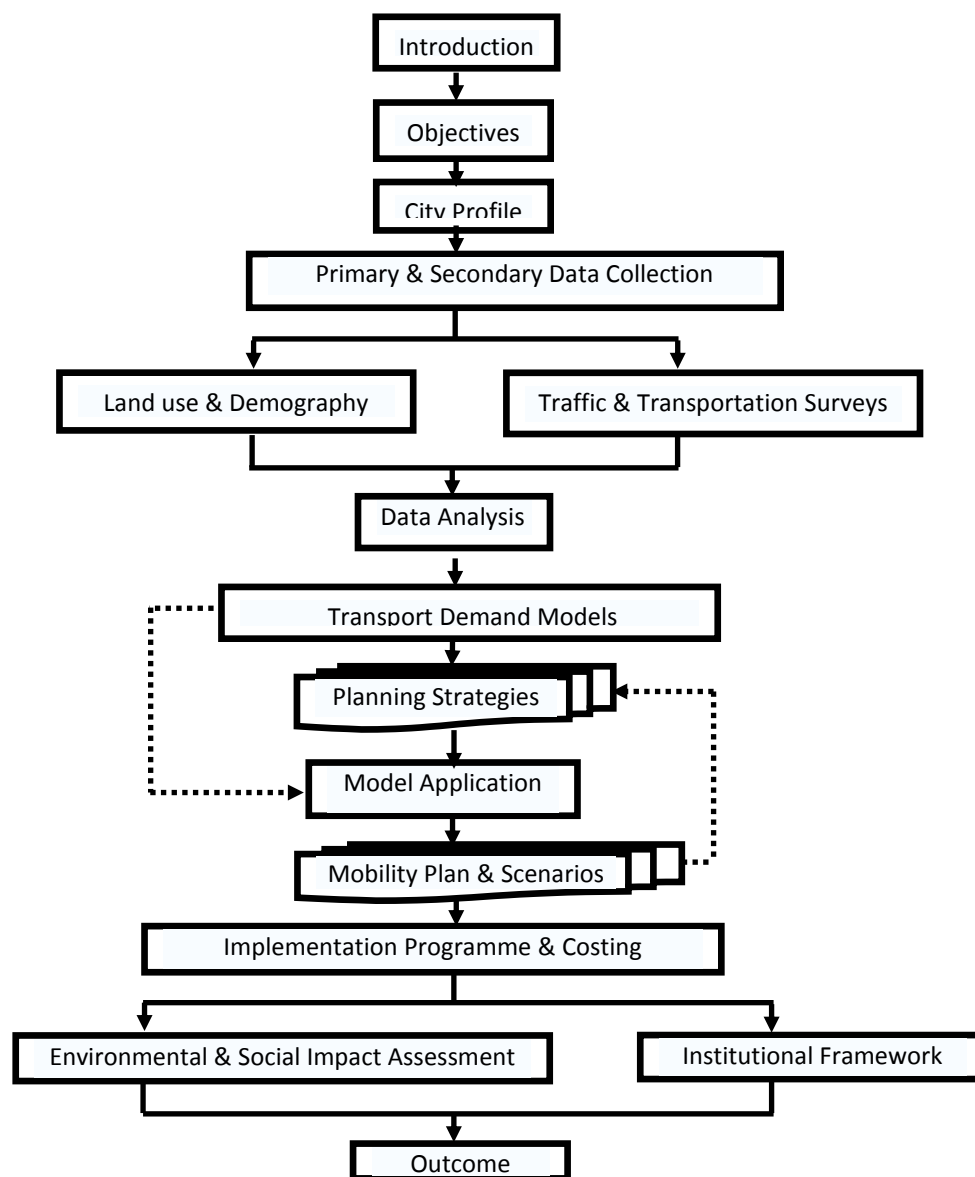


Figure 1-1: Methodology flow chart

1.5. Structure of the Report

The report is structured in to various chapters as per the sequence of activities carried out. Chapter 1 presents a brief background of the Lucknow city and the need for preparation of CMP and the Government policies. In chapter 2 Lucknow city and its transportation system are described. Chapter 3 deals with data collection and data analysis. In chapter 4 development of base year travel demand model and analysis are described. Chapter 5 illustrates the planning strategy and various components of mobility plan are detailed in chapter 6. The implementation programme in terms of short, medium and long term and the corresponding cost are furnished in chapter 7. Chapter 8 outlines the proposed institutional framework required for implementing the mobility plan. The environmental and social impact assessment is covered in chapter 9. The outcome of the study is listed in chapter 10.

2. Lucknow City Profile

2.1. Study Area Study Area

Master Plan boundary area defined by Lucknow Development Authority (LDA) has been considered as study area. This includes the existing notified boundaries of Lucknow Urban Agglomeration Area, Lucknow Development Authority Area and Lucknow Nagar Nigam Area. **Figure 2-1** shows the Lucknow CMP study area.

The study area covers an area of 980 sq.km bounded by 26.30 degree & 27.10 degree North Latitude and 80.30 degree & 81.13 degree East Longitude. The Gomti River, meanders through the city, dividing it into the Trans-Gomti and Cis-Gomti regions.

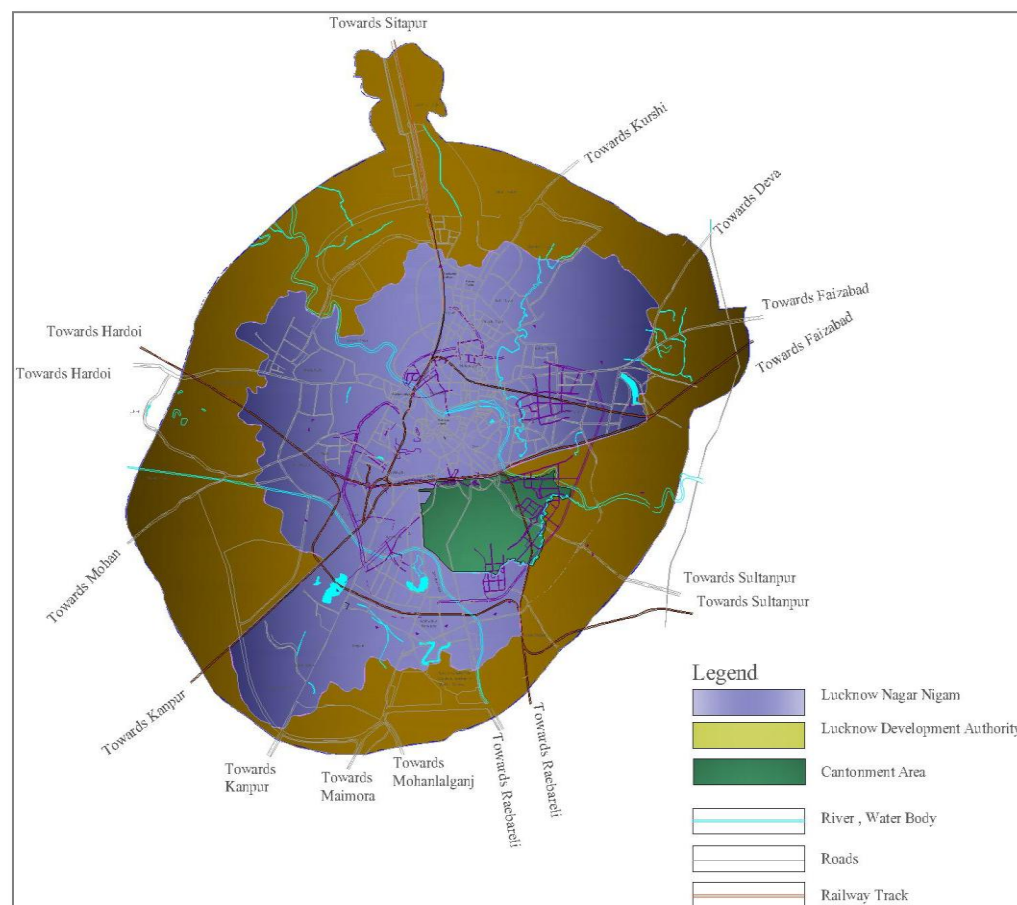


Figure 2-1: Study Area

2.2. Lucknow in Regional context

Lucknow is surrounded by Barabanki district on the east, Unnao district on the west, Raebareli district on the south and Sitapur and Hardoi districts on the north. Lucknow is well connected by NH-24, NH-25, NH-28 and NH-56 by roadways. The main railway station is located at Charbagh giving rail connectivity to various parts of the country through Kanpur, Hardoi, Sitapur, Barabanki and Raebareli. Chaudary Charan Singh Airport is located on the southern side of the city along NH-25 (Lucknow-Kanpur road). **Figure 2-2** shows the external transportation linkages from Lucknow to various important places. In terms of movement of traffic and other day-to-day business, Lucknow has broadly two influence zones as Primary Influence Zone and Secondary Influence Zone.

Primary Influence Zone: This zone consists of the areas between 25 to 40 km radius from Lucknow city. This includes rural towns and villages like the orchard town of Malihabad, historic Kakori, Mohanlalganj, Gosainganj, Chinhat, Itaunja, etc. A large number of traffic movements take place to and from these areas to

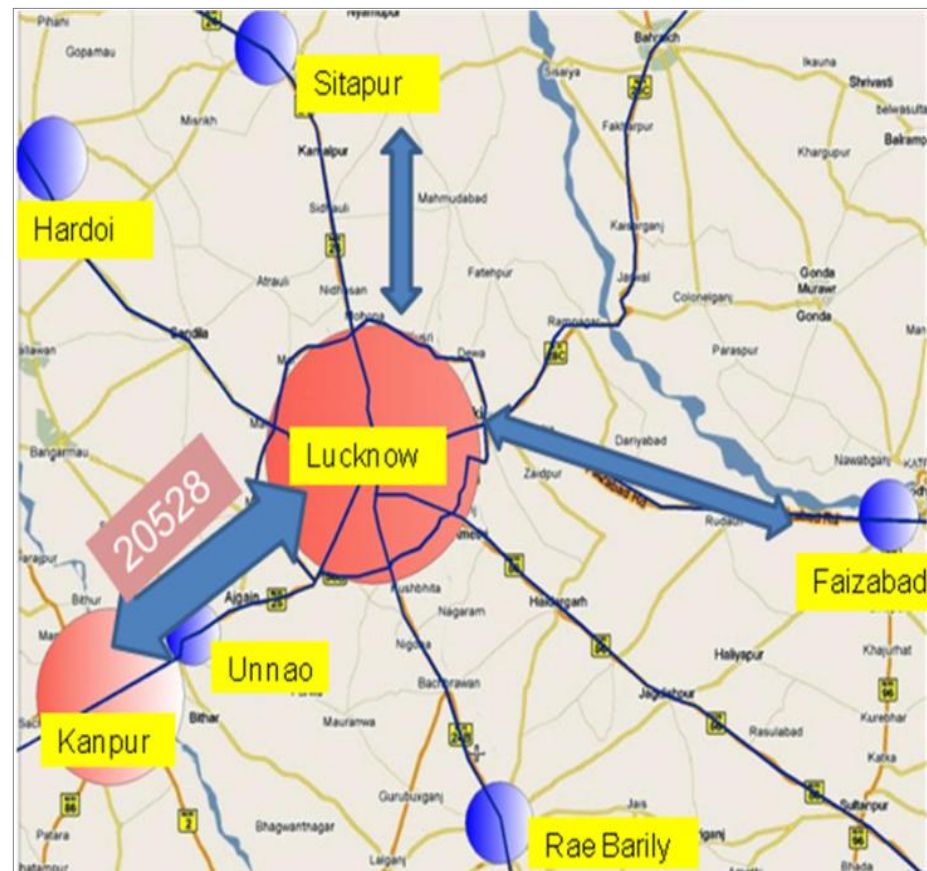


Figure 2-2: External Transportation Linkage

Lucknow city. Secondary Influence Zone: This zone consists of the areas ranging from 80 to 130 km radius from Lucknow city. Cities and towns of Kanpur, Unnao, Hardoi, Sitapur, Faizabad, Raebareli, etc. fall under this zone.

2.3. Demography

Lucknow city has been experiencing high growth of population over the years, which can be attributed to high natural growth and migration from the adjacent rural areas and towns with expectation of better employment and livelihood opportunity. As per Census, the population of the Lucknow Urban Agglomeration in 2001 was 22.46 lakhs, and as per Urban Rejuvenation Plan of Lucknow City, the population in the year 2006 was 27.24 lakhs. The

Master Plan has projected the population for Lucknow for the year 2011 and 2021 at 32.26 lakhs and 45 lakhs respectively

(Figure 2-3). By using the same methodology for population projection, the expected population for Lucknow city in the year 2031 would be around 58.0 lakhs. There has been sharp rise in vehicle registration in Lucknow city. If the same situation continues, it is expected that there will be 20 to 25 lakhs of registered vehicles in Lucknow by the year 2031. Thus, this growth of population and vehicles will pose an unimaginable load on city's already struggling transport infrastructure.

2.4. Growth of Lucknow

Lucknow Urban Agglomeration (LUA) became a million-plus city in 1981. It included areas under Lucknow Municipal Corporation (LMC) and the Lucknow Cantonment (LC).

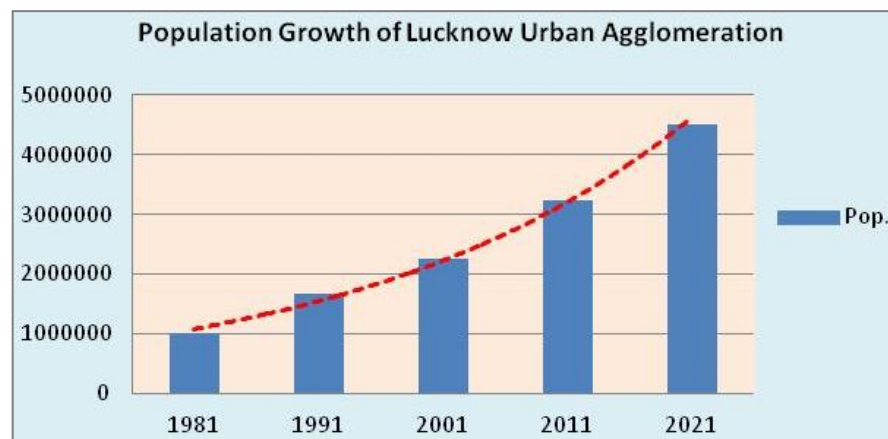


Figure 2-3: Population growth of Lucknow urban agglomeration

Lucknow city is growing in a circular manner with NHs and SHs networks radiating out from the city in all directions. **Figure 2-4**

depicts the growth direction of Lucknow city. The city extends from Indira Nagar and Gomti Nagar on the east and Rajajipuram on the west. Previous decade saw an upsurge in real estate activities in the city. Several housing/residential societies and commercial complexes dot the skies of the city of Lucknow. The Central Business District (CBD) of Lucknow city is located in the heart of the city, and the urban sprawl of the city has resulted in the city growing outwards in all directions. This has significantly increased the commuting distance. The highest density is observed in the old city areas like Chowk, Aminabad, and Hazratganj etc where the settlements started flourishing from the Mughal and Colonial periods.

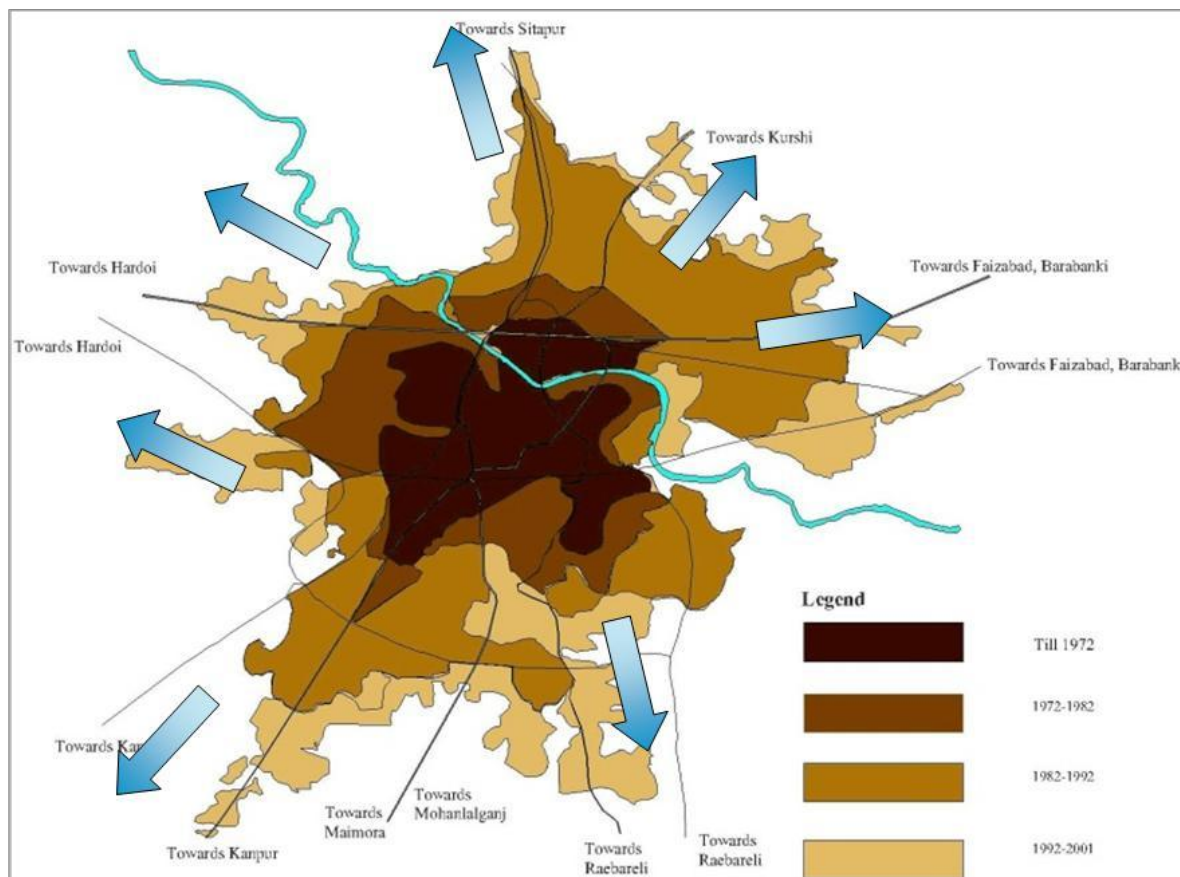


Figure 2-4: Growth of Lucknow City

2.5. Land Use Distribution

The municipal area was 92 Sq Km in 1987 and increased to 163 Sq Km in 2005. The Lucknow Master Plan prepared during 2004-05 for the year 2021 covers an area of 980 Sq Km. Residential use has grown dramatically in comparison to all other uses, although there has also been notable growth in commercial, industrial and public service land use. The percentage of area under traffic and transportation use has decreased from 10.38% in 1987 to 7.62% in 2004-05. However, a provision of 16% of total land use has been made under traffic and transportation in Lucknow Master Plan 2021 (**Figure 2-5**). The master plan showing the land use and transportation network prepared for 2021 by LDA is shown in **Figure 2-6**.

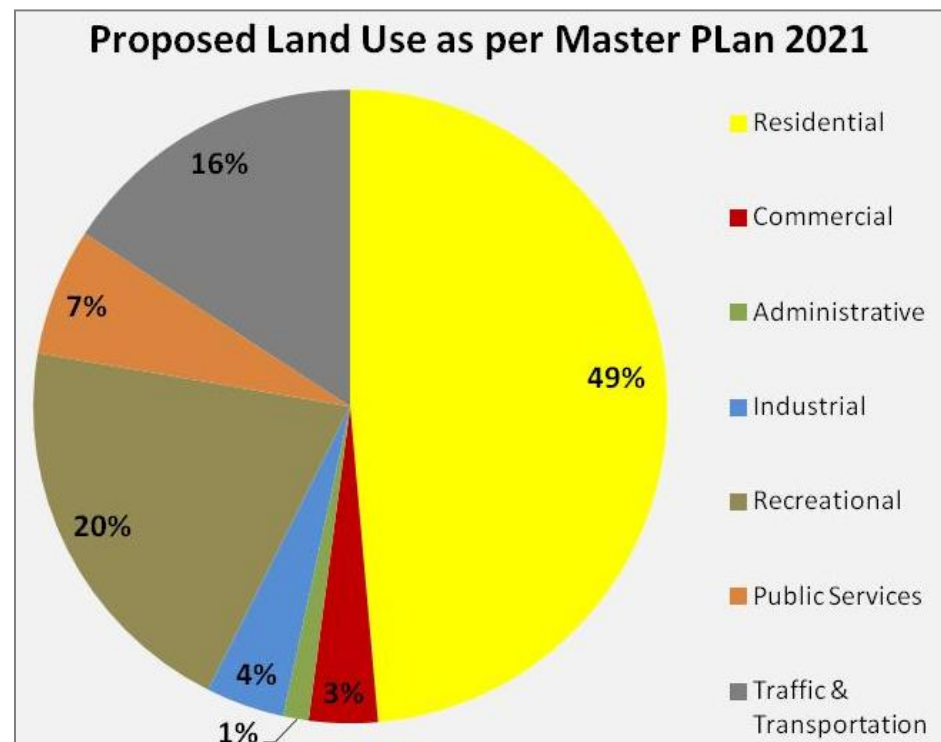


Figure 2-5: Land use distribution

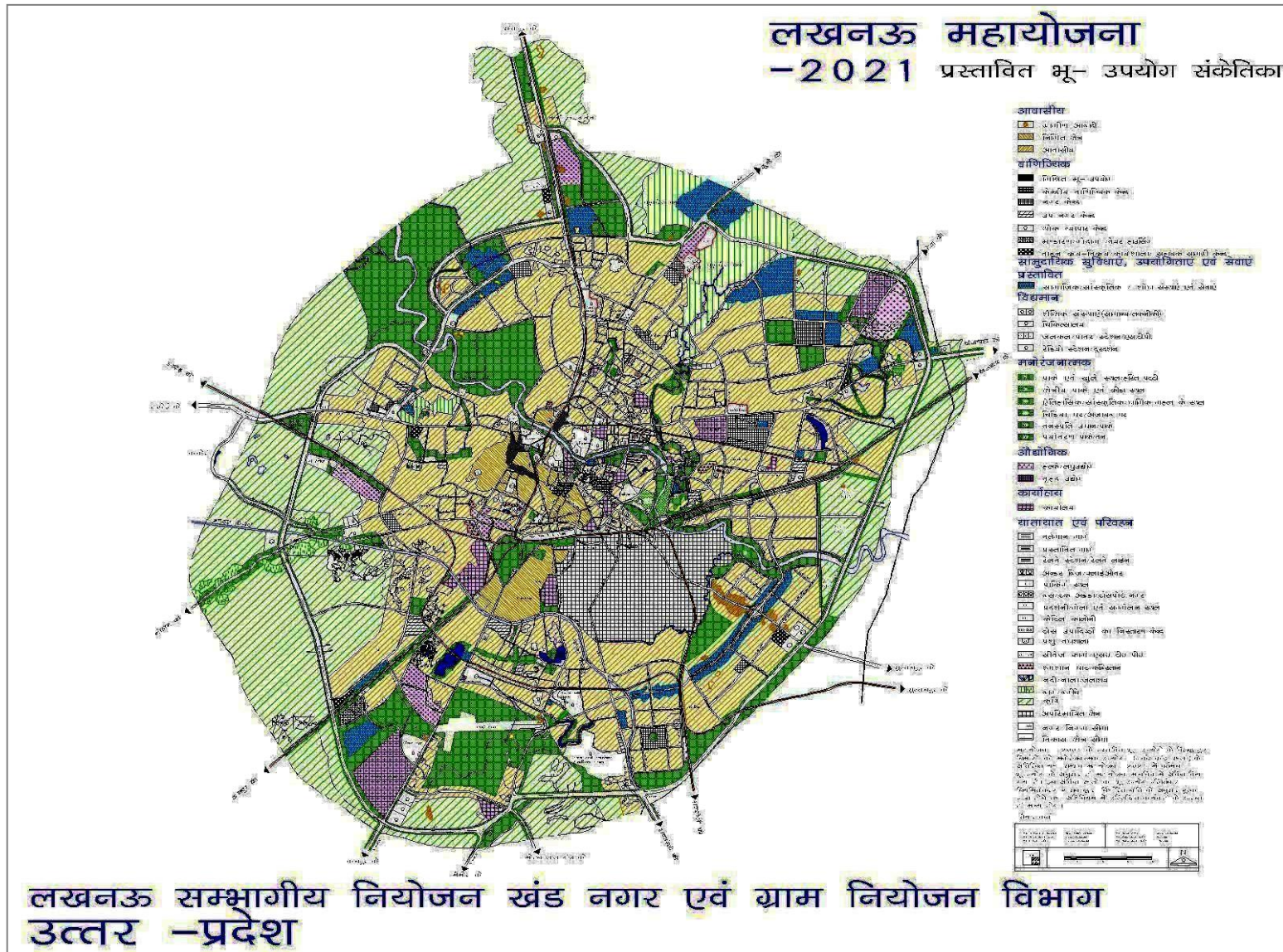


Figure 2-6: Lucknow Master Plan

2.6. Centers of Attraction

Lucknow city has the following distinct centers, which attract people and traffic. **Figure 2-7** shows some of the major traffic attraction zones of Lucknow city.

Heritage Centers or Tourist Centers: The main tourist attraction centers of Lucknow city are: Bara Imamabad, Chita Imamabad, Rum Darwaza –located on the Northwest of the Bara Imambara and Sikandar Bagh.

Commercial Centers: Lucknow has seen a radial growth but the city centre continues to remain the hub of commercial activities. Old City areas of Aminabad, Chowk, Hazratganj, Kapurthala-Bhootnath Chowk, Aminabad-Latouche Road (Gautam Buddha Marg) etc. are the main commercial areas of Lucknow city.

Industrial Centers – Although Lucknow is primarily an administrative city, it also has an industrial base, which includes industries relating to aeronautics, machine tools, distillery chemicals, furniture and chikan embroidery etc. Lucknow city is traditionally associated

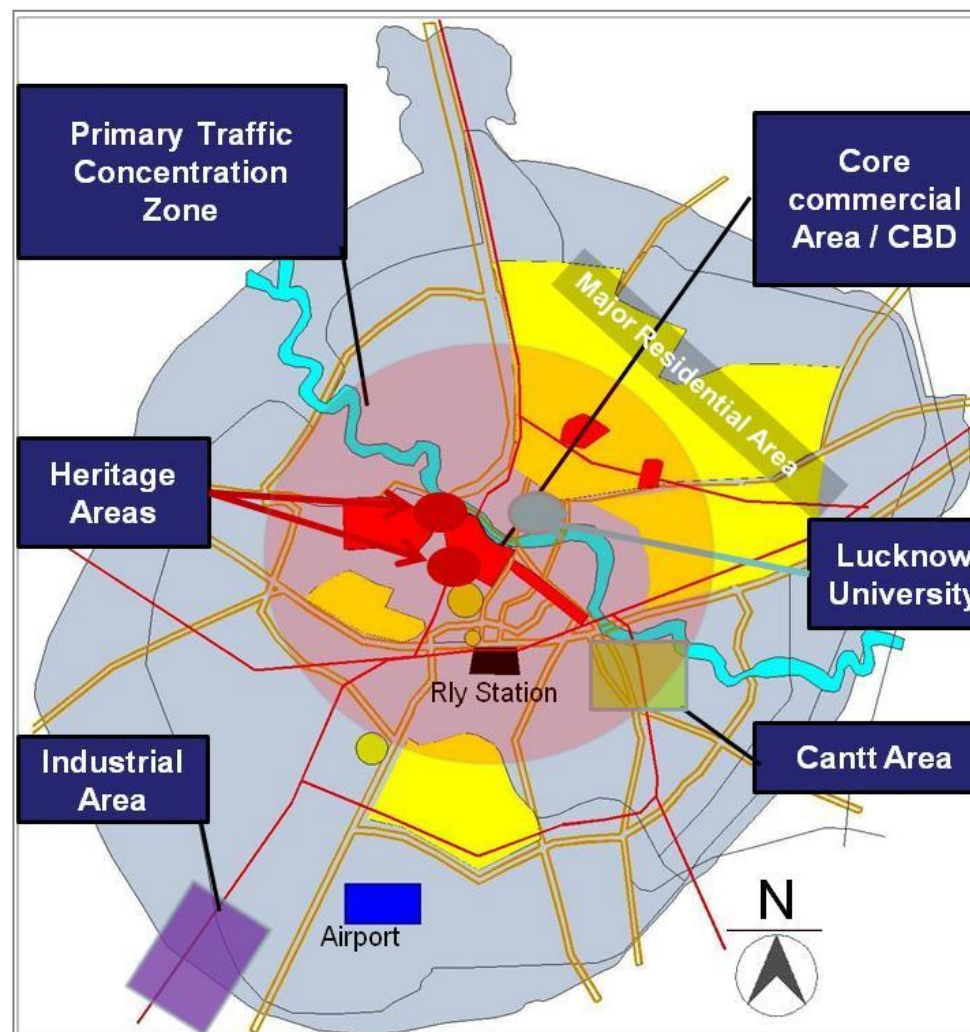


Figure 2-7: Traffic attraction zones

with chikan embroidery work on readymade garments, sarees, etc. with most units being small-scale and household-based and are located in the old city area.

Educational Centers: Lucknow is a hub of education and research and many premier institutions are located in and around the city. The Indian Institute of Management (IIM-Lucknow), Chhatrapati Shahuji Maharaj Medical University, University of Lucknow, Dr. Ram Manohar Lohia National Law University, Babasaheb Bhimrao Ambedkar University, Sanjay Gandhi Post Graduate Institute of Medical Sciences, etc. are some of the most prominent educational hubs in the city. Prominent institutes of Council of Scientific and Industrial Research like Central Drug Research Institute, Indian Toxicological Research Centre, National Botanical Research Institute, and Central Institute of Medicinal & Aromatic Maps are also located in the city.

Transport Terminals: Railway Stations, Airport and Bus & Truck Terminal – Lucknow is well connected by roadways, railways and airways. A large number of passengers/ commuters and goods across the state of Uttar Pradesh and the country use these modes daily to and from Lucknow, and thereby creates an impact on city's transport infrastructure. The main railway station is Lucknow Railway Station at Charbagh, which on an average handles 60,000 passengers daily. It is a major junction with links to all major cities of the state and country. Lucknow has further thirteen more railway stations, viz. Alamnagar, Malhaur, Utretia, Transport Nagar, Dilkusha, Gomti Nagar, Badshahnagar, Manak Nagar, Amausi, Aishbagh junction, Lucknow City, Daliganj and Mohibullapur. Other suburban stations include Bakshi Ka Talab and Kakori.

Chaudary Charan Singh Airport, located on the southern side of the city along Kanpur road, handles about 4000 passengers daily, out of which 17% of them have either origin or destination abroad. Similarly, the Bus Terminal located at Alambagh, run by UPSRTC, is another point of traffic generator.

Lucknow city has one Transport Nagar at Alambagh along Kanpur road that attracts approximately 4800 trucks daily and plays a significant role in terms of freight movement in Lucknow city.



3. Surveys and Data Analysis



3.1. Surveys And Data Analysis

In order to understand the existing traffic and transportation characteristics of the study area information were collected from secondary sources. Since data available from secondary sources was inadequate, primary surveys were required to fill the data gap. Accordingly, primary surveys were conducted; and, a combined data was analysed to extract meaningful and relevant inferences. List of information from secondary sources, type of primary surveys conducted and inferences are furnished in this chapter.

List of Information from secondary sources:

- Ward wise population and area
- City Development Plan
- Master Plan
- DPR for JnNURM bus funding
- Details of registered vehicles
- Road Accident data
- Notified parking locations
- Metro corridor alignment information
- Details of manpower of traffic police in Lucknow

-
- Details of signalized junctions

List of primary surveys:

- Road network inventory
- Speed & Delay Survey
- Household survey
- Outer cordon classified traffic volume count
- Outer cordon origin-destination survey
- Turning traffic volume count at intersection
- Classified traffic volume count at mid block
- Pedestrian count at intersection
- Pedestrian count at mid blocks
- Transport infrastructure user opinion survey
- Bus terminal OD interview survey
- Boarding alighting survey
- Railway terminal survey
- On-street parking survey
- Off street parking survey (12 Hrs.)
- Truck operator survey
- Taxi & IPT operator surveys

Details of primary surveys are furnished in Annexure (Section 1.3). The information collected from secondary source and primary surveys are used for assessment of existing traffic and transportation characteristics and deriving existing mobility indicators; and for development of transportation model, model validation and forecasting of future travel demand.

3.1.1. Vehicles

The growth trend of registered vehicles in Lucknow city shows an increase in personalised vehicles consisting two wheelers and four wheelers over the last five years. **Table 3-1** shows composition of vehicles registered in Lucknow city in the year 2010. **Figure 3-1** shows the growth of vehicle registration in Lucknow city. The increase in private vehicle registration indicates predominant use of personalised modes to fulfill city's mobility needs in the absence of properly organised public transport system in the city. The total number of vehicles registered in Lucknow city has increased from 2, 62,291 in 1994 to 9, 72,127 in 2008 to further 10,10,226 in 2009. The total registered vehicles (on-road) in Lucknow, as per the available data, were 11 lakh as in March 2010. The growth rate is very high for two wheelers and cars-jeep-van category, which are personalised modes and occupy significant proportion of road space.

Table 3-1: Details of registered vehicles

Type of Vehicles	No vehicles registered
Heavy Goods Vehicles	6,242
Light Goods Vehicles	7,657
3 wheelers Goods Vehicles	3,776
Buses	3,741
Taxi	7,399
Tempo	8,447
Auto Rickshaw	5,015
Two wheelers	8,25,088
Four wheelers	1,42,861



Figure 3-1: Growth of vehicle registration in Lucknow

3.1.2. Road Network

Total length of road network in Lucknow city is 620 kms, which includes 73 km of NH; 12.5 km of State Highways and the rest are of arterial and sub-arterial roads. Road inventory carried out and analysed in terms of parameters like type of road, Right of Way (RoW), carriageway, availability of footpath etc. that shows that the road network in the city has not been able to cope up with the growing demand for mobility of the city. The network is not developed enough to cater to the multimodal trip behaviour of the city populace and the ever-increasing trips with the rise in population and growth of vehicle registration. The

survey undertaken revealed that 37% of road network in the study area have Right of Way (RoW) between 20 to 30 meters, 32% of road network has RoW of 10 to 20 meters, and 1% of the road network has RoW above 50 meters (Refer to **Figure 3-2**). The average Carriageway width is 14 meters (Refer to **Figure 3-2**). Thirty percent of road network have abutting land use as mixed land-use. Seventy percent of road network do not have proper signages.

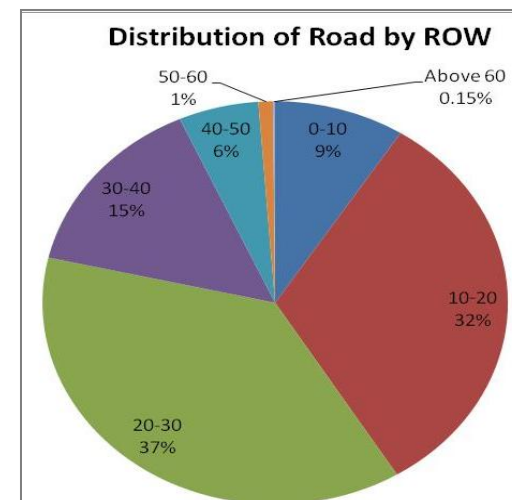


Figure 3-2: Distribution of road by RoW

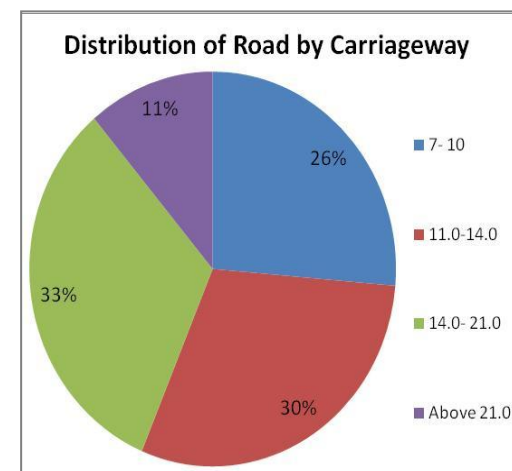


Figure 3-3: Distribution of road by carriageway

3.1.3. Speed Profile

Average speed observed in the city is only 15 kmph, whereas, the average speed in old areas such as Aminabad, Chowk, Hazratganj has been found to be 6 to 9 kmph during peak hours. The low speed profile is due to the following reasons:

- Heterogeneous traffic, mixing of slow moving vehicles with fast moving vehicles
- Pedestrian movement on the carriageway due to non-availability of footpath
- Encroachment on the carriageway by the street-hawkers
- Reduction in actual carriageway width due to unauthorised on street parking
- Poor road geometrics

3.1.4. Traffic Movement Characteristics

Figure 3-5 shows the locations of External Cordon Points where the traffic volume survey was conducted to assess the total magnitude of the external traffic. It is assessed that the total daily traffic volume in both directions on all points is 2,29,793 PCU. It is observed that out of the 7 external points the NH-25 (Kanpur Road) contributes 23% of the total and the rest being in the range of 10% to 15%. The share of traffic volume on each entry is shown in the form of chart in **Figure3-4**.

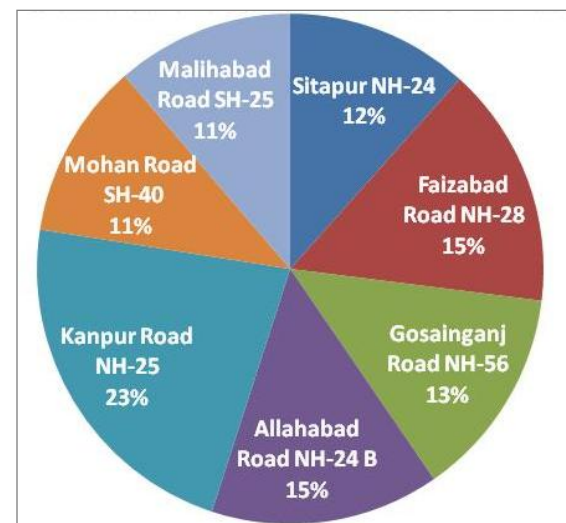


Figure 3-4: Share of Traffic volume at Outer Cordon Points

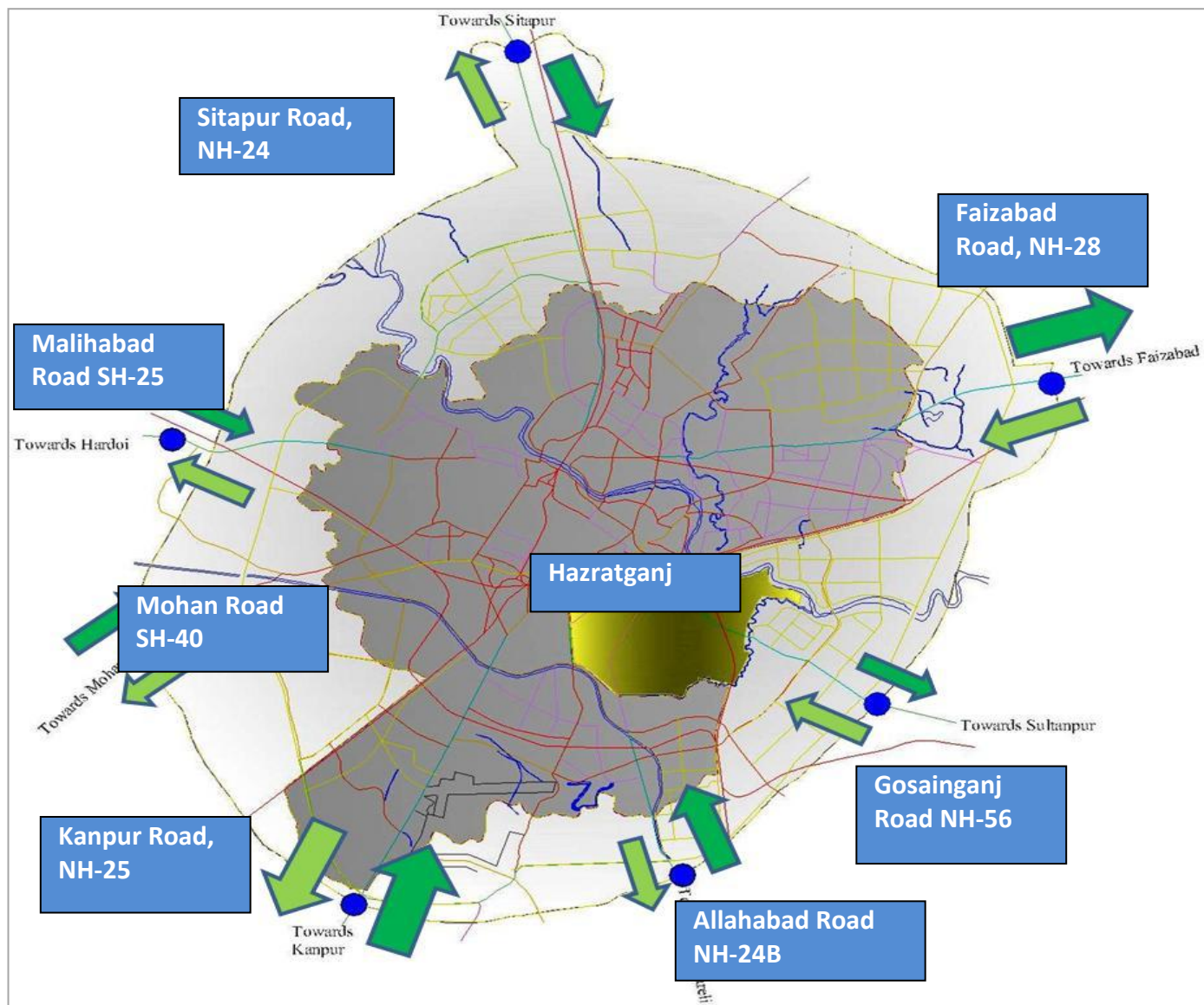


Figure 3-5: Location of External Cordon Points

3.1.5. City Traffic

Hazratganj, the main central business district of Lucknow, Parivartan Chauraha and Polytechnic Chauraha are the main traffic concentration zones in Lucknow City. It can be seen from **Figure 3-6** that the peak hour volume of traffic at most of the junctions is more than 6000; and the volume of traffic at the Polytechnic Chauraha and Hazratganj Chauraha is about 15000 and 14000 respectively.

The areas like Hazratganj, Charbagh, Polytechnic Chauraha, Gole Market, Kapoorthala Chauraha, IT Chauraha and old city area of Lucknow remain congested throughout the day (shown in **Figure 3-7**). Referring to **Table 3-2**, the values of volume by capacity (V/C) ratio of some of the highly congested roads of Lucknow city shows, majority of the roads have v/c ratio greater than one (1), even in the base year. Ideally for C level of service (urban roads), the desired value of v/c ratio is 1. The value of v/c ratio more than 1 indicates need for improvement / management measures. **Table 3-2** is clearly indicating the deteriorated quality of service in Lucknow.

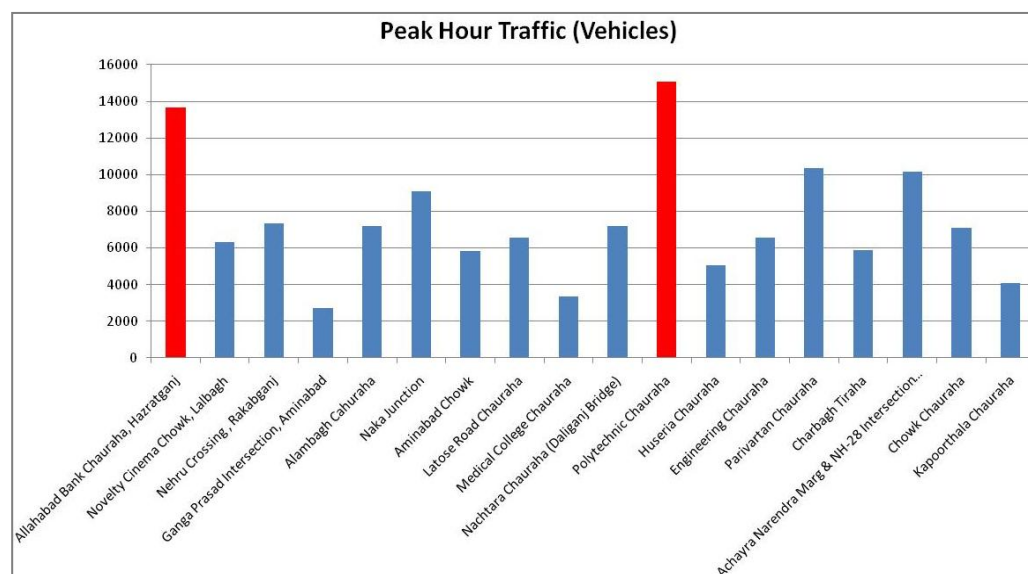


Figure 3-6: Peak hour traffic volume at selected intersections in Lucknow

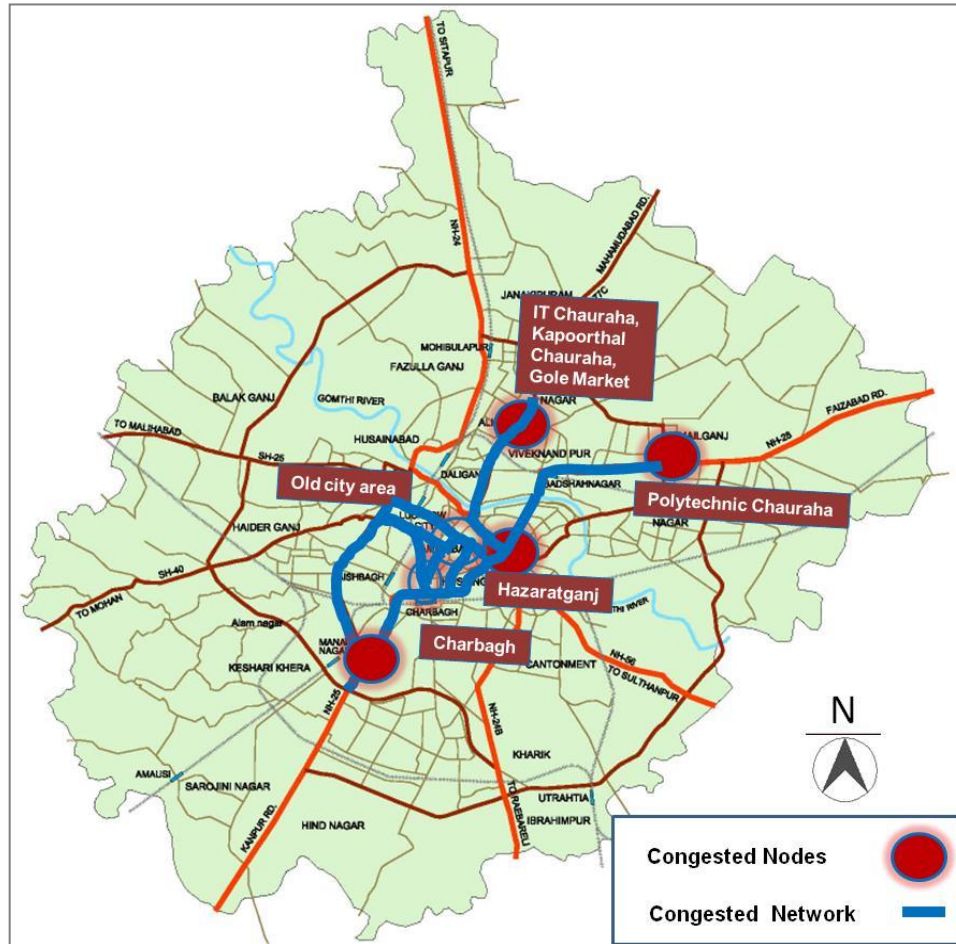


Figure 3-7: Congested nodes and networks

Table 3-2: V/C ratio of some of the congested roads of Lucknow city

Sl. No	Name of the Road	V/C Ratio (base year)
1	Nandan Mahal Road	1.1
2	Tulsidas Marg	0.86
3	Talkatora Road	1.18
4	Gangaprasad Road	0.85
5	M.G.Road	1.13
6	Motilal Nehru Road	0.87
7	Ashok Marg	1.41
8	Faziabad Road	0.98
9	Kanpur Road	1.7
10	Gautam Buddha Road	1.12

3.1.6. Parking

Parking is a major problem in the city due to insufficient off-street parking facility. Parking generally takes place along the roads in front of the commercial establishments, and public and semi-public establishments. On-street parking, which reduces the actual carriageway capacity of a road causes bottlenecks and hampers smooth movement of traffic. **Figure 3-8** shows parking demand and supply at some of the major locations of the city. Highest peak hour accumulation was observed at Hazratganj, Janpath

Market, Kaiserbagh and old city areas. The local traders and shop owners are primarily using these

areas for parking. It was observed from parking survey that 56% and 26% of the total parked vehicles are of two wheelers and four wheelers respectively; and, the remaining being 3 wheelers. Demand/Supply gap analysis indicates that there is an excess demand in case of on-street parking. Due to inadequate off street and organized on-street parking facility, and strict enforcement mechanism, vehicles are parked along the main roads. This results congestion and reduction of travel speed on the main road particularly during peak periods. Creation of off-street parking and organized on-street parking needs to be addressed at the demand assessment and plan preparation stages.

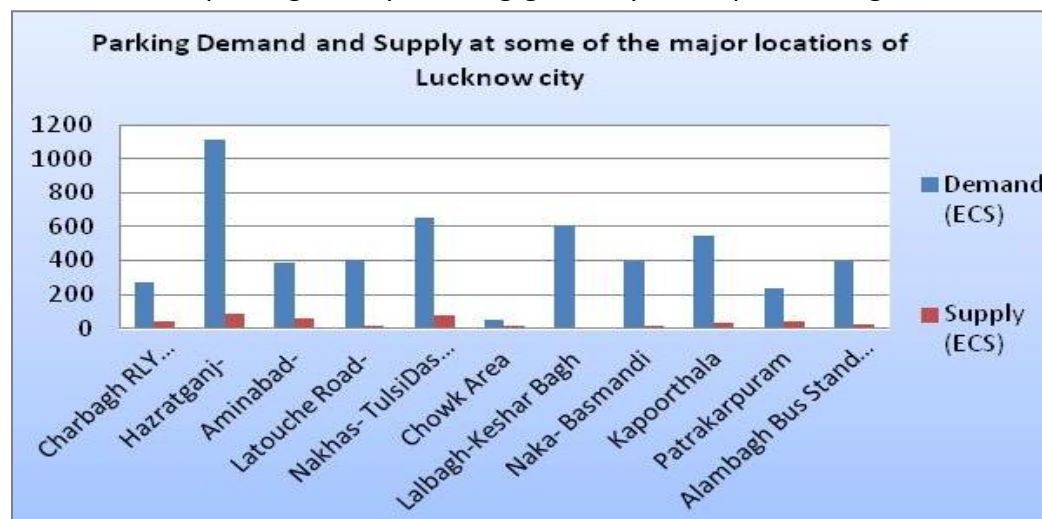


Figure 3-8: Parking demand and supply at some of the major locations of Lucknow city

3.1.7. Public Transport Operations

The Uttar Pradesh State Road Transport Corporation (UPSRTC) is responsible for operation of public bus transportation in the city. It operated bus service under the banner of Lucknow Mahanagar Parivahan Sewa with a fleet of 220 buses provided by Lucknow Nagar Nigam until 2008. Recently Ministry of Urban Development, Government of India, through JnNURM Scheme sanctioned 300 buses for Lucknow city. In view of above, UPSRTC returned the buses to Lucknow Nagar Nigam, and started the city bus service operation with the newly sanctioned JnNURM buses. At present, UPSRTC is plying 260 buses on 20 routes. The route map is shown in **figure 3-9**. It can be seen from **Table3-3** that the public transport share is only 4% in the base year. This is very low share and is a major issue of concern.

Table 3-3: Share of Public Transport in base year

Scenario	Private Vehicle Share (%)	IPT Share (%)	PT Share (%)
Base Year	80	16	4

3.1.8. Operation of Intermediate Public Transport (IPT)

IPT is another predominant mode of transport in Lucknow city. IPT in Lucknow consist of auto-rickshaw and 8-seater tempo. At present (as of 31 March 2010), 4,426 auto-rickshaws run in Lucknow city on area permit basis. Besides 2,984 no of 8 seater tempos ply on 47 designated routes. **Figure 3-10** shows the IPT routes in the study area.

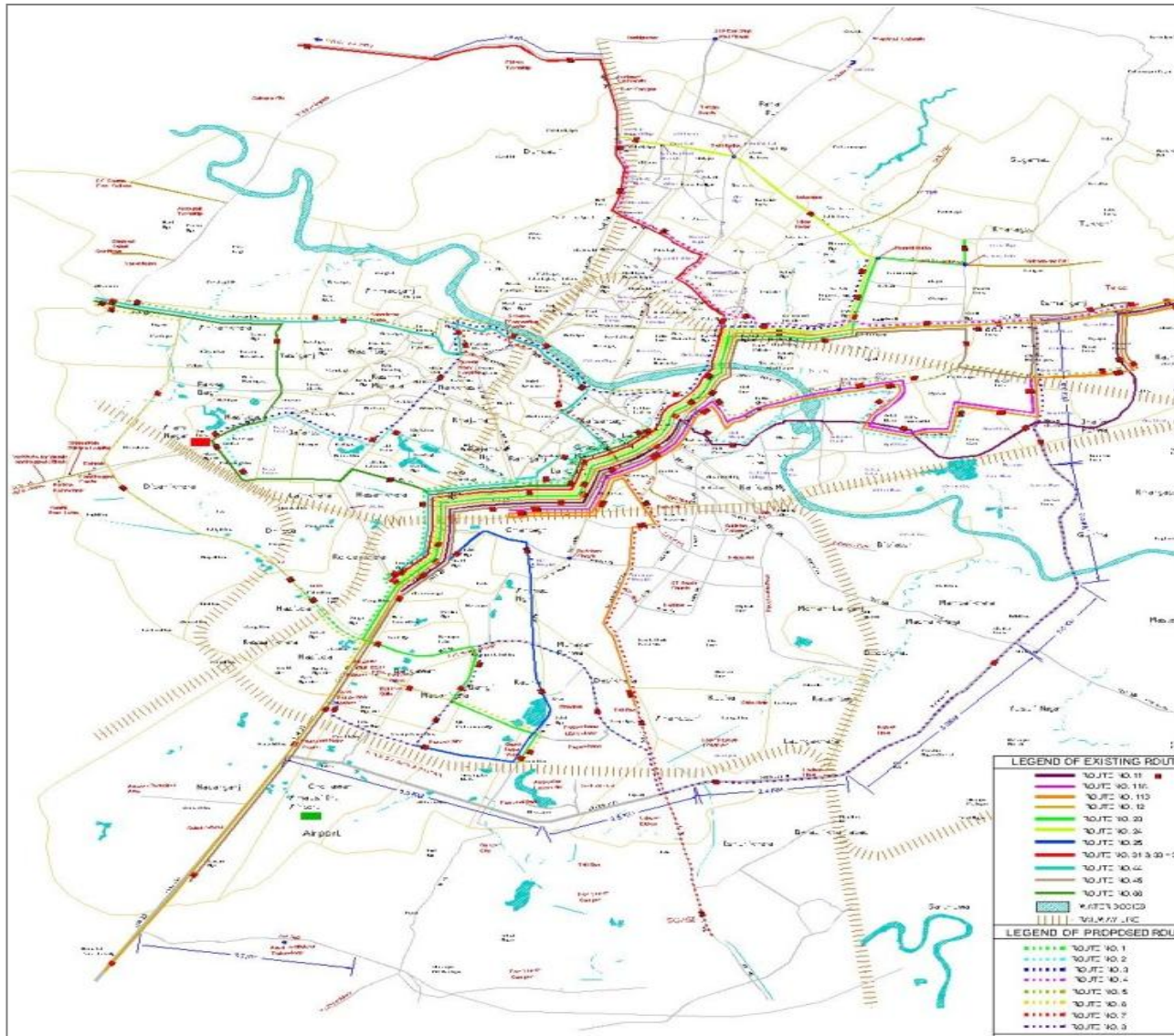


Figure 3-9: Bus route Map

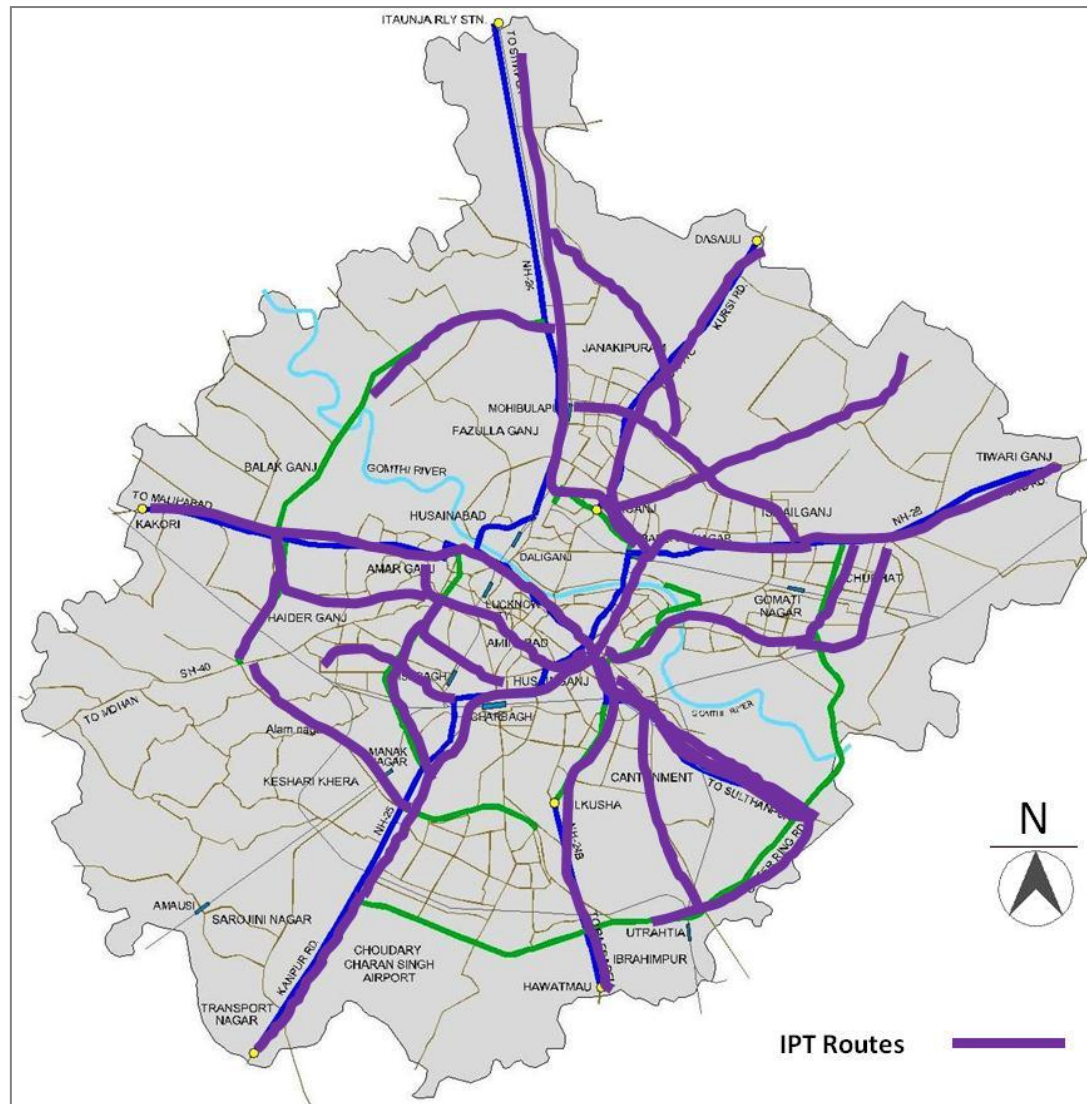


Figure 3-10: IPT route map

3.1.9. Pedestrian Facilities

From household survey it was found that 17% of the trips made are walk-trips. Thus, pedestrians form a significant portion of the mobility pattern on the city. Although walk-trips constitute an important share in the total trips, however, only 44% of road network has footpaths on both the sides, and 3% of road network has footpath only on one side of the road (refer **Figure 3-11**). Further, most of the footpath are discontinuous and non-usable in many stretches due to the enforcement by hawkers and traders, existence of electric poles, and opened manholes on the middle of the footpath. Pedestrian crossing facility is also grossly inadequate. Facilities such as pedestrian signals, zebra crossings, grade separated crossing etc need to be addressed while preparing junction improvement plans to enhance the safety of pedestrian movements.

3.1.10. Freight Movement

It is observed from cordon survey that nearly 40,000 trucks enter/exit through external cordon points daily.

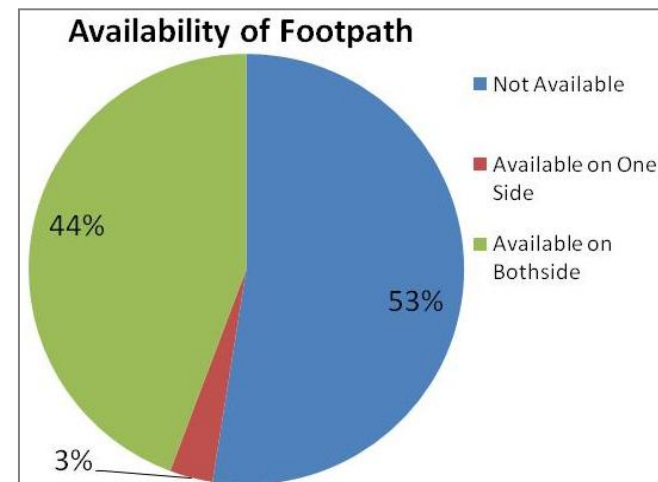


Figure 3-11: Availability of pedestrian facilities in Lucknow



Figure 3-12 Movement of goods vehicle in Lucknow

Heavy Goods Vehicles

Most of the goods vehicle movement takes place on NH 25 towards Kanpur (Refer to **Figure 3-12**). Movement of heavy vehicles within the city is restricted from 7 AM to 9 PM on some of the roads. Most of the heavy vehicles park their vehicles at Transport Nagar along Kanpur road, which is a major loading/offloading centre.

Medium and Light Goods Vehicles

Movement of medium and light goods vehicles within the city generally takes place on tempos, small trucks, animal carts and handcarts within the city almost throughout the day. Due to location of the CBD area in the city centre, most of the lighter good vehicles traverse through this area causing severe traffic congestion. Goods distributed within the city takes place during daytime by hand carts, cycle cart, buffalo carts etc.

3.2. Challenges Ahead

3.2.1. Landuse

With the radial growth of the city, the Cantonment has gradually been engulfed and is today more centrally located. A Ring Road system is under development to connect the new development areas in the southern, southeastern, and western side. The Lucknow Development Authority (LDA) has planned to develop the intervening open spaces to take advantage of the Ring Road. New housing colonies are already under construction in the southeastern and eastern parts of the city. With the entry of private developers, like in other metropolis of the country, Lucknow is witnessing a real estate boom. This additional development will necessarily require infrastructure that needs to be taken into account when planning investments in the future. The entire city has been dependent upon the core area, which has grown to become the lone Central Business District for Lucknow city. This has lead to a large number of trips attracted from all corners of the city towards the central core.

3.2.2. Regional Connectivity

Lucknow city has good network of highways that connects areas radiating outwards from the city; however, absence of complete and proper circular ring road leads to an inconsistent urban growth in the fringe areas of the city. Kanpur city, the main industrial hub of the state, is located within the secondary influence zone of Lucknow city, and thereby warrants an improved regional connectivity for both goods and passenger movement. The proposed Lucknow- Unnao- Kanpur industrial belt will further create additional demand for better regional linkage. Similarly, the proposed 8-lane expressway from Delhi to Varanasi (**Figure 3-13**) will also have connecting link to Lucknow city for better regional connectivity.

3.2.3. Congestion

Unprecedented growth in vehicles on the roads and a stagnant length of road network are characteristic reasons for increasing congestion. However, components like heavy mixing of slow and fast moving traffic, presence of at-grade railway crossings, parking alongside roads, etc are specific features that also cause congestion in Lucknow city.



Figure 3-13: Proposed 8-lane expressway

3.2.4. Changing Expectations

Like in many other developing cities around the world, with rising affluence, the needs and expectations of the people have increased. This has compelled to re-examine the current policies to cater to the higher expectations of the people and those who care for their living environment, as well as the less privileged and lower income group.

3.2.5. Land use under Transportation

It is expected that the travel demand would go up constantly in future with 8% of the land available in the city already allocated for transportation and in the context of ever increasing population and vehicle registration, there is need to develop new transportation system. Master Plan 2021 suggested that there should be an increase in the share of land use allocated for transportation from existing 8% to 16% by 2021. However, simply addition of land for roads will not solve the transport problems in a sustainable way in the long- run, because the demand for road space is insatiable. Hence, the projected increase in travel demand should be met by public transport rather than by personalised modes.

3.2.6. Declining Public Transport Mode Share

Currently the share of public transport is only 4%, resulting in high growth of two wheelers and IPT modes. The trend will have significant implications on the environment in terms of noise, air pollution and congestion. The challenge is to reverse this trend and ensure that our public transport system can cater to the significant increase in daily travel demand.

3.2.7. Lack of Traffic Enforcement

The main arterials of the city such MG Road, Station Road, Kanpur Road, Vidhan Sabha Marg, Ashok Marg etc. are experiencing encroachment by hawkers on the footpaths and on the carriageway by private vehicle users in the form of on-street parking

thus reducing the capacity of the road. Due to absence of proper enforcement mechanism, on-street parking takes places on most of the busy roads, resulting to congestion. The heterogeneous nature of traffic further reduces the speed of the traffic, leading to congestion.

3.2.8. NMT

The city witnesses significant number of walk trips, and the composition of traffic reveals large number of slow moving vehicles (cycle rickshaws, animal carts, etc.) moving on the road along with motorised vehicles. Altogether, the share of Non Motorised Transport accounts for 41% of the total trips (Walk-17%, Bicycle-16%, Cycle Rickshaw-8%). Despite this fact, no specific attention has been given to the safety of all the NMT users. Only 44% of the roads have footpath, remaining 56% of the roads spreading all over other parts of the city do not have footpaths. Absence of any pedestrian signals and suitable roadmarkings at intersections challenge the safety of pedestrians (refer to **Figure 3-14**). Additionally, use of animal carts for transporting goods in some parts of the city leads to added congestion on the road and challenges safety issues.



Figure 3-14: Vulnerable pedestrian at Polytechnic Chauraha, Hawalsia crossing and at Naka Hindola in Lucknow

3.2.9. Freight System

Lucknow being the state capital and administrative hub, is a service industry-based city. Developing Lucknow-Unnao-Kanpur Industrial Belt towards Kanpur road will have significant impact on goods movement in Lucknow city. Existing location of Transport Nagar along Kanpur road can support such development only to some extent. The city is in dire need of a freight management strategy as goods mobility is a very important aspect along with mobility for people.

3.2.10. Traffic Management & Control Mechanism

As the city is growing, the constraints faced by the transportation network are becoming more acute which has resulted in congestion, poor average speed, increased cases of accidents etc. Most of the traffic signals in the city are non-functional. Intersections (or junction) are poorly designed; many of the intersections do not have adequate and proper road geometrics. Another peculiarity of Lucknow city is that the activities, such as retail sales, boarding and alighting of passengers, take place at the intersection control area, which reduces the traffic handling capacity of the intersection significantly. Besides, the bus stops are also located near to the junction, which further reduces the capacity of an intersection. In Lucknow, there are about 395 intersections of varied configuration – from Three-Arm Intersection to Five-Arm to Rotary.

Out of these 395 intersections, 101 intersections are controlled either manually or through signalization or by both. In total, 32 intersections in Lucknow have been signalized; only 6 were fully functional until December 2010. The number of traffic police personnels for managing the city traffic is declining every year (refer **Table 3-4**) whereas each year, on an average, 40,000 to 60,000 vehicles are being added to the city's road network. As per study carried out by Traffic Department, the total manpower requirement in the year 2007 for managing traffic situation in Lucknow was 2,712 personnel, which include 5 Control Officers, 26 Traffic Inspectors, 76 Traffic Sub Inspectors, 236 Head Constables and 2,369 Constables. At present, (in

2010), there are 445 traffic personals for managing traffic in Lucknow. Thus, there is a need for additional requirement of work force for managing the city traffic along with installation of traffic signals and application of Intelligent Transport System (ITS).

Table 3-4 Year wise Traffic Police Personnel in Lucknow

Man Power for managing Traffic in Lucknow City					
Year	Traffic Inspector	Traffic Sub-Inspector	Head Constable	Constable	Total
2001	4	36	120	722	882
2002	4	36	72	624	736
2003	4	30	60	600	694
2010 (Actual)	3	29	83	330	445

Source: Traffic Police, Lucknow

3.2.11. Parking Issues

Lack of adequate parking space is a major issue in Lucknow city. On-street parking which reduces the designed capacity of a road is predominantly occurring in most of the roads in Lucknow due to lack of enforcement and inadequacy of off-street parking. High parking demand has been observed in areas such as Aminabad, Chowk, Hazratganj, Charbagh, Kapoorthala, Patrakarpuram etc. The roads leading to these areas remain congested throughout the day. Short-duration on- street parking during peak hours in front of a number of educational institute such as St. Francis School along Shah Najaf Road etc. also hampers smooth movement of traffic. Unorganised parking outside commercial places and unorganised parking on road is a common phenomenon in Lucknow city.

3.3.Existing Level of Service

The CMP for Lucknow has computed the existing level of service of overall traffic and transportation scenario based on a number of parameters. The **Table 3-5** shows the existing Level of Service (LOS). LOS is a measure of quality of service in terms of ranking – the higher the value of LOS, the lower is the quality and vice versa. From the Table it is clear that other than pollution level and average travel speed in which Lucknow has scored 2 in overall LOS ranking, in all other parameters, the city’s overall ranking is either 3 or 4, meaning poor quality of service. The mobility plan focus attention in improving the level of service incorporating the policy interaction and selecting appropriate planning strategies.

Table 3-5: Existing Level of Service (LOS)

Overall LOS		
Sl.No	Indicators	LOS - Existing
A	Overall Public Transport facilities City wide	3
B	Overall Pedestrian Infrastructure Facilities	3
C	Overall NMT Facilities	4
D	Level of usage of ITS facilities	4
E	Travel Speed along major corridors	2
F	Availability of Parking Spaces	3
G	Road Safety	4
H	Pollution Levels	2
I	Integrated Land-use Transport Integration	4
J	Financial Sustainability of Public transport	3

4. Travel Demand Assessment



4.1. Transport Model

To appreciate and understand the base-year travel demand for the study area and to estimate the travel demand for the horizon year, an urban transport model was developed by using CUBE- 5. Based on the travel demand model, various transport demand situation scenarios along with proposed interventions plan recommendations have been formulated. The process of developing the transport model is discussed in the subsequent sections.

4.2. Model Structure

The model is based on a conventional Four-Stage Transport Model approach (**Figure 4-1**). It includes:

- Trip Generation – calculating the number of origins and destinations for each zone
- Trip Distribution – attaching the origins and destinations for complete trips
- Mode Choice – determining the mode for each trip (Two wheeler, Car, Auto, Public Transport)
- Assignment – assigning passengers to their respective highway and transit networks

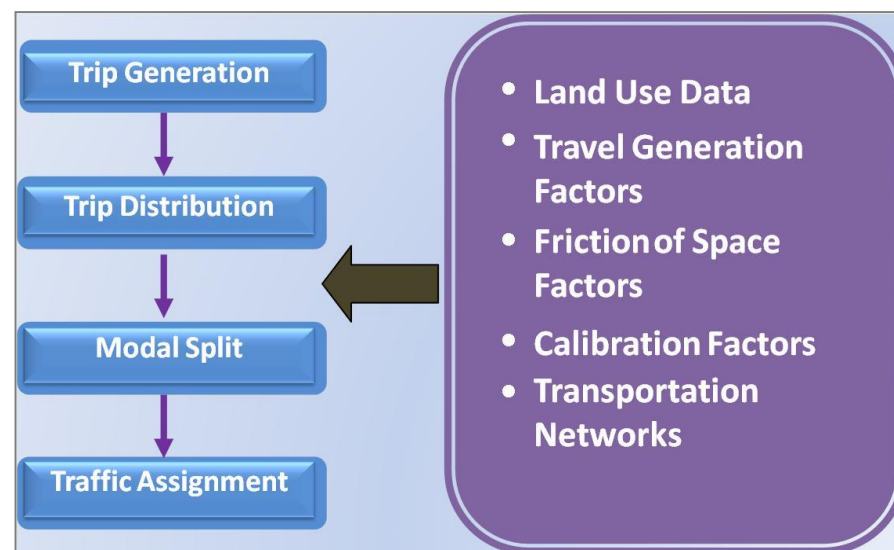


Figure 4-1: Four-stage transport model structure

4.3. Study Area Zoning

The study area has been divided into smaller areas called Traffic Analysis Zone (TAZ) for analysis. As per the guidelines of zoning, the study area has been divided into 127 internal zones and 7 external zones. **Figure 4-2** shows the details of TAZ with zone number. The broad breakup of TAZ is given below:

- Lucknow Municipal Limit: 110 (Municipal Wards)
- Grouped Internal Zones: 16 (Clubbing 98 Villages)
- Cantonment : 1
- External Zones: 7
- Internal Zones: 127
- Total No. of Zones: 134

The zonal parameters such as population, employment are given in Annexure 3. The required zonal parameters (attributes) are attached to the TAZ map for analysis.



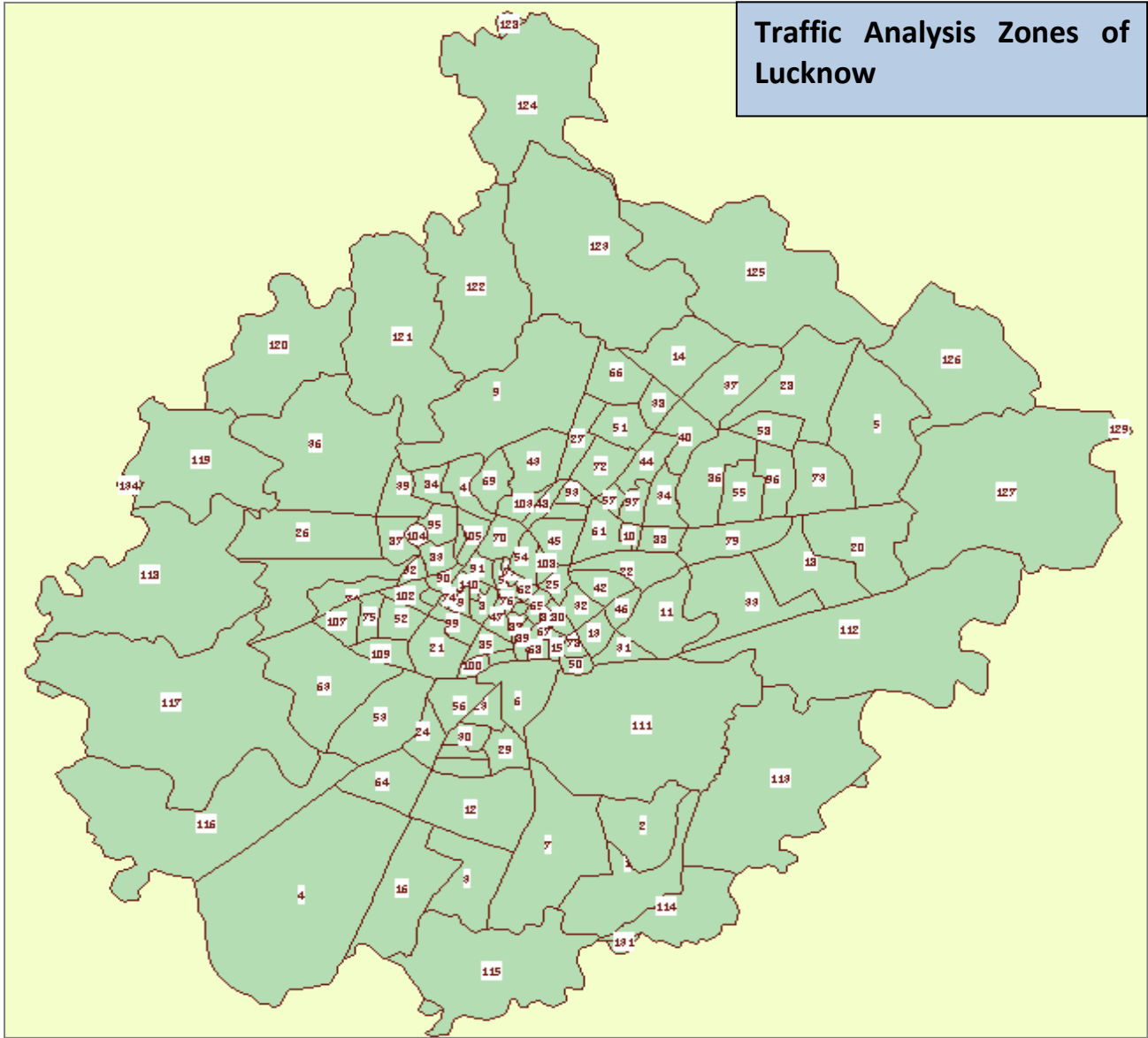


Figure 4-2: Study area traffic analysis zones

4.4. Network Development

Transport network developed for the model comprises of two components:

Highway Network: The coded highway network for the study area represents the nodes (intersections) and links connecting nodes. Connectivity between the network and zones is provided through centroid connectors. Based on the network inventory, each link has been assigned attributes such as: number of lanes; divided or undivided carriageway; one way/two way; encroachments; availability of footpaths, etc. **Figure 4-3** shows the Base Year Road Network of Study Area.

Transit Network: The transit network shows the transport nodes and stops. The transit network is attached with

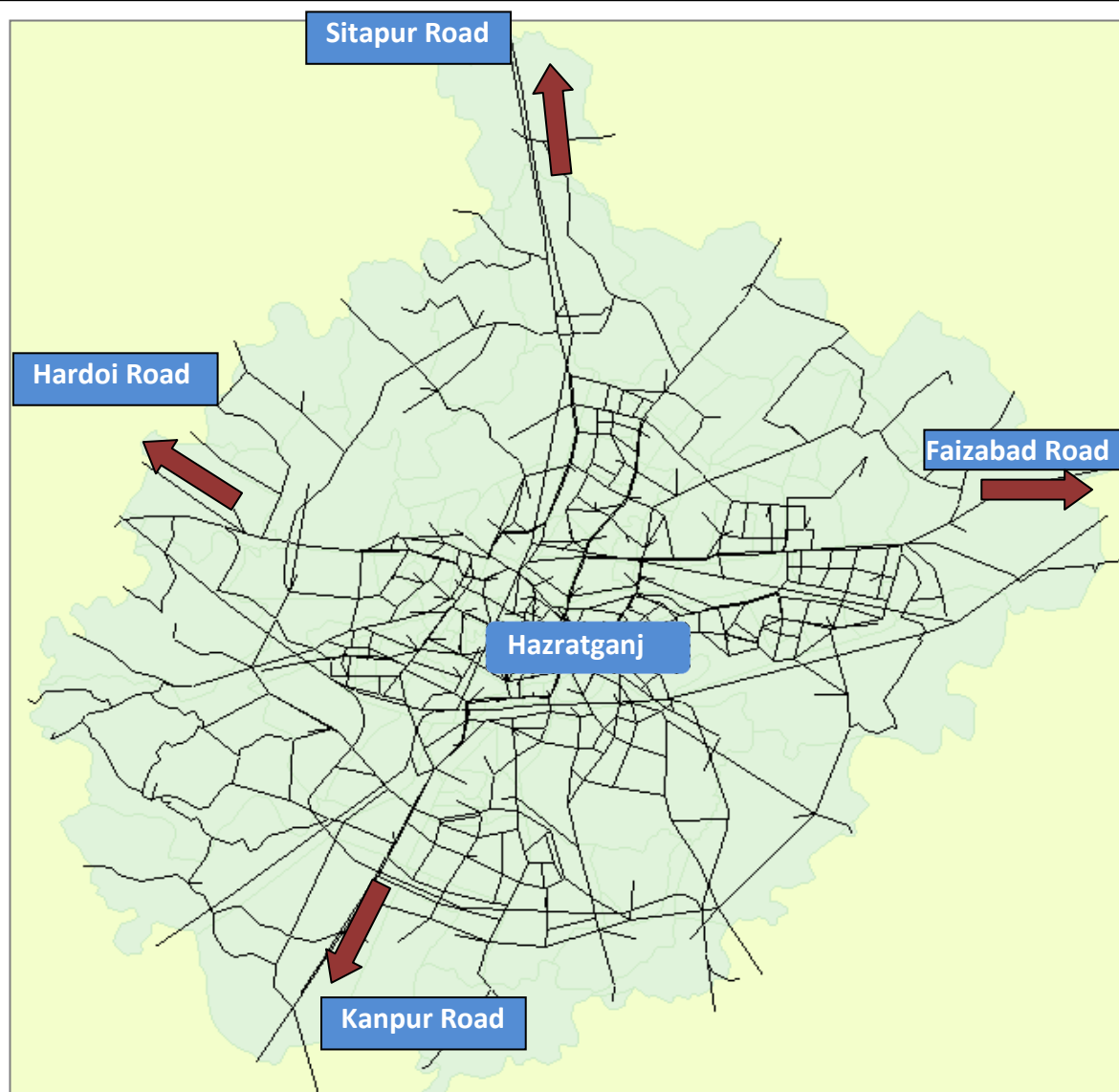


Figure 4-3: Base year road network

transit route information such as route length, origin- destination, headways, capacity etc. Similarly the shared auto transport system network and its attributes were dovetailed with the transit network. **Figure 4-4** shows the base year Transit Network.

4.5. Trip Generation

The objective of a trip generation model is to forecast the number of person-trips that will begin from or end in each TAZ. In the present study, population and employment of each zone are used to predict the 'Production' and 'Attraction' trips from/to each zone.

4.6. Trip Distribution and Modal Split

Trip Distribution and Modal Split phase were carried out jointly using a combined mode choice cum doubly constrained gravity model of the form. Details are given in Annexure 2.

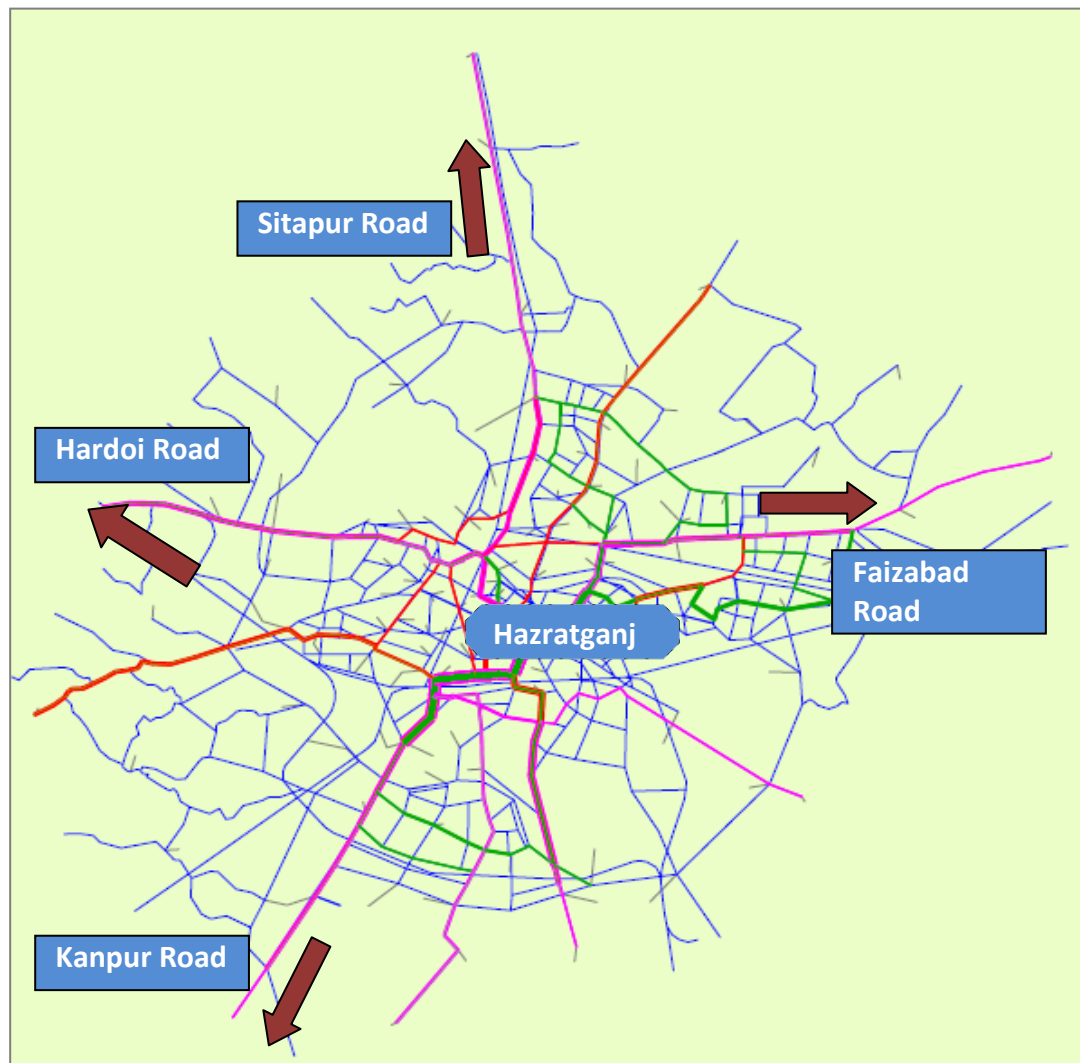


Figure 4-4: Base year transit network

4.7. Trip Assignment

Traffic assignment is the stage in the transport planning process wherein the trip interchanges are allocated to different parts of the network forming the transport system.

- **Highway Assignment** – User-equilibrium multi-modal assignment procedure based on generalised cost was used for assignment highway traffic.
- **Transit Assignment** – Stochastic user equilibrium method, a multi-path assignment considering number of transfers, non-transit and in-vehicle cost, boarding and transfer penalties, and fares, etc. has been performed for Transit Assignment.

4.8. Base Year Travel (2010) Pattern

The base year trip matrices have been developed using the data extracted from household surveys and roadside interview survey. The trip matrices thus derived were then compared with the passenger trip-rates for the study area. The traffic characteristics of the study area is identified in terms of average network speed, average trip length volume to capacity ratio, vehicle distance travelled, total passenger hours, etc. The results of the travel-demand-estimation for base year and trip-rate-analysis is summarised in the **Table 4-1**.

Table 4-1: Base Year Peak Hour Travel Demand in Lucknow

Sl. No	Mode	Trips	Percentage
1	TW Passengers	1,61,071	72%
2	Car Passengers	17,897	8%
3	Auto Passengers	35,794	16%
4	Public Transit Passengers*	8,948	4%

4.9. Model Validation

Base year mode wise matrices were assigned to the network. The assigned volume on the network was compared with the observed volume on the screen line. Since the variation was low with $\pm 15\%$, the model parameters are acceptable for further applications.

4.10. Travel Demand Forecasting

The Travel Demand Model developed in this study is used to estimate or project the travel demand for the horizon year in 2016, 2021 and 2031 under respective land-use and transport network scenarios. The projected population and employment values are shown in **Table 4-2**. These values of population and employment were further used to estimate trips in the corresponding horizon years. Based on the estimated trips, five different scenarios of travel demand pattern have been assessed for the study area. **Table 4-3** shows the various travel demand share of Lucknow city for different scenarios.

Table 4-2: Travel in Lucknow

SL. No	Scenario	Private Vehicle Share (%)	IPT Share (%)	PT Share (%)
1	Base Year	80	16	4
2	Do Nothing Scenario-2031	85	12	3
3	Network Improvements-2031	88	9	3
4	City Bus Service augmentation and IPT route rationalization-2031	70	9	21
5	Network Improvements along with promotion and development of public transport including development of MRTS-2031	64	6	30

Table 4-3: Estimated Population and Employment in Lucknow

Projected Population/ Employment	2011	2016	2021	2031
Population	3456613	3985224	4513835	5860939
Employment	967017	1192048	1414784	2084734

Based on travel demand model projection, in Do Nothing Scenario, the value of V/C ratio shows that most of the major roads in Lucknow city will be below the standard level of service by 2031 (**Table 4-4**).

Table 4-4: V/C ratio of some of the congested roads of Lucknow city

Sl. No	Name of the Road	V/C Ratio (base year)	V/C Ratio 2031 (Do Nothing)
1	Nandan Mahal Road	1.1	2.97
2	Tulsidas Marg	0.86	1.53
3	Talkatora Road	1.18	3.04
4	Gangaprasad Road	0.85	1.69
5	M.G.Road	1.13	1.97
6	Motilal Nehru Road	0.87	1.22
7	Ashok Marg	1.41	1.97
8	Faziabad Road	0.98	1.45
9	Kanpur Road	1.7	3.53
10	Gautam Buddha Road	1.12	1.67

In the subsequent chapters, the travel demand models are used and analysis was carried out dovetailing various policy interventions and strategies to arrive at the optimum solution for sustainable transportation system.

5. Strategic Approach to Mobility Plan



5.1. Review of Past Studies

Several studies on traffic and transportation have been undertaken for Lucknow. It is worthwhile to understand the previous recommendations before preparation of CMP. Salient features of certain relevant studies are briefly given.

5.2. Comprehensive Traffic and Transportation Studies for Lucknow

National Transportation Planning and & Research Center (NATPAC) carried out Comprehensive Traffic and Transportation Studies for Lucknow in the year 1994.

The study suggested:

1. Introduction of Mass Transportation System (Bus or LRT)
2. Decentralization of work and commercial centers and development of residential space in the periphery of the city
3. Junction improvement plans

5.3. Transport Plan for Lucknow city

Central Institute of Road Transport (CIRT) prepared Transport Plan for Lucknow city based on secondary data to identify the problems of transport and circulation and to suggest feasible solutions.

The study suggested:

1. Development of Roads



-
2. Management Measures
 3. Junction Improvements

5.4. Physical and Financial Plan for Lucknow Metropolis -2015

Rail India Technical Economic Services Ltd (RITES) prepared Physical and Financial Plan for Lucknow Metropolis -2015 in the year 1993, which suggested:

1. Road Development programmes.
2. Traffic Management Plan including parking measures, bus system, improvement measures for passenger and goods terminals
3. Assessed the need for LRT system.

5.5. Traffic Management Plan for central Areas of Lucknow

Traffic Management Plan for central Areas of Lucknow city was prepared by Rail India Technical Economic Services Ltd (RITES) in the year 1999, which recommended:

1. Alternative circulation plan for central areas and old city areas
2. Parking plans for central areas

5.6. Lucknow City Development Plan

Feedback Ventures prepared Lucknow City Development Plan in the year 2006 following is the recommendation as regard to Transportation:

1. Multi-level parking lots in certain commercial areas through PPP model

2. Extension of the city bus transportation to various new identified residential, commercial and institutional areas in the city.
3. Promoting CNG use for public transportation vehicles.
4. Proposal to achieve 50% PT share in modal split.

5.7.Detailed Project Report for Funding of Buses under JNNURM – Lucknow

Detailed Project Report for Funding of Buses under JNNURM – Lucknow was prepared by Urban Mass Transit Company Limited (UMTC). Salient features are given below:

1. City bus service on 20 routes connecting important parts of the city
2. Infrastructural facilities such as Bus terminal
3. Intelligent Transport System (ITS) such as Automatic Vehicle Location (AVL) system for fleet management, security and communicating online arrival and departure times of different buses, Passenger Information System (PIS) for the convenient and comfort of passengers
4. Urban Transport Reform which included the following aspects:
 - Setting up of Unified Urban Transport Committee to coordinate the activities and functions of multiple departments/organizations involved in urban transport
 - Formation of Special Purpose Vehicle for city bus operation
 - Creation of Urban Transport Fund
 - Advertisement Policy
 - Parking Policy
 - Transit Oriented Development

-
- Regulatory Mechanism for periodic Revision of Fares
 - Traffic Information and Management Centre

5.8.Detailed Project Report for Lucknow Metro

Delhi Metro Rail Corporation prepared detailed Project Report for Lucknow Metro in the year 2009. This study has recommended two corridors. They are

1. North – South corridor connecting Amusai airport and Munshipulia with a total length of 23.7 km.
2. East- West corridor connecting Lucknow Railway Station Vasant Kunj with the length of 11.1 km.

5.9.Urban Rejuvenation Plan of Lucknow City

Urban Rejuvenation Plan for Lucknow City was prepared by Lucknow Development Authority in the year 2007, which covered the following aspects as a part of rejuvenation plan:

1. Transport
2. Water Supply
3. Sewerage
4. Power
5. Public Amenities
6. Hospitals and Health Facilities
7. River Front Development

In terms of transport rejuvenation, the Urban Rejuvenation Plan for Lucknow City has suggested number of improvement measures such as widening of road, junction improvement, development of new arterial road, creation of pedestrian infrastructure, provision of parking lots, development of signal free access control outer ring road etc.

5.10. Lucknow Master Plan 2021

Lucknow Master Plan for 2021 was prepared in 2006.

To address the chaotic traffic situation Lucknow Master Plan has suggested:

1. Shifting of Mandis, Motors Parts establishment from core areas of the city to outer areas
2. Shifting of Bus/ Truck terminals from congested core areas to outer areas
3. Reduction of traffic problem on Charbagh Railway station by properly developing railway stations at Utteria, Gomtinagar, Manak Nagar, Alamnagar and Dilkush
4. Creation of Bypass Road for through traffic
5. Creation Parking Space

5.11. Planning Strategy

Building on the vision for CMP 2031, mobility strategies have been shaped by three mobility pillars:

1. Integrated Land use-Transport Planning
2. Bringing a control on movement of personal vehicles
3. Encourage public transport system and other sustainable modes

These pillars provide the framework for establishing the direction of the CMP, and for selecting and evaluating individual transportation projects. Building on these pillars, the strategies have been defined; projects and programmes have been identified by first prioritising investments in preservation, maintenance and operation of the existing transportation system. Investments to improve the safety and security of the transportation system are identified next, followed by investments that improve the efficiency of existing infrastructure.

5.12. Mobility Strategies

The mobility goals for Lucknow need to be addressed through a multipronged approach. Solutions for mobility improvements cannot be achieved by adopting a single strategy. The following strategies need to be adopted to meet the goals set for Lucknow:

1. Land Use and Transport Strategy
2. Development of Mobility Corridors
3. Making Public Transport a choice mode
4. Promotion of Non-Motorised Transport Strategy
5. Efficiency in Freight Mobility
6. Demand Management Strategy
7. Traffic Engineering Measures

Each of the broad strategies includes sub-strategies of immense importance. The strategies when implemented through specific projects shall fulfill the goals and objectives of the CMP. The sections below discuss these strategies.

5.13. Land Use and Transport Strategy

There is a fundamental link between land use and transportation. Supportive land use patterns include the appropriate intensity, configuration, and proximity of housing, jobs, stores, and schools. Land use patterns are also shaped by roads, footpath, sidewalks, rail and other public transportation infrastructure. Locating shops, offices, and services near homes, and ensuring well-connected transportation infrastructure can promote walking, bicycling transit used and greatly contribute to improved accessibility and mobility. In order to provide mobility solutions for Lucknow city, it is important that there is an effective integration between Land use and transport in the entire region.

5.14. Concepts of Corridor and Nodes

Referring to **Figure 5-1**, conceptually, the development pattern of city may be organised as:

- **Concentric Growth Pattern:** The city expands over a large area with a moderate density through a concentric growth pattern by developing tiers of circular roads.
- **Ring Town Concept:** The urban sprawl of the city is restricted and smaller activity zones are developed around the city, which are connected by a radial road network.

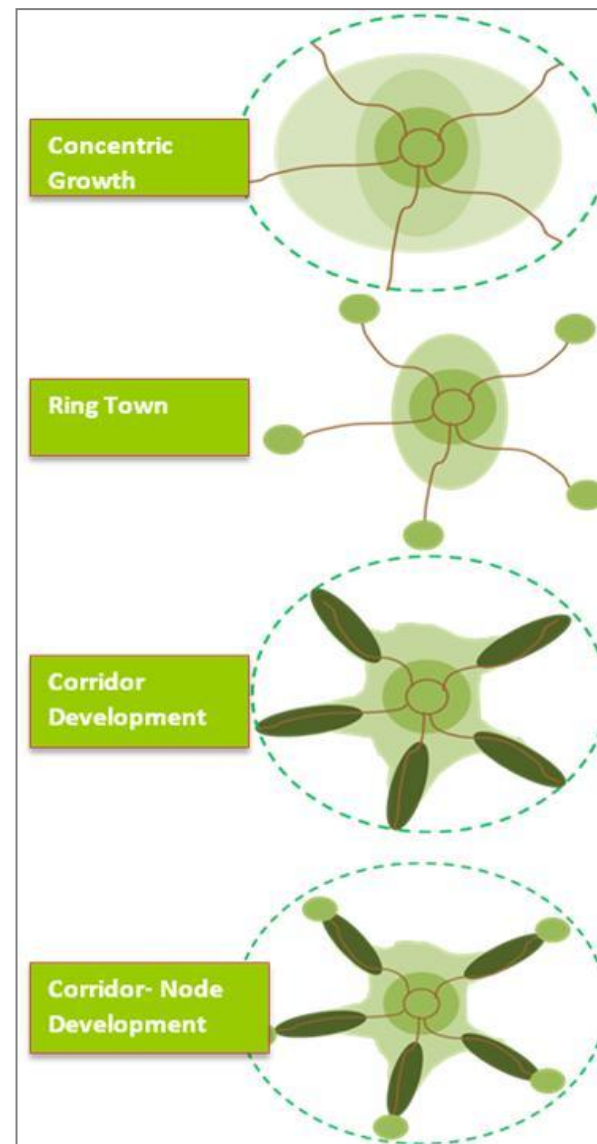


Figure 5-1: Concepts of corridor and node

- **Corridor Development Pattern:** Development is channelised along transit corridors to facilitate accessibility and mobility objectives. The end points can be activity generators/nodes.
- **Corridor Node Development Pattern:** The ring town concept and corridor concepts is integrated.

The city of Lucknow is at present in the Corridor-Node Development stage. Thus, a ring radial pattern of development of the city is suitable for sustainability of Lucknow city (refer to **Figure 5-2**).

5.15. Present Land Use Pattern of Lucknow and the Master Plan Vision

The urban sprawl in Lucknow has taken place in all directions, along the NHs and SHs. Four National Highways, viz, NH-24 to Delhi; NH-25 to Shivpuri and Jhansi; NH-56 to Varanasi; and NH-28 to Mokama originate from Lucknow. Apart from NH, two State Highways viz, SH 25 and SH 40 and a Major District Road (MDR 77C) radiate from the city center. As the city is growing along all the radials in the form of NHs and SHs, Ring and Radial pattern of growth of Lucknow city with development of sub-city centre at the intersection of major rings and radials is desirable. The development of new sub-city centre at the periphery of the city in the intersection of major rings and radials, if properly developed, will work as counter magnet for the core commercial areas like Hazratganj, Aminabad and Chowk. As per the Master Plan prepared by Lucknow

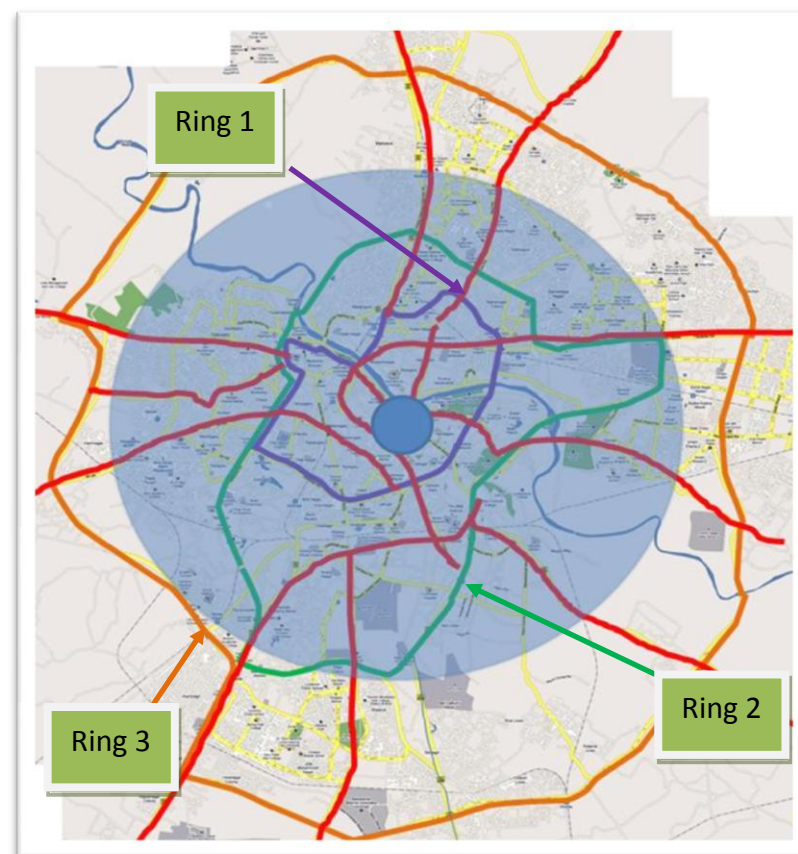


Figure 5-2: Ring-radial concepts of Lucknow City

Development Authority (LDA), it has been planned to develop the intervening open spaces to take advantage of the ring road. However, the same space where major transit modes are intersecting with each other can be developed as Transit Node with sub-city centre. Due to shape and development, Ring and Radial pattern of growth of the city would be ideal with formation of three ring roads with exiting radials.

5.16. Development of Residential Colonies

Numbers of residential colonies are being developed along the major radial roads of the city, primarily along the National Highways and State Highways (**Figure 5-3**). Both the private players as well as Government agencies, such as Lucknow Development Authority (LDA) and Uttar Pradesh Housing & Development Board, are planning and executing the housing colonies in Lucknow. Some of the prominent upcoming residential colonies are Sharda Nagar towards Mohanlalganj road, LDA colony towards Kanpur road, Amrapali towards Mohan, Sahara City towards Kakori, Jankipuram towards Sitapur road, and Golf City towards Gosainganj road. All these colonies are located on the outer areas of

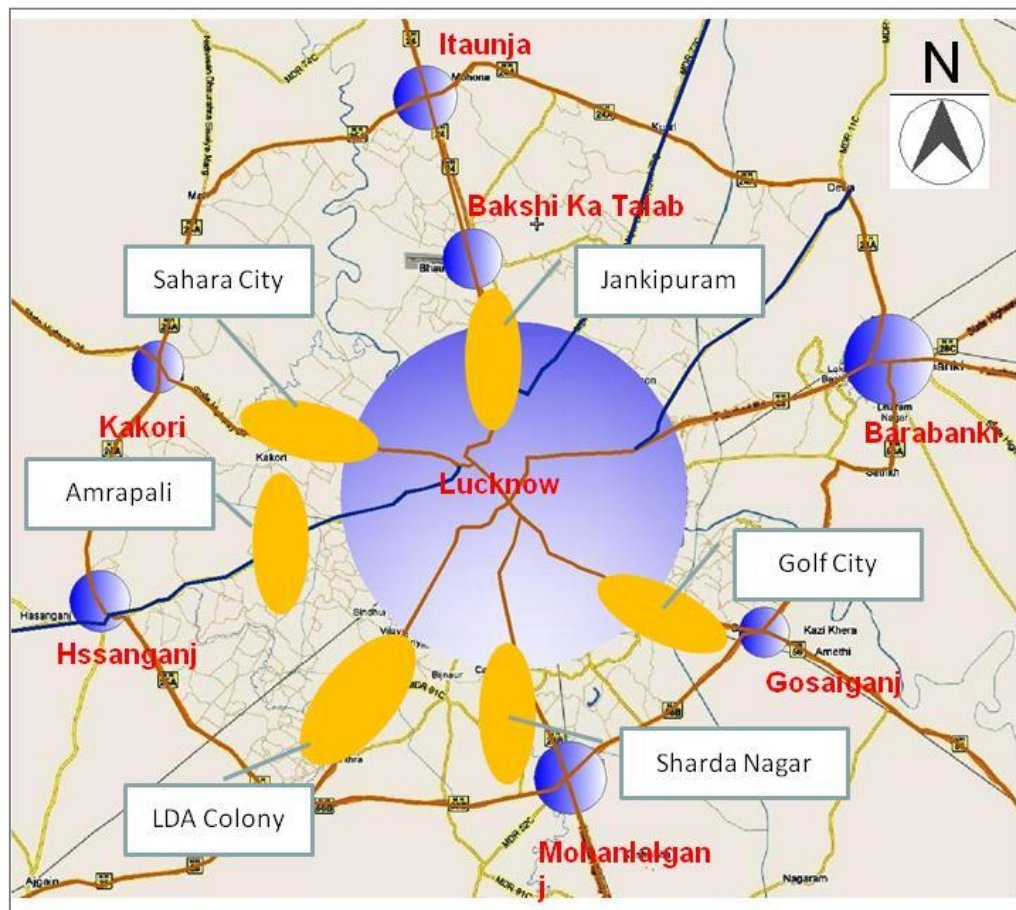


Figure 5-3: Development of residential colonies in Lucknow

Lucknow city. These residential colonies will require adequate commercial, open, recreational, and employment-generating spaces in order to reduce their dependence on core city area and to make them as self-sufficient residential colony. Strategy is to ensure that they are all connected with suitable transit network.

5.17. Concepts for Lucknow City

The Mono-Nuclei character of Lucknow is experiencing heavy dependence of its residents on the core central business district, which results in large volume of vehicular and commuter interaction with the core area. This development has resulted in chaotic traffic situation such as congestion, long queue length at the intersections, conflict of pedestrian etc.

Thus, the concept of developing Lucknow with multiple activity nodes is based on the principle of equitable and efficient utilisation of city's road network while keeping the core area decongested.

5.18. Development of Mobility Corridors

The concept of developing mobility corridor is aimed at optimisation of throughput of people. It focuses on public transit systems, and thus there is need for ensuring when designing these corridors that all modes of travel are considered and integrated.

The concept of mobility corridor in Lucknow city should recognise the importance of existing road network pattern and travel characteristics. Based on the importance of existing road network, certain roads should be selected for the status of mobility corridor.

5.19. Making Public Transport a Choice Mode

Public transport is the most efficient means of carrying large numbers of people. Given the projected increase in population and the increase in daily travel demand, a high mode share in favour of public transport is crucial. This will ensure that the roads continue to be free flowing and commuters on public and private transport, as well as goods vehicles, can reach their destinations within reasonable time.

5.20. Strategies to Improve Public Transport System

One of the goals identified as part of the vision is to increase the public transport trips to 30% by 2031 from existing 4%. To achieve this, the following initiatives need to be under taken to improve public transport:

- Promotion of public transport by introducing multimodal public transport system – such as road-based and rail-based MRTS system

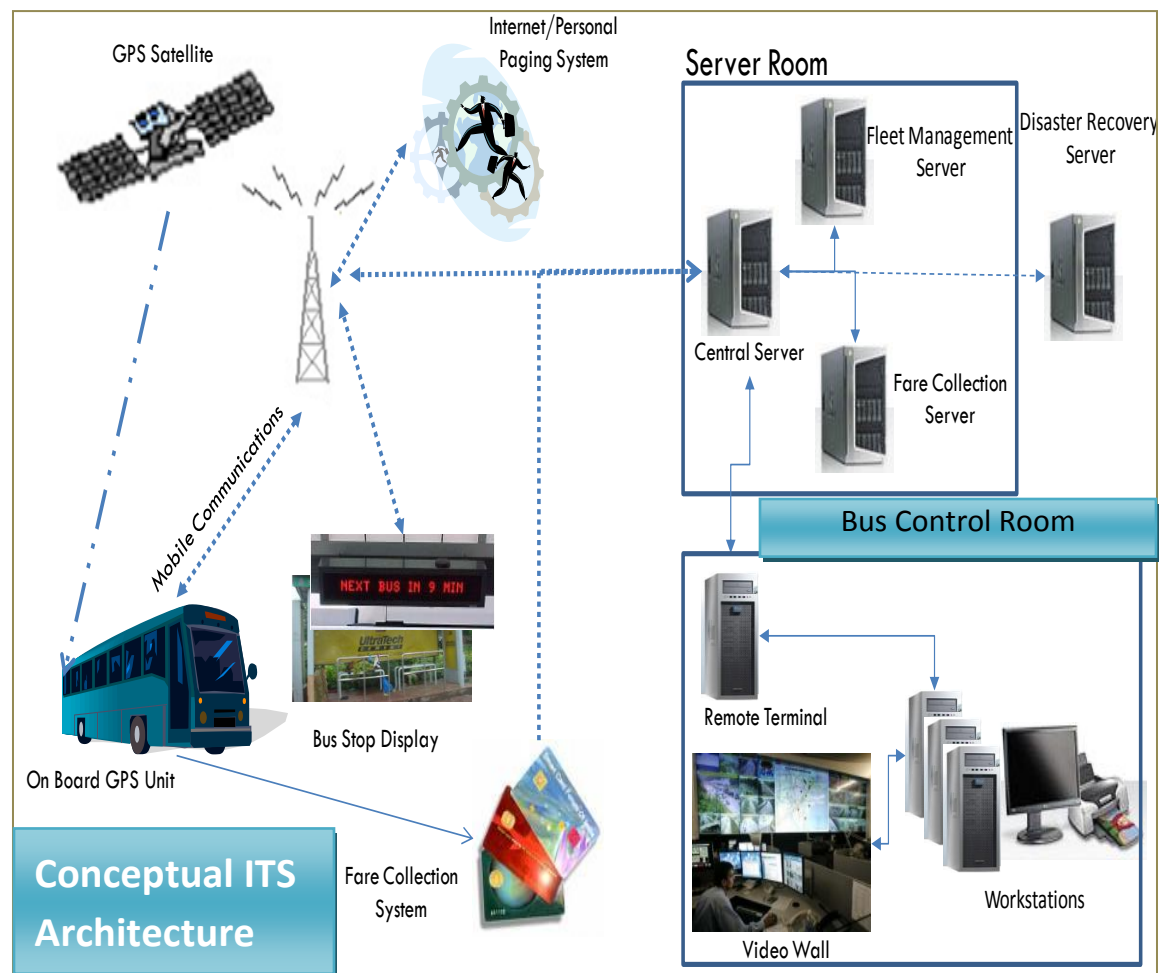


Figure 5-4: Conceptual ITS architecture

- Functionalisation of Special Purpose Vehicle (SPV) or Special Purpose Company (SPC) to monitor, manage and regulate the city bus service
- Operation of City Bus Service under Public Private Partnership mode with the objective of improving the efficiency in the system on the one hand and the utilisation of private fund for development of community services on the other hand
- Introduction of Bus Priority System through lane marking and effectively designing the traffic signal
- Application of Intelligent Transport System (ITS) for the benefit of both the user as well as the controlling and monitoring authority, ITS devices such as GPS, GPRS, etc will enable the authority for better, improved and efficient management of fleet. Similarly, use of Passenger Information System (PIS) on the buses and the bus-stops, and Automatic Fare Collection System and Travel Card, will enhance commuter safety and reliability. The concept of its architecture is shown in **Figure 5-4**.
- Provision of covered link-ways and pedestrian overhead-bridges, and integrated transport hubs
- Integration of city bus service with other modes



Figure 5-5: Bus Lane by marking



Figure 5-6: Bus priority signal

5.21. Bus Augmentation and Higher Order Mass Transit System

It is important to utilise and upgrade the existing bus-based public transport. This would mean improvement of the bus fleet, both in quantity and in quality of the buses. The existing fleet needs to be replaced with modern buses equipped with advanced technology such as ITS.

5.22. Priority for Buses on the Roads

To improve the reliability, safety and speed of bus service, it is important that buses should be given greater priority on roads over other vehicles. This will help to shorten bus journey time and make them a more viable option in comparison to cars. The aim is to achieve average bus speeds of 25 kph. For this purpose, the following measures need to be adopted:

- (I) **Provision of bus lanes** – It improves bus speeds by as much as 16%. To enhance public transport journey experience, bus lanes can be provided on major arterials (**Figure 5-5**).
- (II) **Signal priority for buses at junctions** - Signal priority to be given for buses approaching some major junctions by extending the green-time for them to clear the junctions (**Figure 5-6**). This will help to enhance the effectiveness of the bus lane/full-day bus lane scheme.
- (III) **Other bus priority measures** - The following bus priority measures can be adopted:
 - Contra flow bus lanes that allow buses to run on a dedicated lane in reverse direction to the main traffic flow.

- Segregated bus ways (**Figure 5-7**) where buses can enjoy uninterrupted travel along dedicated right of way. Bus Rapid Transit (BRT) or tram systems, which are high quality public transport alternatives that combine the reliability and capacity of rail based transit system with the flexibility offered by buses, could be introduced on such segregated bus ways.



Figure 5-7: Segregated Bus Lane

5.23. Intermediate Public Transport System

In the absence of an efficient public transport system in Lucknow, IPT has become preferred mode of travel after private vehicles. At present 4,426 auto-rickshaws run in Lucknow city on area permit basis and another 2,984 Tempos ply on 47 designated routes that together shares 16% of the total trips. It has been observed that many do not comply with the rules and regulations. They

operate without proper license, avoid paying taxes, do not review PUC certificate, etc. Hence, there is an immediate need to have a proper system of regulation and management of auto-rickshaws in Lucknow. The existing IPT routes overlap with the city bus service routes leading to poor commercial viability of city bus service. It can be seen from **Figure 5-8**, 90% of city bus service routes overlaps with the IPT routes. In order to make the city bus service commercially viable and sustainable and also to make IPT as feeder to city bus service, the existing IPT routes need to be rationalised.

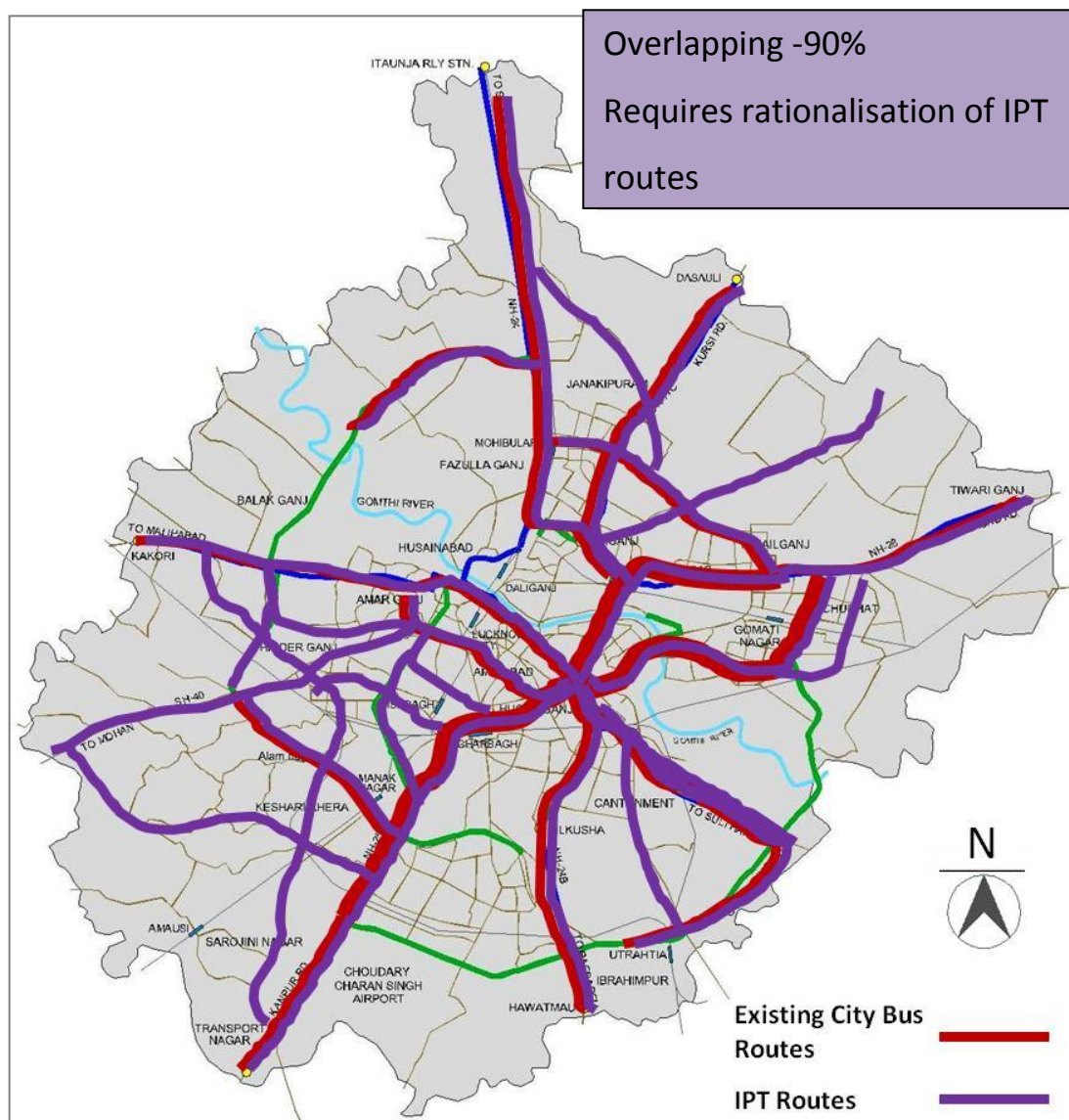


Figure 5-8: Overlapping of bus and IPT routes

5.24. Non-Motorised Transport Strategy

Forty-one percent (Walk-17%, Bicycle-16%, Cycle Rickshaw-8%) of trips in Lucknow are made by non-motorised transport (NMT); but the facilities available are grossly inadequate. The objective is to provide continuous, encroachment-free pedestrian and NMT facilities across the city. The proposed measures to develop facilities for pedestrians and bicyclists on the streets include:

- Development of NMT network for full width (**Figure 5-9**)
- Provide pedestrian path/foot paths
- Provision of grade separated facilities for pedestrian crossing
- Establish connected walking networks
- Provide adequate walkway widths
- Prevent vendors, pavement dwellers, vehicle parking and other uses from blocking walkways
- Dedicated cycle track (**Figure 5-10**)
- Use street furniture (e.g., benches) and pedestrian friendly design features
- Integrate cycling with transit



Figure 5-9: Organized Foot Path and Cycle Track



Figure 5-10: Dedicated Cycle Track

- Providing bicycle parking/rickshaw stands
- Addressing security concerns of pedestrians and cyclists
- Specific measures for facilitating bicycle use

5.25. Development of NMT Network

It is important to develop a linked network at local area level. This would allow residents of the area to travel by using NMT mode such as, either through walk or via bicycle, rather than requiring a motorised trip. The pedestrian facilities created should be located adjacent to existing roadways exclusively.

5.26. Construction of foot-paths and Zebra Crossings

In Lucknow, the road network is found devoid of foot-paths. This makes the pedestrians use carrigeway for walking. Many a time it has been observed that the pedestrians use the road without least concern for the vehicular traffic. This leads to accidents. Hence, it is necessary that foot-paths should be provided along the main roads.

5.27. Pedestrian Signal Phase at Junctions

A significant amount of pedestrian traffic was observed at various intersections in the city. In order to have safe movement of pedestrians at the intersections, it is necessary to include a separate “Pedestrian Phase” or “All Red” phase in the cycle of the traffic lights. This will ensure safe crossing of pedestrian at signalised junctions.

5.28. Pedestrian Zones

Motor vehicles are allowed but broad pavements, speed regulations, physical speed regulators, etc. favour walking and cycling rather than cars.

5.29. Cycle Rickshaw Management

Cycle rickshaw plays a very important role in the city as they cater to a large number of short distance trips in Lucknow city particularly in old city area. Considering the importance of cycle rickshaw, modern cycle rickshaw stands at selected locations of old city area city with the following facilities needs to be provided:

- Sitting facility
- Fare Chart
- Drinking water facility, urinal and bathing facility for the registered cycle rickshaw pullers
- Rickshaw repair facility
- Night Shelters for the cycle rickshaw pullers.

5.30. Cycle Sharing Scheme

Bicycle sharing schemes are becoming increasingly popular across the world. The central concept of the systems is free or affordable access to bicycles for short trips within the city, as an alternative to motorised public transport or cars, thereby reducing traffic congestion, noise and air-pollution. In Lucknow, 16% of trips are made by bicycles, thus introduction of cycle sharing scheme can promote use of NMT as noise and air-pollution free mode of transport. For introducing cycle sharing scheme in Lucknow, a detail study needs to be carried out.

5.31. Freight Mobility

The movement of goods is another vital function for the city's transportation system. An efficient freight transportation system helps to maintain the city's quality of life, ensures that businesses can deliver products and services to market and strengthens the economy. Freight mobility is multi-functional, multimodal, and intermodal. In the core area of the city, goods movement primarily takes place by truck, tempo and animal and hand-driven carts. CMP has been designed to support three aspects of freight movement: (1) meeting the freight movement needs for trade and commerce in the region, (2) Efficiency in local delivery system, and (3) Infrastructure and operational solutions needed to support the growth of the city as well as of the state.

Freight Strategy is structured around the following framework issues:

- To preserve and maintain the city/region's existing multimodal freight transportation system to increase reliability and efficiency and to prevent degradation of freight mobility
- To co-ordinate regional planning with railroad capacity expansion plans and support capacity expansion compatible with state, regional, and local plans
- To complete key roadway projects to enhance freight mobility, such as creation of outer ring, by-passes, etc.
- To shift the wholesale markets from the congested city core to the outskirts to reduce freight traffic in the city

Freight movement in a city is an inevitable process of trade and economy. Traditionally, movement of goods for local consumption and sale generally takes place from a certain location within a city which is closest to the wholesale markets. In other cases where there have been successful planning interventions, the goods terminal is preferred to be located on the outskirts of the city in order to prevent the entry of heavy vehicles into the congested parts of the city.

Lucknow has one Transport Nagar on the southern part of the city along Kanpur Road. Maximum freight traffic comes from Kanpur Road, Faizabad Road and Allahabad Road direction.

Freight transport management includes various strategies of increasing the efficiency of freight and commercial transport:

- Restriction of heavy vehicle entry into the city during day time
- Use of small and medium size vehicles with modern emission controls in the central city areas
- Development of Freight Terminals/warehouses on the periphery of the city

5.32. Travel Demand Management (TDM)

Travel Demand Management (TDM) means adoption of a number of strategies that results in efficient use of transportation resources.

It is an intervention, excluding provision of major infrastructure, to modify travel decisions so that more desirable transport, social, economic and/or environmental objectives can be achieved, and the adverse impact of travel can be reduced. A combination of TDM strategies and policies helps to reduce/redistribute travel demand. A demand management approach to transport has the potential to deliver better environmental outcomes, improved public health and stronger communities, and more prosperous and

Types of Travel Change sought by TDM

- ***Trip reduction*** – reduce the need to travel and thereby reduce overall travel demand.
- ***Reduce vehicle use*** – reduce car travel.
- ***Increase vehicle occupancy*** – reduce the amount of single occupancy car trips.
- ***Increase travel by alternative modes*** – encourage public transport use, walking and cycling.
- ***Trip retiming*** – encourage travel at less congested times.
- ***Alternative destinations*** – encourage travel to destinations that are closer and lead to less overall congestion.
- ***Reduction in trip length*** – by planning for the provision of employment, retail and other services closer to where people live.

livable cities. The most common strategies widely used across the globe and which can potentially be used in Lucknow are:

- Operational (such as dynamic route information on highways)
- Physical (such as auto restrictions in city centres)
- Financial/pricing (such as congestion charging)
- Organisational (such as sustainable travel planning)

5.33. Physical Strategies

Physical measures either restrict the use of personalised modes in certain areas or during certain times of the day or involve strategic improvements to the transportation network or increase the capacity of public transport or high occupancy vehicles.

The physical measures to influence demand include the following:

- Improvements in public transport systems by building extensive park-and-ride facilities on the periphery of cities and offering express bus or rail service into the city centers.

5.34. Operational Measures

Operational measures manages demand through enhanced choices and provides traveler information about these choices. The concept is implemented at the traffic control centres. The interesting strategies observed are the following:

- The user is given the choices of selection on route, time, and mode up to breaking down point, after which, the network traffic control system diverts traffic around bottlenecks using dynamic destination signs, barriers, ramp metering, etc.

- Traveller information system including travel time prediction in terms of average speeds, and Parking availability prediction.

5.35. Financial/Pricing Strategies

To keep traffic flowing smoothly on the roads, it is important to adopt a holistic package of measures that includes promoting public transport, road expansion as well as managing demand for road use by controlling vehicle growth and restraining usage. These measures would reduce pressure on road space. However, it is important to implement congestion or road pricing as a key tool to manage travel demand and ensure that Lucknow remains a liveable city.

- Local infrastructure needs to be adjusted for the implementation of restricting zones.
- Congestion charging should be complemented with measures like improved public transport and park and ride facilities.

5.36. Organisational Strategies

Demand management requires new partnerships, planning processes, and approaches to address traffic congestion. The ability to institutionalise a demand management philosophy in supply-oriented organisations is a key factor in the success of the endeavour. The integration of many strategies into a cohesive, comprehensive approach is one of the key to maximise the intended effects. Therefore, by setting own examples, city administrations can convince companies to take part in mobility management.

Traveller information is often gathered and compiled by the public sector and disseminated by public and private operators. However, conflicts can arise when the private providers do not want to use real-time or predicted information that they fear will

not be accepted by travellers. One strategy could be to better coordinate the timing and nature of travel, even in goods movement.

5.37. A combination of Strategies

Lowering vehicle population growth rate - The building of more roads is not a sustainable approach in addressing traffic congestion. The addition of a lane to an already congested road alone is insufficient in itself because it does not address the underlying problems of vehicle growth, which is resulting in congestion.

Parking Control - Many cities in the world such as London, Hong Kong, Singapore, Tokyo and New York rely on parking as a tool to manage the demand for road use in the form of parking surcharges or restrictions on the supply of parking spaces. Such policies aim to move people out of their cars and onto public transport. In Lucknow, the increasing number of private vehicles in the city has resulted in increased number of vehicles plying on the roads causing congestion. In view of this, it is imperative that a parking policy be outlined for the city so that new parking areas may be identified in the city in order to accommodate the increasing demand and, at the same time, encourage people to use public transport by introducing a parking fee, which reflects the true cost of land.

5.38. Traffic Engineering Measures

Traffic Engineering Measures generally qualify as short-term measures for bringing in immediate relief from traffic problems. A combination of several measures can prove to be effective means of problem solving. These measures are generally not very capital intensive and give instant results. It is imperative that Traffic Engineering and Traffic Management should be given high priority in Lucknow. Simple junction design and optimisation itself can alleviate difficult problems in the short run.

In addition, the street looks organized and provides a much better ambience to the whole of Lucknow itself. Key traffic engineering management measures are as follows:

- | | | | |
|-------------------------|--------------------------|-----------------------|-----------------------------------|
| 1. Junction Improvement | 2. Traffic signalisation | 3. Parking Management | 4. Encroachment/Hawker Management |
| 5. Road Marking | 6. Signages | 7. Street light | 8. One way plan |

5.39. Mobility Indicators

The present situation in Lucknow will only continue to worsen unless the Government responds appropriately in this regard. In the absence of Government interference, by 2031, the share of public transport will further go down leading to more congested road space attributed by higher use of private mode. Traffic forecasts show network speeds of 8 to 10 kmph in 2031, a really serious and unsustainable situation. A set of performance indicators has been developed as goals to be achieved for the city. The goals have been defined based on the vision and the objectives. The mobility strategies developed will aim at attaining the goals.

Table 5-1 shows the targeted goals for Lucknow city in 2031; and the mobility planning process is set to achieve.

Table 5-1: 2031 Mobility Indicators

2031 Mobility Indicators		
Indicators	Existing	Benchmark Goal
Average Journey Speed	15 Kmph	30 kmph
Public Transit Share	4%	30%
Walkability (Footpath Length /Road Length)	40%	100%
Cyclability (Cycle path Length /Road Length)	1%	50%
Fatality Index (Fatalities/ Lakh Population)	16	Reduction by 50%

6. Mobility Plan



Based on the framework of the plan, travel demand model, and the strategy for achieving the vision under realistic scenario, the mobility plan has been prepared and various components and details of the same are given as under:

- Land Use and Transport
 - Development of Transit Node cum Sub-City Centre
 - Mobility Corridors
 - Network Improvement Plan
- Public Transit
 - Promotion of Public Transport
- Non-Motorised Transport
 - Promotion of Non-Motorised Transport
- Freight Management
 - Smoothening of Goods Movement
- Traffic Engineering Measures
 - Intersection Up-gradation
- Travel Demand Management
 - Parking Management
 - Traffic Management



6.1. Land Use and Transport

Due to the Mono-Nuclei character of Lucknow, the core city consisting of heritage area is experiencing heavy dependence in terms of vehicular and commuter interface. Besides, large number of Government office buildings such as Jawahar Bhawan, Shakti Bhawan, Indira Bhawan, etc. are located along the main arterial of Vidhan Sabha Marg- Ashok Marg. These establishments attract large number of trips.

In Lucknow there is a lack of proper and dedicated industrial activity zone. Although the Master Plan 2021 has proposed relocation of some polluting industries at the outer areas of the city and creation of new industrial zone along Kurshi, Deva and Faizabad road, proper enforcement and timely action is extremely important. It has been proved from different studies that Landuse and Demand for Transport has significant inter-dependence impact on each other. In order to decongest the core city area and for efficient and equitable distribution of transport demand throughout the city, it is imperative to develop sub-city center in different places of the city. The Master Plan 2021 has also suggested for using of intervening space in the proposed residential areas. The CMP for Lucknow has proposed the development of sub-city centre at the areas where different transport mode intersect with each other.

6.2. Transit Oriented Development

Higher density development is concentrated near the station to make transit convenient for more people and encourage ridership. This form of development utilises existing infrastructure, optimises use of the transit network and creates mobility options for transit riders and the local community. Successful TOD provides a mix of land uses and densities that create a convenient, interesting and vibrant community for local residents and visitors alike.

6.3. Development of Sub-City Center

Development of a ring-radial road network will allow the city to grow in all the directions as it is growing in recent times. Since in the existing situation there is only one core commercial zone, there has been a heavy flow of trips attracted to the core city area. Thus, transit hub cum sub-city centres have been proposed at the major residential areas based on the Transit Oriented Development principle. The purpose of setting-up of transit hubs would be to act as self-sustaining sub-city centres that are a mix of commercial and public/semi-public land use. Once developed, they would result in a decentralised growth of the region and result in a balanced

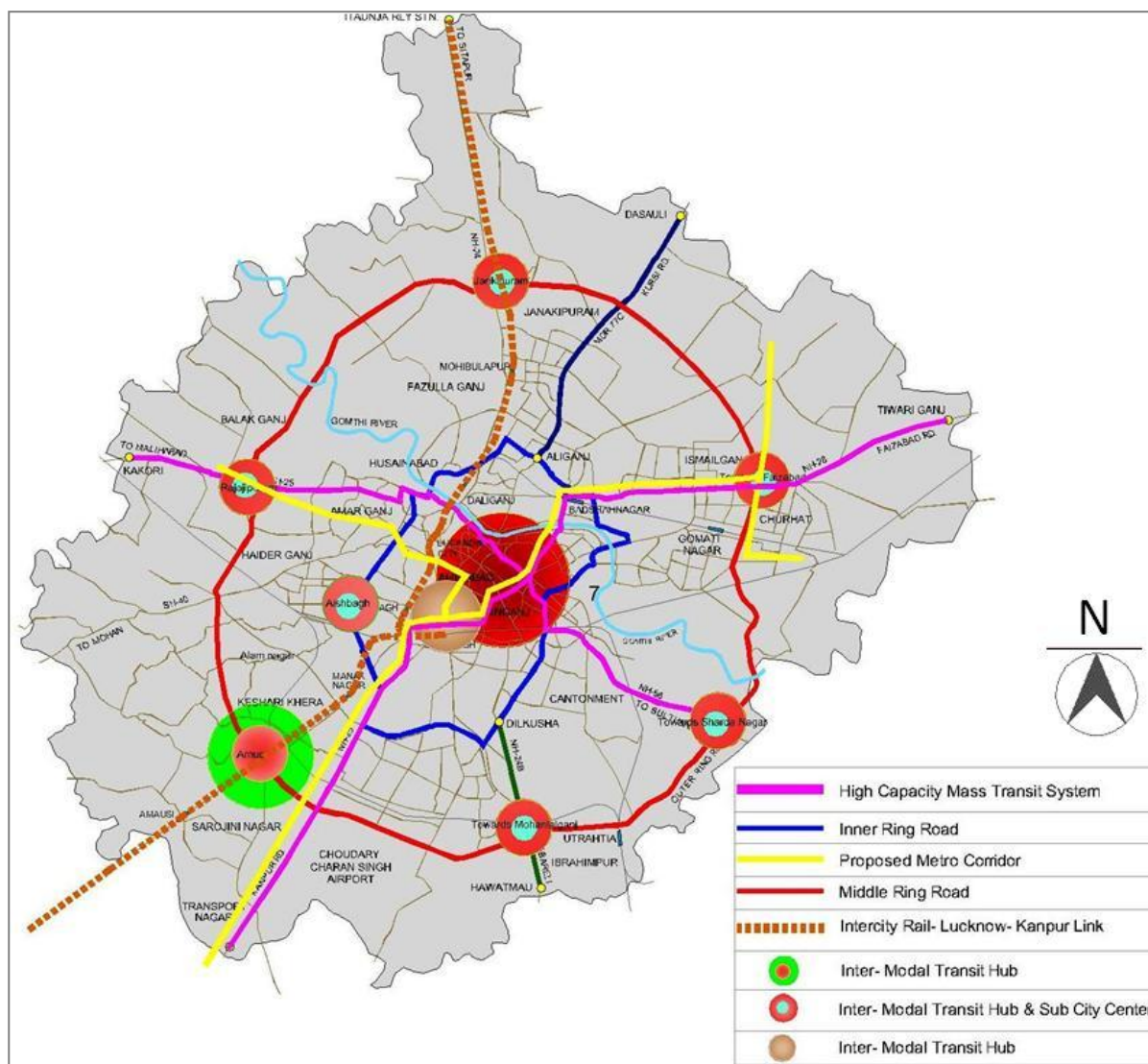


Figure 6-1: Inter-modal transit hub for Lucknow city

landuse-transport integration policy for Lucknow. Proposed locations of TOD Hubs are shown in **Figure 6-1** and the same are as follows:

7. Towards Jankipuram
8. Towards Faizabad Road
9. Near Golf City & Sharda Nagar
10. Towards LDA Colony
11. Rajajipuram
12. Aishbagh

Link between Amausi Railway Station and Amausi Airport is proposed to be developed as Inter-Model Regional Transit Hub. However, identification of exact site shall be based on detailed studies and proximity to surrounding Transit Nodes and approved landuse plan for the region.

6.4. Mobility Corridor Concept Plan

Mobility corridor should have right of way of at least 25 m for mixed traffic conditions and 30 m for carriageway with dedicated public transport bus lane . These corridors would be expected to have the following cross-sectional elements:

1. Continuous kerb, footpath-cum-drain & bi-cycle lanes
2. Service roads where feasible
3. Restriction or preferably prohibition of parking on the carriageway/shoulders
4. At-grade/grade-separated public transport systems as per the public transport/mass transport master plan

The mobility corridors for the Study area constitute of radial roads complemented with circumferential roads to form a ring-radial pattern of network. Referring to the **Figure 6-2**, the mobility corridors forming the radial network are:

1. Faizabad Road; NH-28
2. Kanpur Road; NH-25
3. Raebareli Road; NH-24B
4. Sultanpur Road; NH-56
5. Mohan Road; SH-40
6. Malihabad Road; SH-25
7. Inner Ring Road
8. Middle Ring Road

In Lucknow the radial network is present but the network needs to be upgraded to mobility corridor standards. Some portions of these networks needs to be widened to at least 30 m RoW. The Inner & Middle Ring Road will be as follows:

➤ **Inner Ring:** The inner ring road is

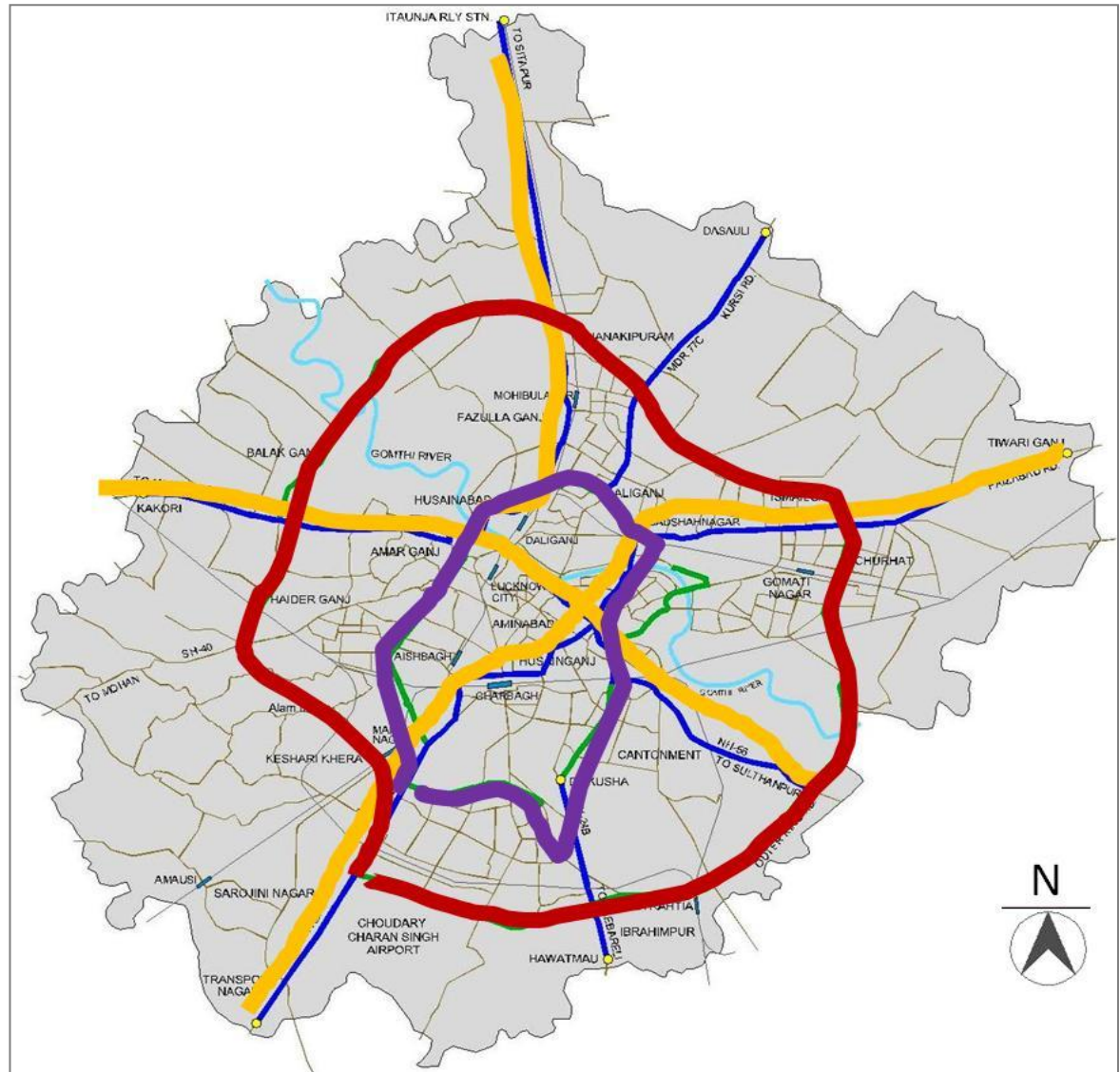


Figure 6-2: Mobility corridor for Lucknow city

proposed to start from NH-25 Ramprasadkhera and intersect NH24B, NH 28 and pass through Hussainganj and Takotra to facilitate circular movement as shown in **Figure 6-2**.

- **Middle Ring:** The middle ring road is proposed from NH-25 near Alambagh, connecting NH-24B on the southern side, NH-56 on the North east side and NH-28 at Faziabad Road on the eastern side. This road further meets MDR 77C on the northern side and intersects SH-40 and SH-25 on the western side. The middle ring should have a minimum of 40 m RoW, while the inner ring should have a minimum of 30 m RoW.

6.5. Network Improvement Plan

The Comprehensive Mobility Plan for Lucknow has suggested improvement of network for overall enhancement of connectivity. As a part of its network improvement plan, the following aspects have been covered:

- Completion of Missing Links
- Widening of Roads (in accordance with Lucknow Master Plan)
- Development of New Arterial Road
- Development of Road Hierarchy System

Each of these aforementioned aspects has been described as a part of network improvement plan in details in the subsequent sections.

6.6.Completion of Missing Links

To continue and complete the proposed mobility corridor, the following missing links need to be developed in the phase I. The details of missing links are given below. Refer to **Figure 6-3** and **Table 6-1** for details.

Table 6-1 Missing Link Details

Serial No	Link Details	Length (in Km)
1	Link between SH-40 and Kanpur Road	Approx. 10 kms
2	Link between Sitapur Road to Faizabad Road	Approx. 15 kms
3	Samta Mulak Chowk to Faizabad Road along Kukrail Nallah	Approx. 1.6 kms
4	Kapurthala Road to NH-24	Approx. 1.5 kms

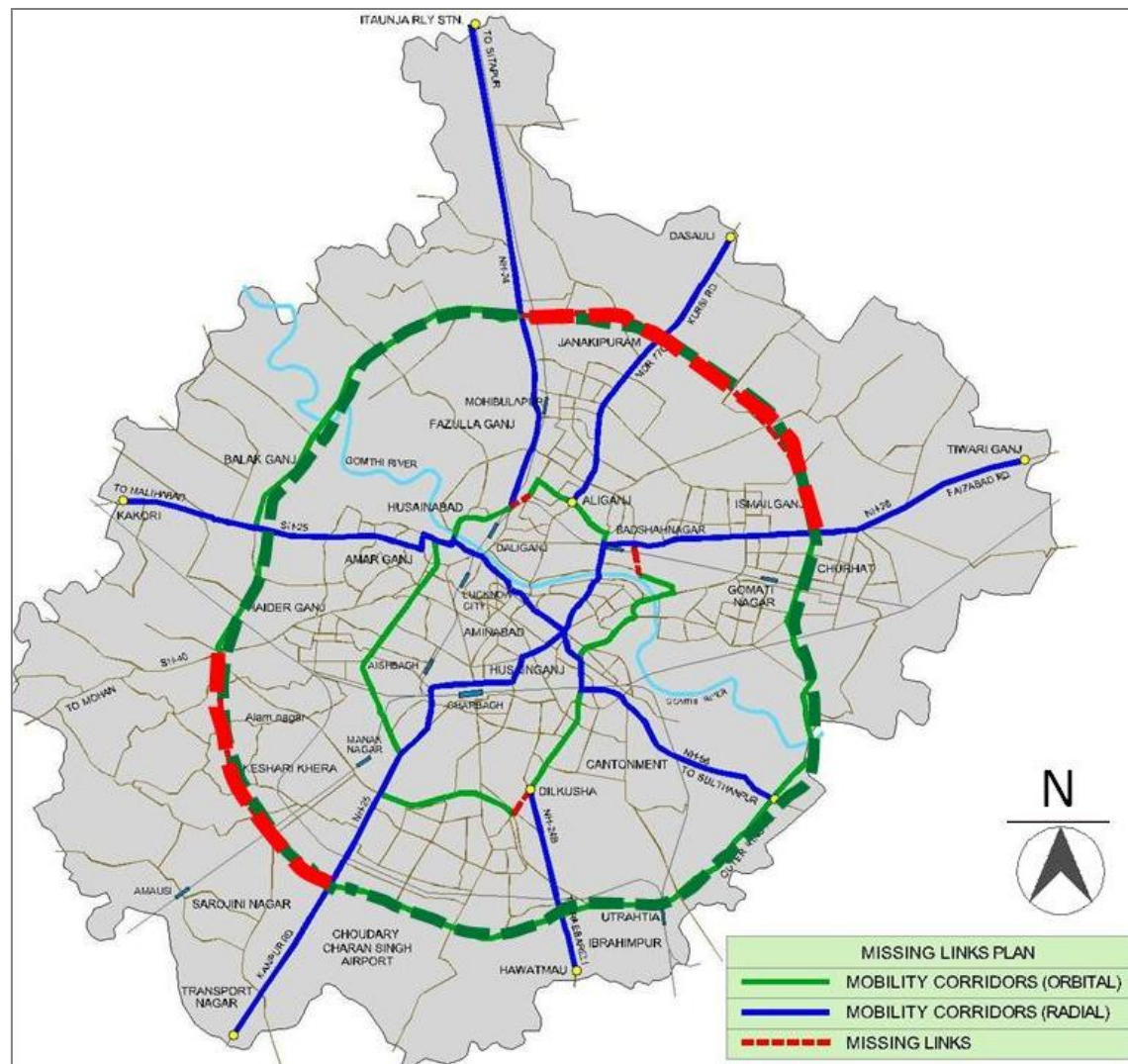


Figure 6-3: Missing link plan

6.7. Widening of Roads

Most of the commercial areas in Lucknow have congested roads, partly because of encroachment and hawkers. Thus, considering this aspect, the Master Plan 2021 has identified 26 no of sections for road widening through removing of encroachments from the footpath and carriageway. Based on secondary data and primary data the CMP for Lucknow has also suggested widening for the following roads. (through removing of encroachments)

Table 6-2 Road Widening Proposals

Serial No	Name of the Road	From	To
1	Faizabad Marg	Kukrail Barrage	Govt. Polytechnic
2	Vidhan Sabha Marg	Hussainganj Chauraha	Royal Hotel
3	Ashok Marg	Hazratganj Central Market	Rana Pratap Marg
4	Shahnajaf Road	Hazratganj Central Market	Rana Pratap Marg
5	Station Marg	Hussainaganj Chauraha	K.K College Churaha
6	Alambagh -Talkatora Marg	Tehripulia	Sharada Nagar
7	Bisheshwarnath Marg	Kaiserbagh Chauraha	Royal Hotel
8	Tulsidas Marg	Chowk Chauraha	Gajiuddin Nehar
9	Kursi Marg	Rodas Temple	Aliganj Sector G
10	Nishantganj	Nishantganj Chauraha	Gomti River Bridge
11	Ramtirth Marg	Hazratganj Central Market	Rana Pratap Marg
12	Subhas Marg	Medical College Chauraha	Station Marg
13	Cantt Road	Kaiserbagh Central Market	Cantt. Railway
14	Aminabad Marg	Charbagh Railway Station	Aminabad Central Commercial Zone
15	Gautam Buddha Marg	Kaiserbagh Central Market	Railway Station Marg
16	Shivaji Marg	Hussainganj Chauraha	Gautam Buddha Marg
17	Guin Road	Aminabad Central Commercial Zone	Gulmarg Hotel Chauraha

Serial No	Name of the Road	From	To
18	Lanquan / Gurudwara Marg	Hussainganj	Naka Hindola
19	Golaganj Marg	Golaganj Chauraha	Kaiserbagh Bus Station
20	Ganga Prashad Marg	Rakabganj Chauraha	Aminabad Central Commercial Zone
21	V. N. Verma Marg	Gulmarg Hotel Chauraha	Kaiserbagh Bus Station
22	Nazirabad Marg	Aminabad Central Commercial Zone	Kaiserbagh Chauraha
23	Keshari Marg	Aminabad Central Commercial Zone	R. N Tandon Marg
24	Jhao Lal Marg	Gulmarg Hotel	Golaganj Chauraha
25	Lalbagh Zone		
26	Pan Dariba Marg		

6.8.Regional Road Widening

Apart from Bazaar Road, the CMP for Lucknow proposes widening of the following roads:

1. Lucknow - Barabanki Road , 10kms, 6 Lane
2. Lucknow - Sitapur, 7Kms, 6Lane
3. Lucknow - Kanpur, 5Kms, 6 Lane
4. Lucknow - Sultanpur, 5Kms, 6Lane
5. Lucknow - Raibareli, 4Kms, 6Lane
6. Lucknow - Mohan, 6Kms, 4Lane
7. Lucknow - Hardoi , 5Kms, 4Lane
8. Lucknow - Kursi, 6Kms, 4 Lane

9. Lucknow - Deva, 4Kms, 4 lane

6.9. Development of New Arterial Road: Nallah Road along Haider Canal and Kukrail Nallah alignment

The route connecting Kanpur Road-Motilal Nehru Marg- Vidhan Sabha Marg-Ashok Marg- Faizabad Road (**Figure 6-4**) forms one of the main arterial of Lucknow city. In fact, this particular route can be considered as the spine of the city in terms of traffic movement. This route passes through a large number of Government offices, the main CBD area of Hazratganj, Charbagh Railway Station and other traffic attracting commercial areas of the city because of which it experiences heavy traffic movement. Thus, there is a need for development of an alternative route. A route connecting Haider Canal-M.G. Road, Lohiya Path, Kukrail Nallah joining Faizabad Road becomes parallel and alternative to the afore-mentioned main arterial of the city. The existing Volume by Capacity (V/C) ratio for the main arterial formed by route connecting Kanpur Road-Motilal Nehru Marg-Vidhan Sabha Marg-Ashok Marg-Faizabad Road is computed at 1.7 with “C” level of service. The V/C ratio is a qualitative index of road network; if the V/C ratio exceeds 0.8, then it means that the particular stretch of the road is critical. As per traffic projection, the V/C ratio of this arterial is estimated at a value of 3.53 by the year 2031, if no improvement measures are adopted, thus implying complete deterioration of the level of service. With the development of Canal road, as per estimate, approximately 40% traffic will shift from the existing arterial to the proposed Canal linking road with expected load of 4000 PCUs on the Canal road. As a result of which the V/C ratio of the existing arterial of Kanpur Road-Motilal Nehru Marg-Vidhan Sabha Marg-Ashok Marg-Faizabad Road will significantly go down, leading to improvement in the level of service. The Figure 6-4 shows the comparative V/C ratio of the existing arterial with and without Canal Road. From the Figure, it is clear that after the development of the Canal Road there will be improvement in the traffic situation along the route connecting Kanpur Road-Motilal Nehru Marg-Vidhan Sabha Marg-Ashok Marg-Faizabad Road. Further, Rajajipuram, one of the major residential areas of Lucknow, does not have direct access from the city centre of Hazratganj. The Haider canal passes through the city from west to east connecting

Rajajipuram and becomes parallel in terms of its alignment to the Station Road at the Charbagh Railway Station area with a length of about 2.5 kms. A road over Haider canal connecting Rajajipuram in this stretch can act as a parallel link to the Station Road. CMP Lucknow has considered this aspect and has proposed to develop this new link road. This new link road will also provide an additional linkage for the rapidly growing Gomtinagar and Mahanagar areas.

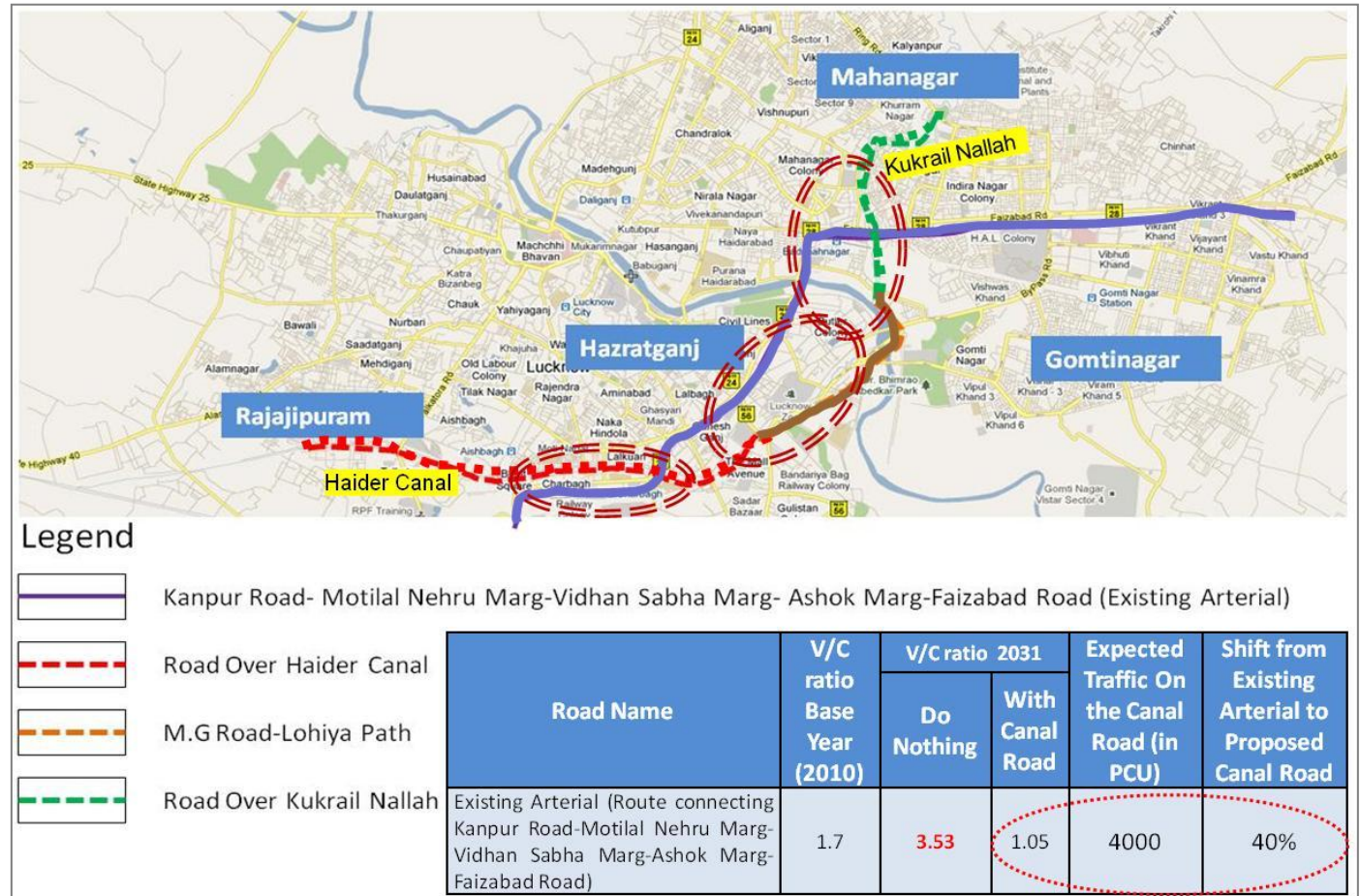


Figure 6-4: Nallah road along Haider Canal and Kukrail Nallah

6.10. Development of New Arterial Road: Development of Signal-Free 6-Lane Outer Ring Road

A signal-free 6-lane outer ring road is proposed for smooth movement of through traffic in general and freight traffic in particular. Total length of the outer ring road is about 110 km (**Figure 6-5**).

6.11. Development of Road Hierarchy System

The National Highways passing through Lucknow serve a variety of functions, including but not limited to the provision of direct access to properties, pedestrian paths, bus routes, private vehicles and catering for through traffic that is not related to immediate land uses. Apart from the NH, most other roads serve more than one function to

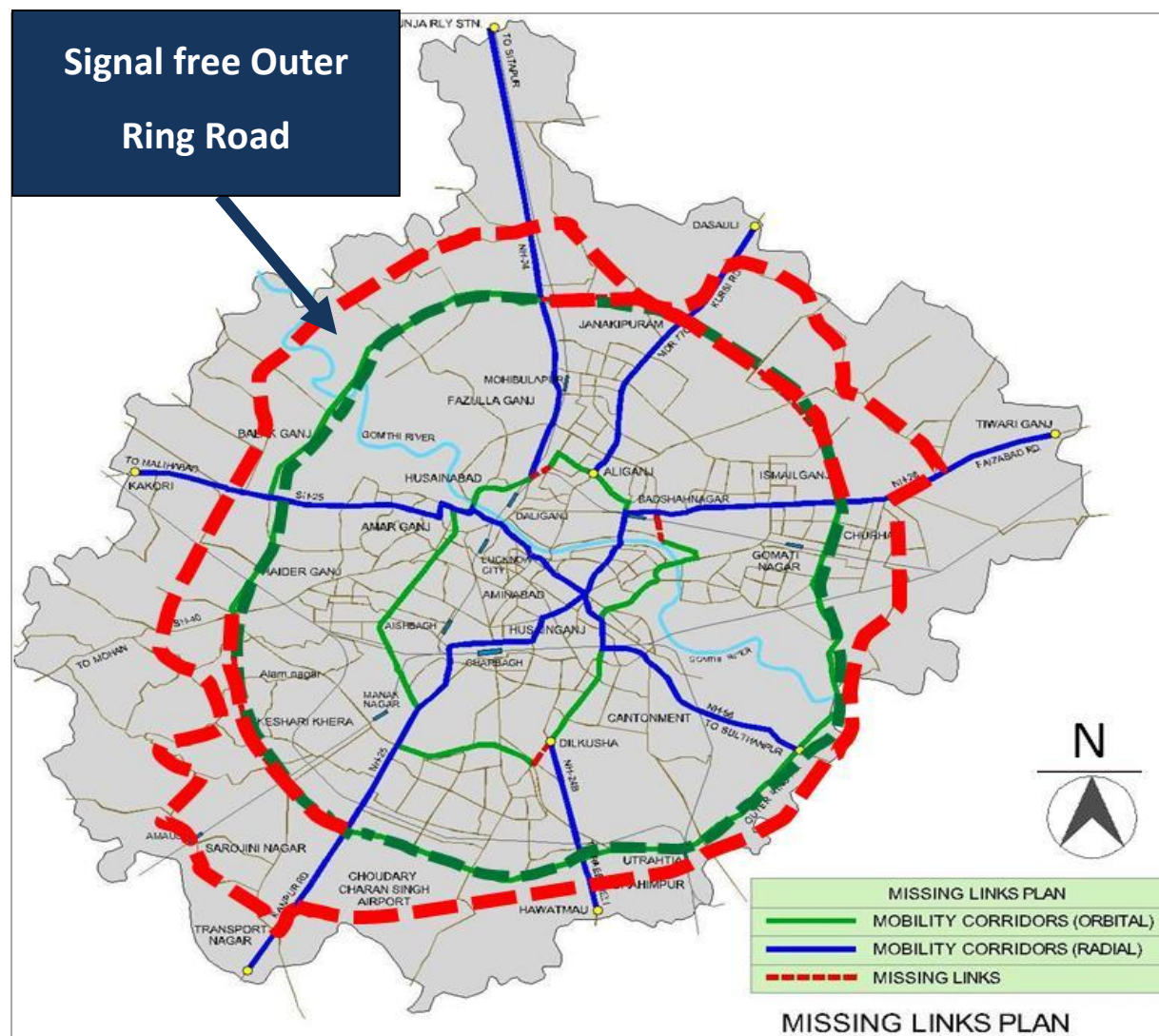


Figure 6-5: Proposed signal-free outer ring road

varying degrees, but it is clear that the mixing of incompatible functions has been leading to problems. Further, due to lack of proper enforcement mechanism, on-street parking takes place along most of the roads in Lucknow. A road hierarchy is a means of defining each roadway in terms of its function such that appropriate objectives for that roadway can be set and appropriate design criteria along with functional classification can be implemented. These objectives and design criteria are aimed at achieving an efficient road system whereby conflicts between the roadway and the adjacent land use are minimised and the appropriate level of interaction between the roadway and land use is permitted. Referring to **Figure 6-6**, Kanpur Road-Station Road-Vidhan Sabha Marg-Ashok Marg-Faizabad Road, and Allahabad Road-M.G Road-Sitapur Road should be declared as arterial roads. Along these arterials, there should be complete ban on on-street parking. Encroachment along these arterials should be removed with enforcement. Violators should be heavily fined.

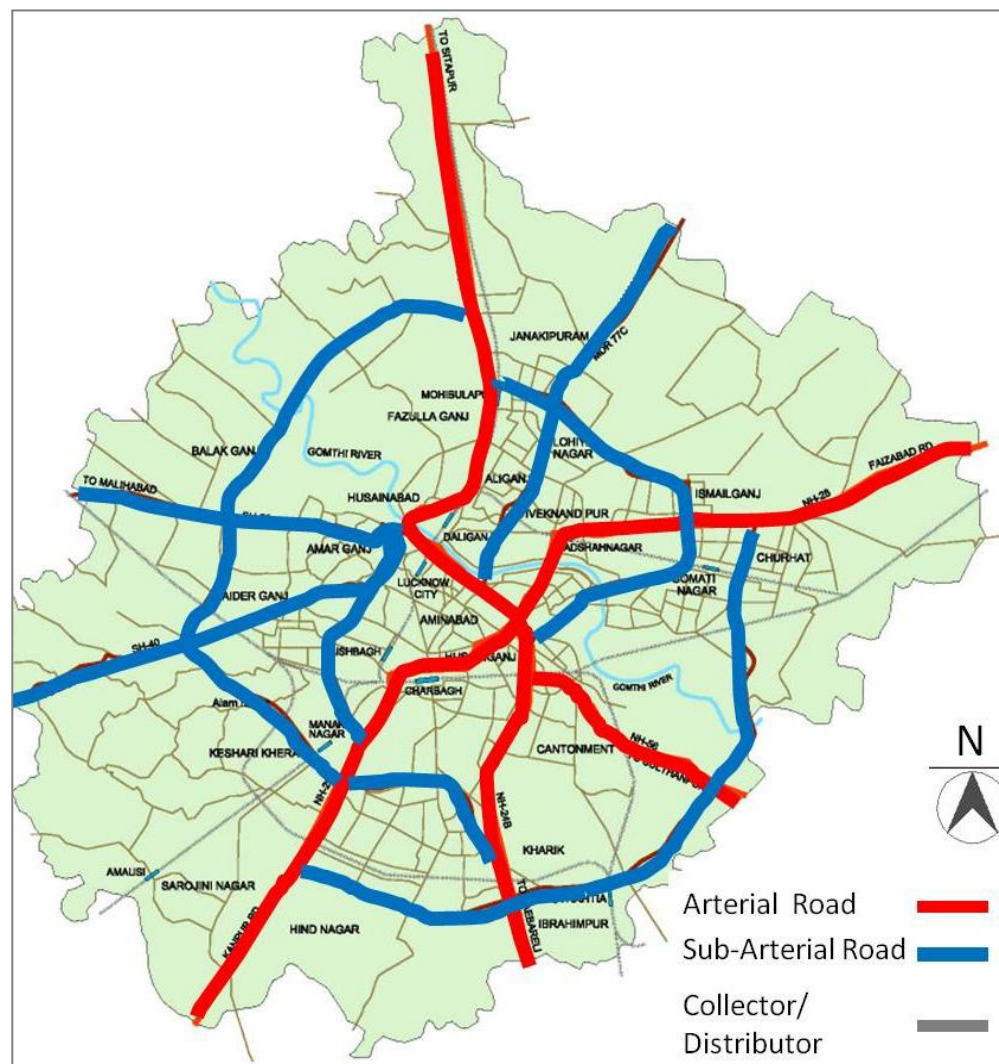


Figure 6-6: Proposed functional road hierarchy of Lucknow

Similarly, all the SHs and Major District Road (MDRS) should be declared as sub-arterial road and there should be ban on on-street parking during peak hours along these roads. Violators should be fined. All other roads will act as collector or distributor.

6.12. Public Transport Plan

To achieve the goals set for the study area, of achieving the modal share of 30% in favour of public transport, the comprehensive mobility plan for Lucknow has proposed adoption of a number of strategies for promotion and development of public transport system. These strategies include:

1. Development of three tiers of Public Transport system which shall include:
 - Mass Rapid Transit System
 - High Density Bus Corridor
 - City Bus Service
2. Restructuring of Intermediate Public Transport particularly 8-seater tempo through route rationalisation and adoption of strategies for sustainable City Bus Service
3. Improvement and development of adequate infrastructure for promotion of public transport and multi-modal integration
4. Implementation of ITS for improving reliability of public transport
5. Adoption of private vehicle usage reducing strategies and policies
6. Adoption of Transit oriented development measures
7. Initiating reform measures in Urban Transport
8. Promoting public participation and campaigning mass awareness programme
9. Encouraging private sector in promotion of public transport

6.13. Development of three tiers of Public Transport system

The CMP for Lucknow has proposed phase-wise development of three tiers of public transport system according to hierarchy of system. Mass Rapid Transport System (MRTS) (such as, bus-based or road-based system like Bus Rapid Transit System (BRTS), rail-based system like Metro rail, Monorail, LRT, etc.) at the highest level of public transport system has been proposed along the routes where higher ridership is estimated. To feed the MRTS system, high-density bus corridor, augmentation and re-organisation of city bus service have been proposed (**Figure 6-7**) The CMP for Lucknow has proposed phase-wise development of public transport system in Lucknow city.

Phase I, Public transport plan for Lucknow (**Figure 6-8**) includes:

1. Rationalisation of IPT Routes: In order to minimise the overlapping of IPT routes with city Bus Service routes and to develop IPT to act as feeder service to the city bus service, IPT services should be restricted within the old city area and the peripheral areas of the city
2. City Bus service along the existing identified routes
3. Increase in frequency of city bus service in order to develop High Density Bus Service along:
 - Corridor-1: Kanpur Road-Station Road-Vidhan Sabha Marg-Ashok Mark-Faizabad Road
 - Corridor-2: NH-56- M.G Road- Sitapur Road

Phase II, Public transport plan for Lucknow (**Figure 6-9**) includes:

1. Augmentation of City Bus Service along the existing city bus service routes
2. Conversion of High Density Bus Service along Corridor 1 and Corridor 2 into Bus-based Mass Rapid Transit System (MRTS) (**Figure 6-9**)
3. Development of High Density Bus Service along Inner Ring Road
4. Increased Frequency of Lucknow – Kanpur Intercity Rail Service with upgradation of existing railway station

Phase III, Public transport plan for Lucknow (**Figure 6-10**) includes:

1. Augmentation of City Bus Service along the existing city bus service routes
2. Introduction of High Density Bus Service along Middle ring road
3. As per LDA proposal, introduction of Rail-based MRTS in two corridors (**Figure 6-11**)
 - Corridor 1: Amausi to Munshi Pulia via Kanpur Road and Faizabad Road
 - Corridor 2: Final EW Corridor from Lucknow Railway Station along Gautam Buddha Marg via Aminabad, Pandey Ganj, City RS, Medical Crossing, Nawajganj and thereafter; along Hardoi Road up to Vasant Kunj

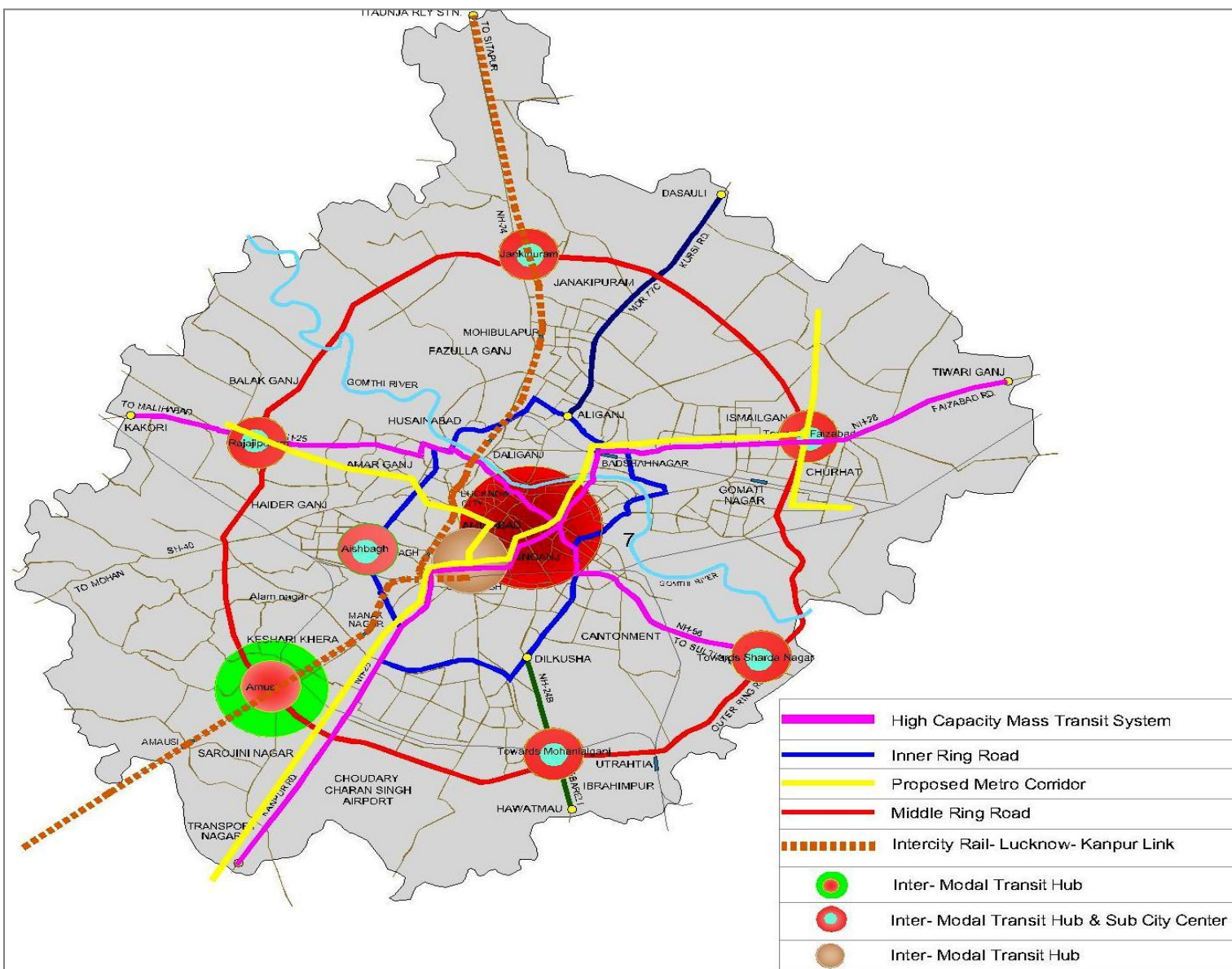


Figure 6-7: Three tiers of public transport system for Lucknow city

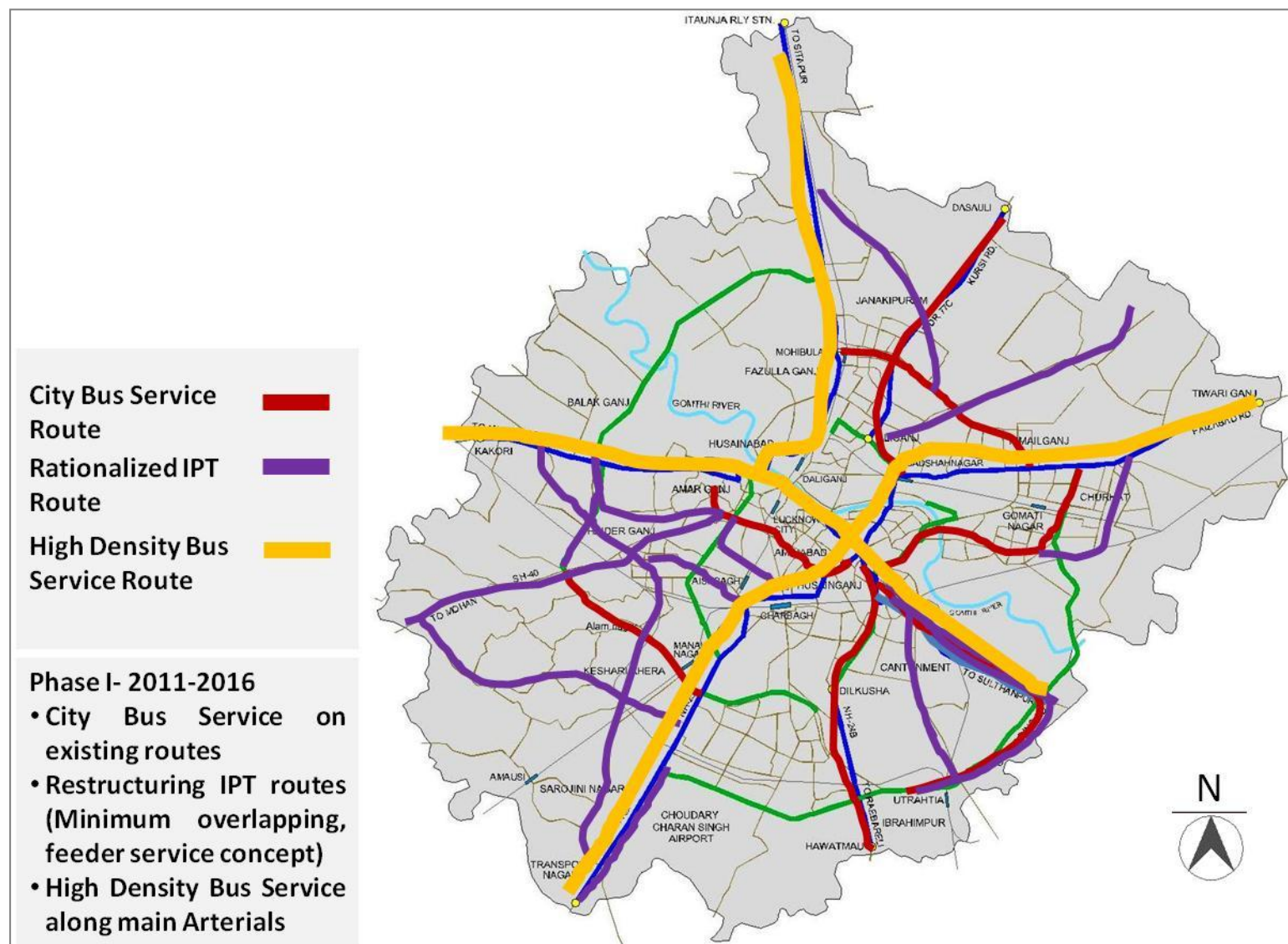


Figure 6-8: Public transport plan for Lucknow city –Phase I

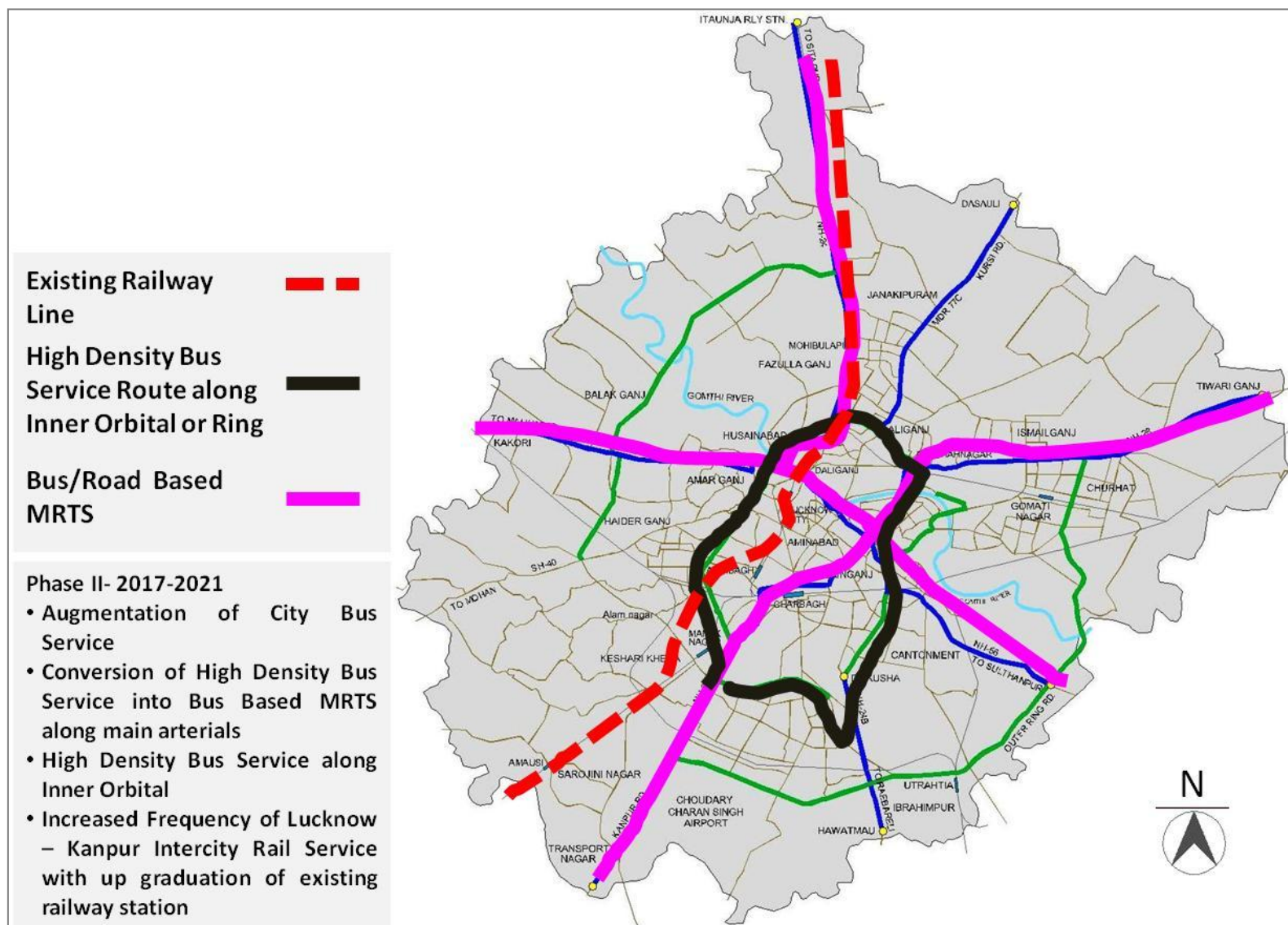


Figure 6-9: Public transport plan for Lucknow city –Phase II

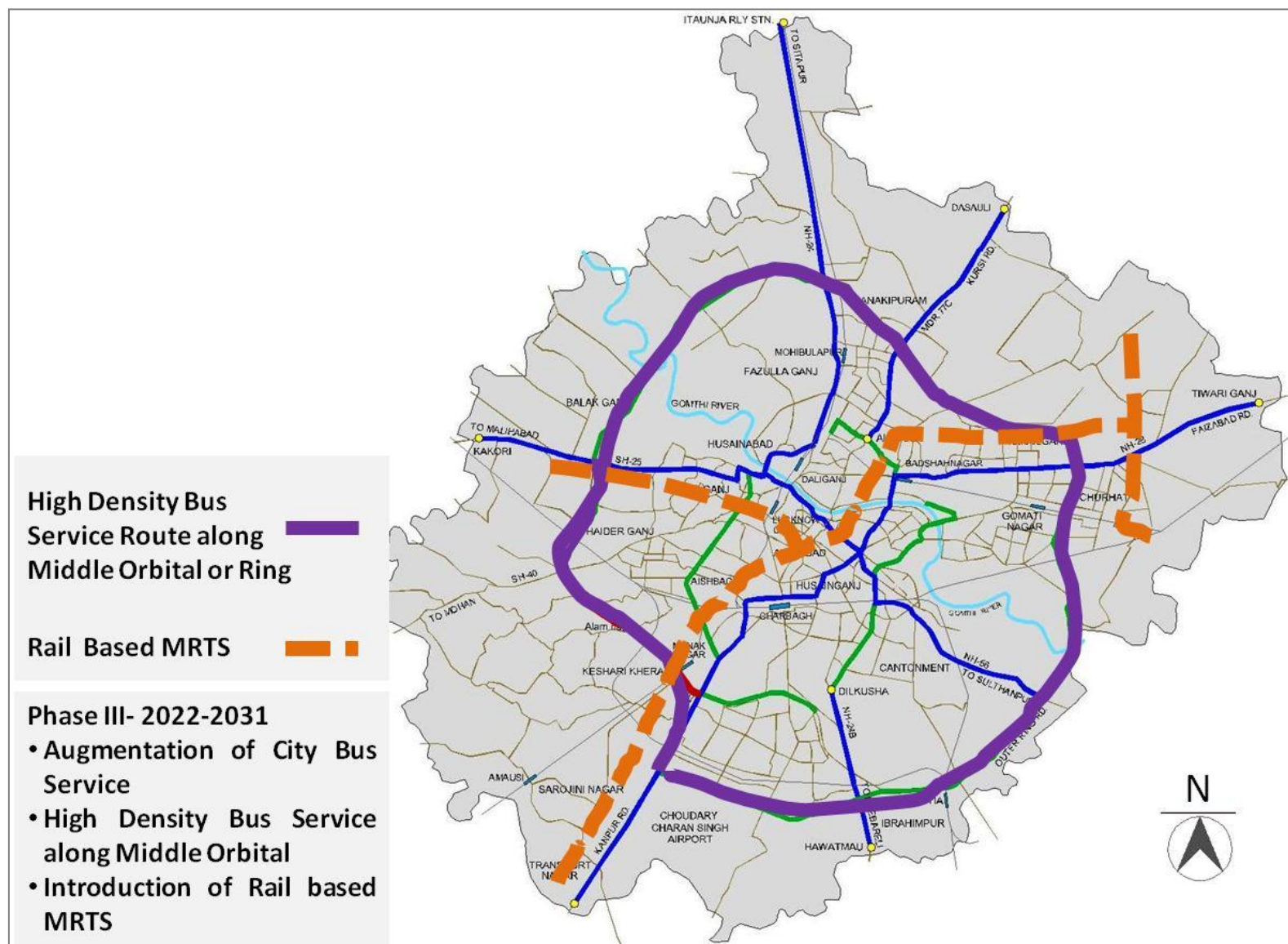


Figure 6-10: Public transport plan for Lucknow city –Phase III

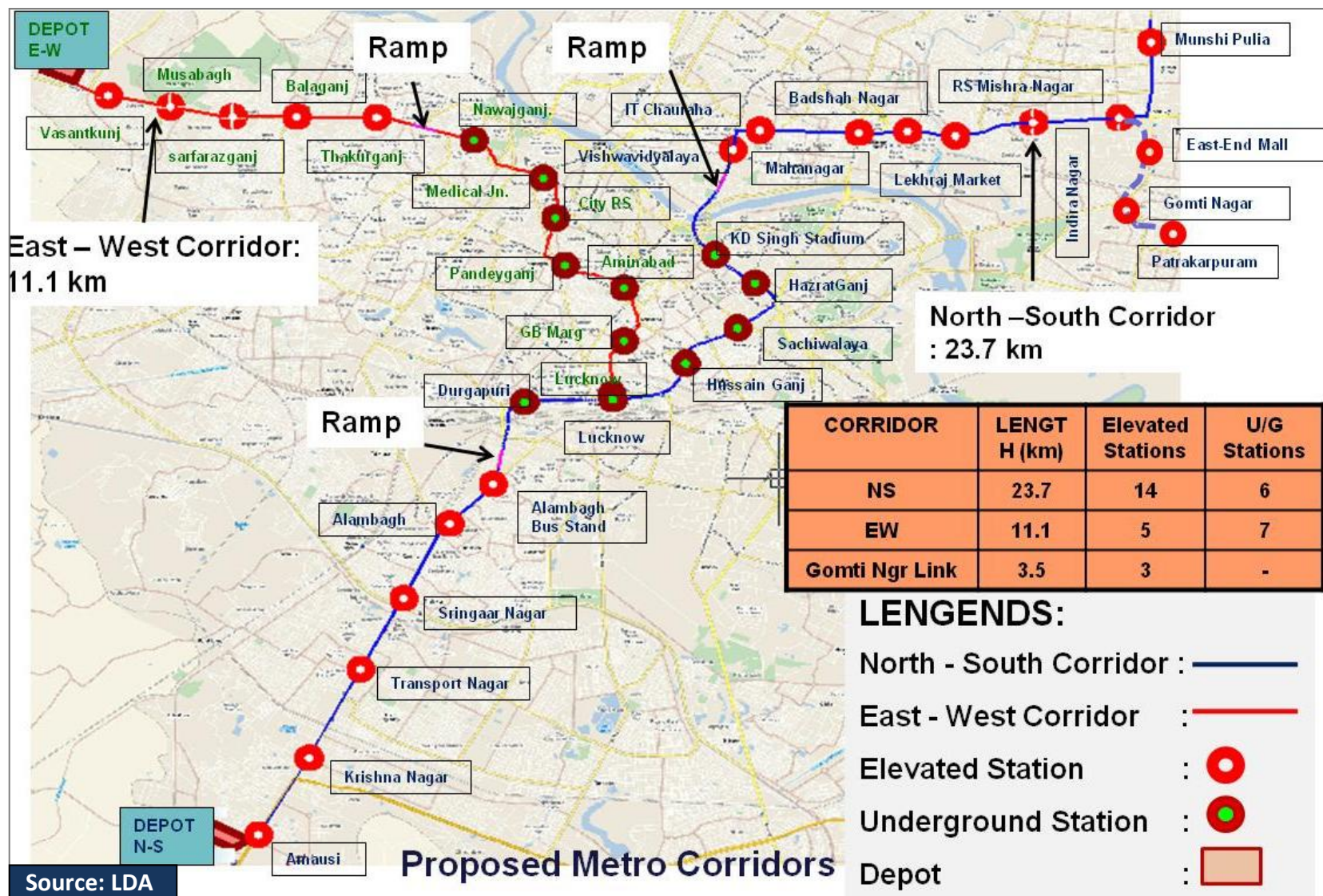


Figure 6-11 : Proposed metro rail project by LDA

6.14. Restructuring of IPT and adoption of strategies for sustainable City Bus Service

As per Government of India's flagship Scheme of JnNURM, Ministry of Urban Development, Government of India, has sanctioned 300 buses for augmenting the city bus service in Lucknow. (Table 6-3). Out of these 300 sanctioned buses, except the semi deluxe buses rest 260 buses are now operated by UPSRTC on 20 identified routes. Since the IPT, particularly the tempo routes, overlaps with almost 90% of the existing city bus service routes, it is clear that route overlapping reduces the commercial viability and sustainability of city bus service. Thus, considering this aspect, the CMP for Lucknow has proposed to develop IPT as a feeder service to the city bus service by rationalising the IPT routes. Figure 6-8 shows the city bus service routes and the rationalised IPT routes. Details of rationalised IPT routes are given in Annexure 4.

Table 6-3 JnNURM Bus Details

Category of buses	Approved No. of Buses
Mini Bus	125
Ordinary buses	90
Semi Deluxe	40
Deluxe Non AC	30
Super Deluxe AC	15
Total	300

6.15. Infrastructure for public transport and multi-modal integration

For development of three tiers of public transport, it is imperative to develop adequate infrastructure. Considering the multimodal integration of different types of public transport, there should be complete and supportive public transport infrastructure. Thus, CMP for Lucknow has proposed the following infrastructures to promote public transport and achieve the objective of 30% share of public transport by 2031. The infrastructure requirement for Lucknow is classified as:

(A) Infrastructure for bus-based public transport: Following are the list of infrastructure requirements for bus-based public transport:

- 1. Improvement of Existing depots and terminals of UPSRTC:** At present, there are four (4) depots at Gomti Nagar, Charbagh, Amausi and Dubagga and ten (10) terminals at Gudamba, Virajkhand, Alambagh, Scooter India, Engineering College, Babu Banarasi Das University, Pasi Qila, Charbagh, Andhe ki Chowki, Budheshwar Chauraha which need to be revamped in order to strengthen the existing city bus service.
- 2. Development of New Terminal and Depots:** Apart from the existing terminal and depots, four (4) new terminal cum depots have been proposed, which are given in **Table 6-4**.

Table 6-4: New Terminals cum Depots for bus Public Transport

S. No.	Name of the site	Area (in Ha)
1	Faizabad and Kursi Marg (Viraj Khand near Hainiman Chauraha)	1.2 - 1.6
2	Kanpur and Hathroi Marg (Dubagga, Hathroi Road)	1.2 - 1.6
3	Sitapur, Kursi Marg (Jankipuram Vistar Yojana)	1.2 - 1.6
4	Raibareli and Sultanpur Marg (Vrindawan Yojana/ near Utrathiya Rly. Station)	1.2 - 1.6

Apart from the depots cum terminals, bus shelters also need to be provided for better operation of bus service. The locations of bus stops are given in Annexure 4.

(B) Infrastructure for rail based public transport: Following are the list of infrastructure requirements for rail based public transport

- 1. Improvement of existing railway station:** Six (6) railway station namely Amausi, Manak Nagar, Aishbagh, Lucknow city, Daliganj and Mohibulapur need to be revamped and re-developed for better operation and passenger amenities. It is proposed to increase the frequency of intercity train between Lucknow and Kanpur for better level of service.

2. Depots for proposed Metro System: As per the proposal of LDA, for the proposed Metro Rail project in Lucknow, it is proposed to develop two depots at Amausi and Basant Kunj

(C) Infrastructure for Multi-modal Integration: For multi modal integration, a multi-modal transit hub at Charbagh has been proposed. This multi-modal hub will integrate the existing Charbagh railway station and Charbagh Bus terminal with proposed bus based Mass Transit System and proposed Metro System.

Figure 6-12 shows the proposed infrastructure for public transport system in Lucknow.



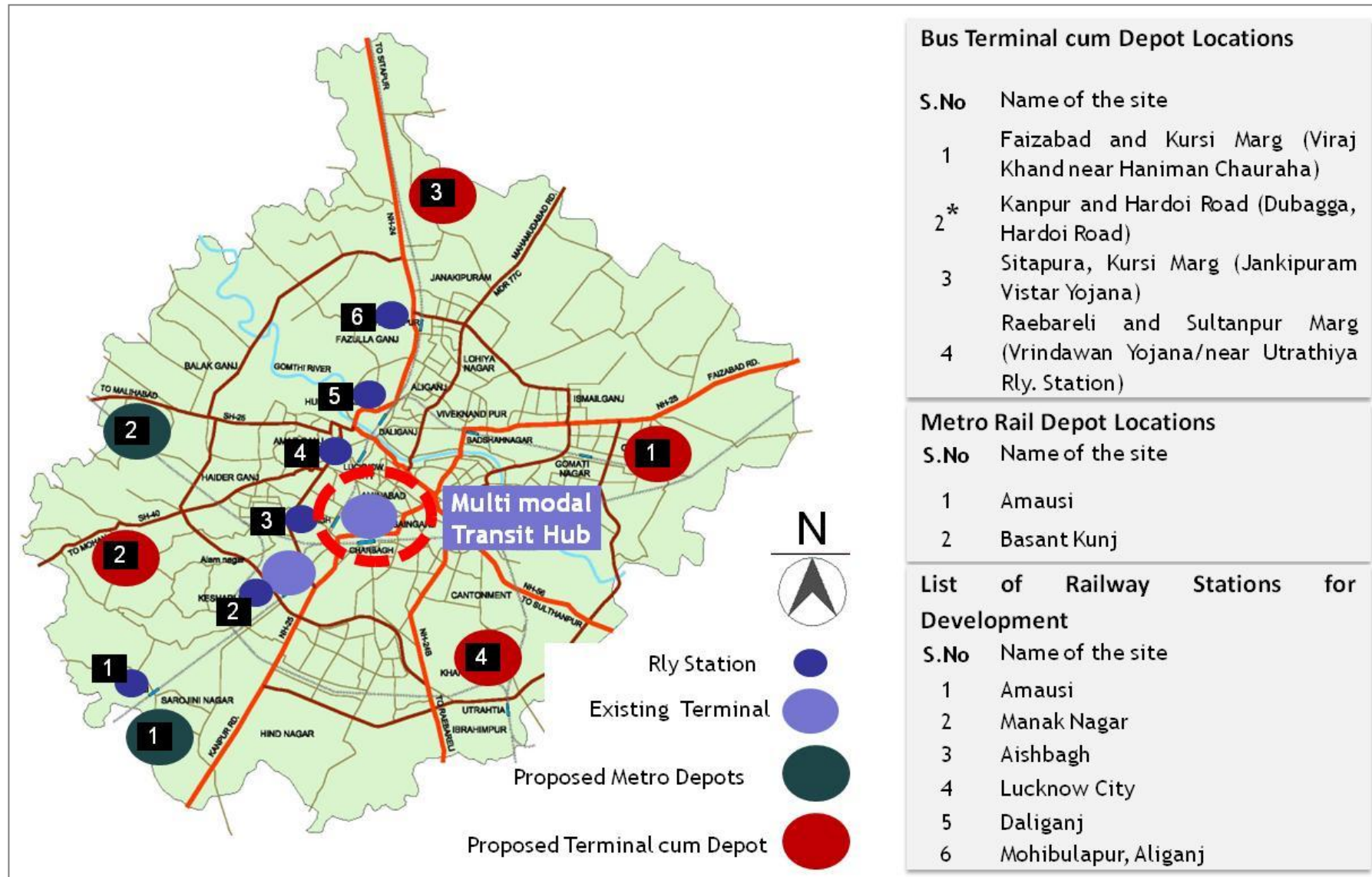


Figure 6-12 : Infrastructure requirement for public transport

6.16. ITS for Public Transport

Lucknow city lacks adept history of organised public transport system, although UPSRTC had started operation of city bus service since 2005 under the banner of Lucknow Mahanagar Parivahan Sewa, because of which the city has been experiencing mushrooming growth of IPT and private modes.

In order to promote public transport in general and city bus service in particular improvement in the quality of service, efficiency, reliability and safety is utmost important which can lead to wider acceptance of the service. In the wake of newly started city bus service under JnNURM, there is an urgent need of installation of ITS and Control system facilities. Installation of ITS will improve the efficiency, reliability, and safety of the city bus service which will create value addition to the service and thereby will contribute to increase in ridership. The CMP for Lucknow has proposed phase wise installation of ITS system for improvement in the quality of city bus service and to promote public transport.

➤ Installation of ITS on vehicles:

- GPS and Data Logger Facilities: The system would record latitude, longitude, fuel consumption data (optional), with time stamp so as to be able to facilitate computation of stoppage data, speed data, distance covered, route deviation, stoppage deviation, skipping of scheduled stoppages, and provide passenger information like next bus queue shelter, expected time to arrive at next bus queue shelter, etc.
- LED display in vehicles capable of providing information of current location of bus and the next stop.
- Automated announcement facilities on the bus to inform the current position of the bus, next stoppage and the time left to reach next stoppage.

- A modem/GSM-based transceiver for maintaining contact between the bus driver and the control centre.
- Fuel sensor to provide correct information on fuel consumption per kilometer, fuel theft, etc.

➤ **Installation of ITS at the bus stops**

- LED display at bus shelter to provide a wide range of message display attributes including the information on departure sequence number, route number, destination, scheduled departure time, predicted time of arrival, etc.
- Communication interlink system for maintaining communication between the bus stop and the control centre

➤ **Installation of ITS at the control station**

- Communication centre (GSM/CDMA/GPRS based)
- GIS Application Software
- Other hardware and software requirements at the control centre

The central control system shall have suitable facilities for detecting and reporting malfunctions and failures of system elements without continuous supervision. The system shall include a comprehensive, efficient and user-friendly Database Configuration Management Tool for managing the process of entering/changing data, verifying the data, testing the data, activating the data in the live data set, distributing the live data set around the whole system (including the vehicle fleet) and withdrawing the data. The tool shall enable the number of routes covered by the system to be increased with minimal disruption to the settings of previously configured routes. In addition to the above mentioned ITS Facilities, it is proposed that the following will be included at a later stage in the second phase for a more comprehensive ITS environment for public transport system management and control in the city.

It also proposes for the introduction of Management Information System (MIS) covering the aspects related to vehicle details, fare collection details, etc.

6.17. Adoption of private vehicle usage reducing strategies and policies

The CMP for Lucknow has proposed a number of measures to reduce the usage of private vehicles, which includes:

- Introduction of different (both) road-based and rail-based Mass Rapid Transit System (MRTS)
- Adoption of parking policy conducive for promotion of public transport

6.18. Adoption of Transit Oriented Development (TOD) measures

The CMP for Lucknow has proposed Transit Oriented Development (TOD) measures as described earlier. Further, it has also proposed Transit Oriented Development (TOD elements in the Building Bylaws, details of which are given in Annexure 6 section 7.6).

6.19. Initiating reform measures in Urban Transport

To effectively promote and implement public transport, a robust institutional arrangement is essential. In line with the Government of India guidelines, it is proposed to set up a single agency that would coordinate public transport services in the city so that there is an integrated service. Refer to Chapter- 9 where the details of institutional setup has been discussed.

6.20. Public participation and Awareness Programme

For successful implementation of the public transport project, it is considered necessary to promote public awareness and create a sense of public ownership of the project. It is necessary to evolve an outreach and education strategy for public transport. Refer to Annexure 5, where public participation and campaigning mass awareness programme has been discussed in detail.

6.21. Encouraging private sector in promotion of public transport

Traditionally, the responsibility of providing public transport lies with the Government financed and operated using resources from taxes and various levies. Over the years, experience have shown that important urban utility services like urban transport is controlled by multiple institutions resulting in fragmentation of functional responsibilities and large scale inefficiencies in service delivery. In order to improve the quality of service delivery of public transport and to effectively infuse and utilise private fund for supply of public transport, participation of private players should be encouraged through adopting various Public Private Partnership (PPP) models. Details of various PPP model have been discussed in Annexure 6.

6.22. Non- Motorised Transport (NMT) Improvement Plan

Forty one percent (41%) of trips in Lucknow are made by Non-Motorised Transport (NMT). The CMP for Lucknow targets these NMT trips. To ensure safe NMT trips, provision of footpath, safe pedestrian crossing facilities and slow moving vehicle lanes are proposed as part of the NMT Improvement Plan.

6.23. Footpaths

A significant portion of the trips (17%) are walk trips; however, 53% of the road network do not have footpath. The target has been set to achieve walkability index of 100% by 2031 from exiting walkability index of 40% in 2010. The CMP for Lucknow has



therefore proposed the development of 280 kms of footpath in phase-wise manner (**Figure 6-13**). The following measures needs be undertaken as a part of improvement in pedestrian mobility:

- Construction of Foot Path on the proposed mobility corridors and also the secondary arterials, as a minimum requirement. It should also be created in all the residential roads, wherever possible.
- A minimum usable width of 1.5 meters should be provided for footpath.
- It is desirable to have a footpath width of 2.0 meter for all roads.
- Obstructions on footpath must be relocated. The footpath must be cleaned and even made comfortable to walk on.
- Footpath design must discourage two wheelers using the footpath during periods of congestion.
- At signalised intersections, pedestrian zebra crossings must be clearly marked.
- Footpaths at all busy intersections must be provided with handrails to enforce pedestrians cross at zebra crossings.

6.24. Bi-cycle Lanes

Several trips exceeding a trip length of 2 km are made through bi-cycle. Sixteen percent (16%) of the trips in Lucknow are made by cycles. To encourage and cater to these trips, dedicated bi-cycle lanes should be provided. The non-motorised vehicle lanes must be continuous and form a network. CMP for Lucknow has proposed the development of 250 kms of cycle track in three phases (refer to **Figure 6- 13**)

Figure 6-13 shows, the phase-wise development of NMT plan (development of footpath and bicycle lanes) and the phase details are given below.

Phase I NMT Plan: NMT network is proposed to be developed the following areas:

- Core city areas of Hazratganj, Aminabad, Chowk and other old city areas



- In the Phase I, the CMP for Lucknow has proposed to develop approximately 90 Km of footpaths and approximately 60 Kms of bicycle lanes.

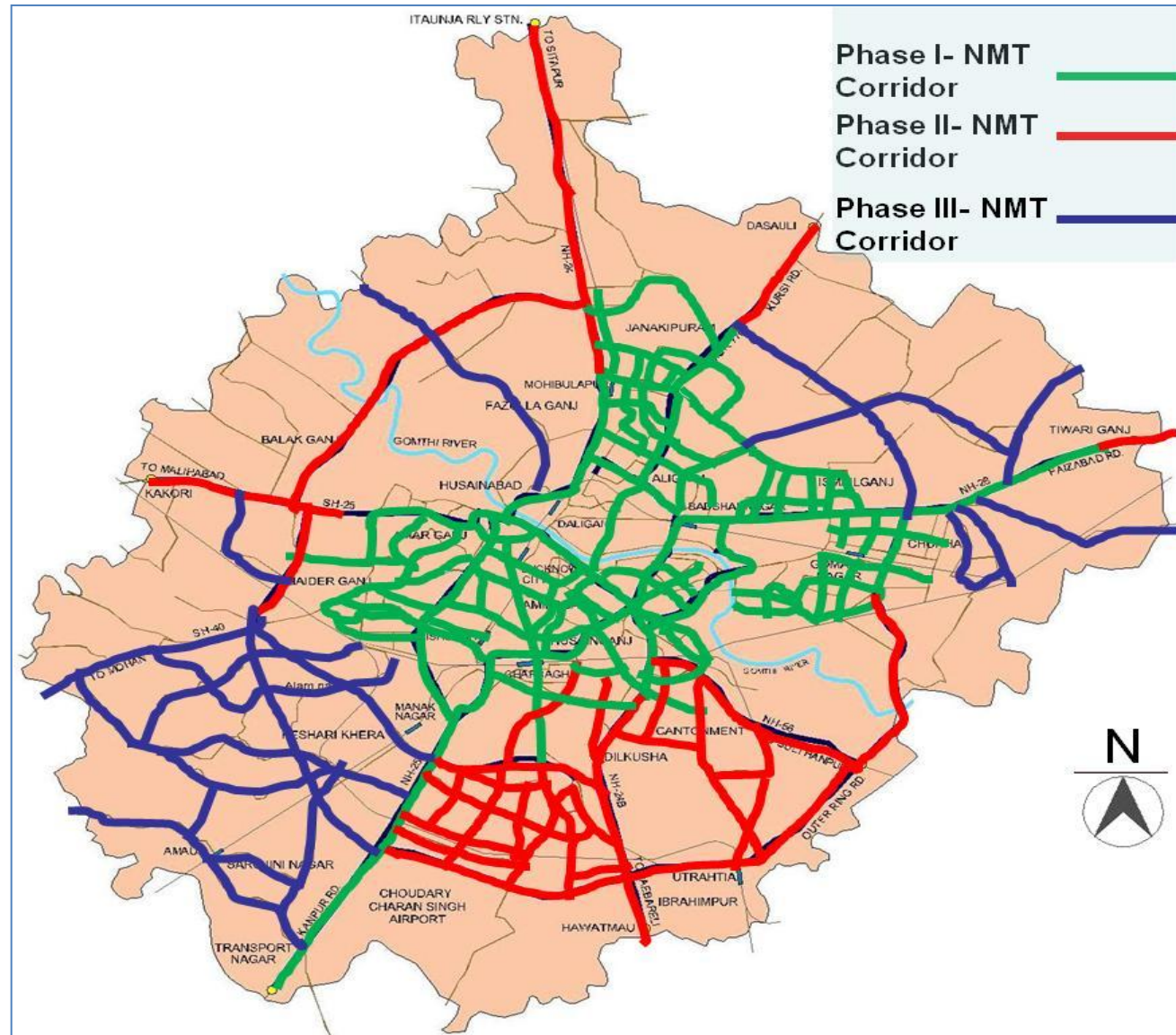


Figure 6-13: Proposed NMT plan

Phase II NMT Plan: NMT network is proposed to be developed in the following areas and networks:

- Sitapur Road,
- Major Roads of Anand Nagar, Ashiyana Colony, etc.

In Phase II, approximately 95 Km of footpaths and bicycle lanes need to be developed.

In the Phase III, the CMP for Lucknow has proposed the development of NMT network in remaining networks, which is approximately 95 Kms of footpaths and bicycle lanes.



6.25. Pedestrian Facilities at Intersections

Pedestrian Safety is one of the key features that needs to be addressed under urban transport planning for any city. A continuous, obstacle-free movement of pedestrians is possible when there is a seamless pedestrian walkway network on urban roads. For this purpose, intersections act as crucial areas of focus for safe pedestrian movement. The following list of intersections has been selected based on the pedestrian volume study for installation of pedestrian signals along with necessary road-markings (**Figure 6-14**).



Figure 6-14: Locations of junctions for pedestrian signal

1. Novelty Cinema Chowk, Lalbagh
2. Kaiserbagh Rotary
3. Nehru Crossing , Rakabganj
4. Ganga Prasad Intersection, Aminabad
5. Naka Chowk
6. Aminabad Chowk (GB Road)
7. Gautam Budha Road Chauraha
8. Medical College Chauraha
9. Nachtara Chauraha (Daliganj Bridge)
10. Huseria Chauraha
11. Engineering Chauraha
12. Parivartan Chauraha
13. Chowk Chauraha
14. Kapoorthala Chauraha
15. Mithaiwala Intersection



Figure 6-15: Locations of junctions for grade separated pedestrian facility

Based on traffic and pedestrian flow data, following locations (refer to Figure 6-15) are recommended for grade separated pedestrian crossing facility:

1. Charbagh
2. Polytechnic Chauraha
3. Alambagh
4. Allahabad Bank Chauraha
5. Mahanagar Boys

6.26. Cycle Rickshaw Management Plan

Cycle rickshaws play a very important role in the city as they cater to a large number of short distance trips (1-5 km) in any city. A significant number of short distance trips are being catered by cycle rickshaw in Lucknow city. Cycle rickshaw constitutes 8% of total trips.

In addition, Cycle rickshaw is one of the most eco-friendly modes of transport and generates employment for the economically weaker section of the society. With the intention to streamline traffic, Modern Cycle rickshaw stands are required at major locations across the city with the following facilities:

- ❖ Sitting facility
- ❖ Fare Chart
- ❖ Free-of-cost drinking water facility for the registered cycle rickshaw pullers
- ❖ Free-of-cost urinal and bathing facility for the registered cycle rickshaw pullers
- ❖ Rickshaw repair facility

- ❖ Night Shelters for the cycle rickshaw pullers subject to land availability by the Municipal body

The CMP for Lucknow has proposed the development of modern cycle rickshaw stand in old city areas.

6.27. Core area NMT corridor

The areas such as Chowk, Aminabad, Hussainabad etc. form the old city area of Lucknow city. A distinguishing characteristic in Lucknow is that all the activities, such as commercial or recreational gathering, takes place mostly at the mouth of the junctions. Slow moving traffic such as cycle, cycle rickshaw, animal cart etc. in the old city areas along with fast moving traffic leads to congestion and safety hazards for NMT users. CMP for Lucknow thus proposed to segregate the slow moving traffic from the fast moving traffic to improve the speed profile and avoid mixing of traffic, which acts as a safety hazard for the NMT. The component to be added to the lane after removal of encroachments and roadside parking is provision of foot path on both sides with width of 1.5.

6.28. Freight Management Plan

The plan envisages development of Transport Nagar, Terminal, adoption of regulatory measures for movement in the city, ban on aged vehicles etc. They are proposed to be developed in three phases. The details are given below.

Phase 1: Figure 6-16

1. Improvement of existing Transport Nagar
 - Segregating loading/unloading lanes
 - Road Improvement
 - Parking Bays

-
- Terminal facilities, like public utilities, rest rooms for drivers and labours
 - Weighing Machines
2. Movement Restrictions of heavy vehicles in the city from 08:00 am – 09:00 pm.
 3. Abolishing renewal of licenses for old goods vehicles

Phase 2: Figure 6-17

1. Development of new goods/truck terminal towards Faizabad Road, in proximity to the Outer Ring Road
2. Identification of a Mobility Corridor for Goods Vehicles, movements to be restricted completely on all other roads
3. Ban on all animal carts being used for goods movement

Phase 3: Figure 6-18

1. Setting up of truck terminals at the following locations
 - Towards Deva Road
 - Towards Kurchi Road
2. Segregated high speed outer Bypass Road
3. Promotion of Use of small and medium size vehicles with modern emission controls in the central city areas

All the proposed new Truck Terminal or the Transport Nagar will have the following facilities:

- Area for Transport Agencies
- Area for Circulation
- Area for Parking
- Open Space
- Petrol Pump
- Service Centre

-
- Toilets
 - Police Station
 - Restaurant
 - Shops
 - Godown Facility
 - Weigh Bridge
 - Stalls/Dhabas
 - Administrative Office
 - Fire Station, Dispensary, Post Office
 - Bank, Bus Station, Electric Substation
 - Cold Storage
 - Spare Parts Shop , Body building shop

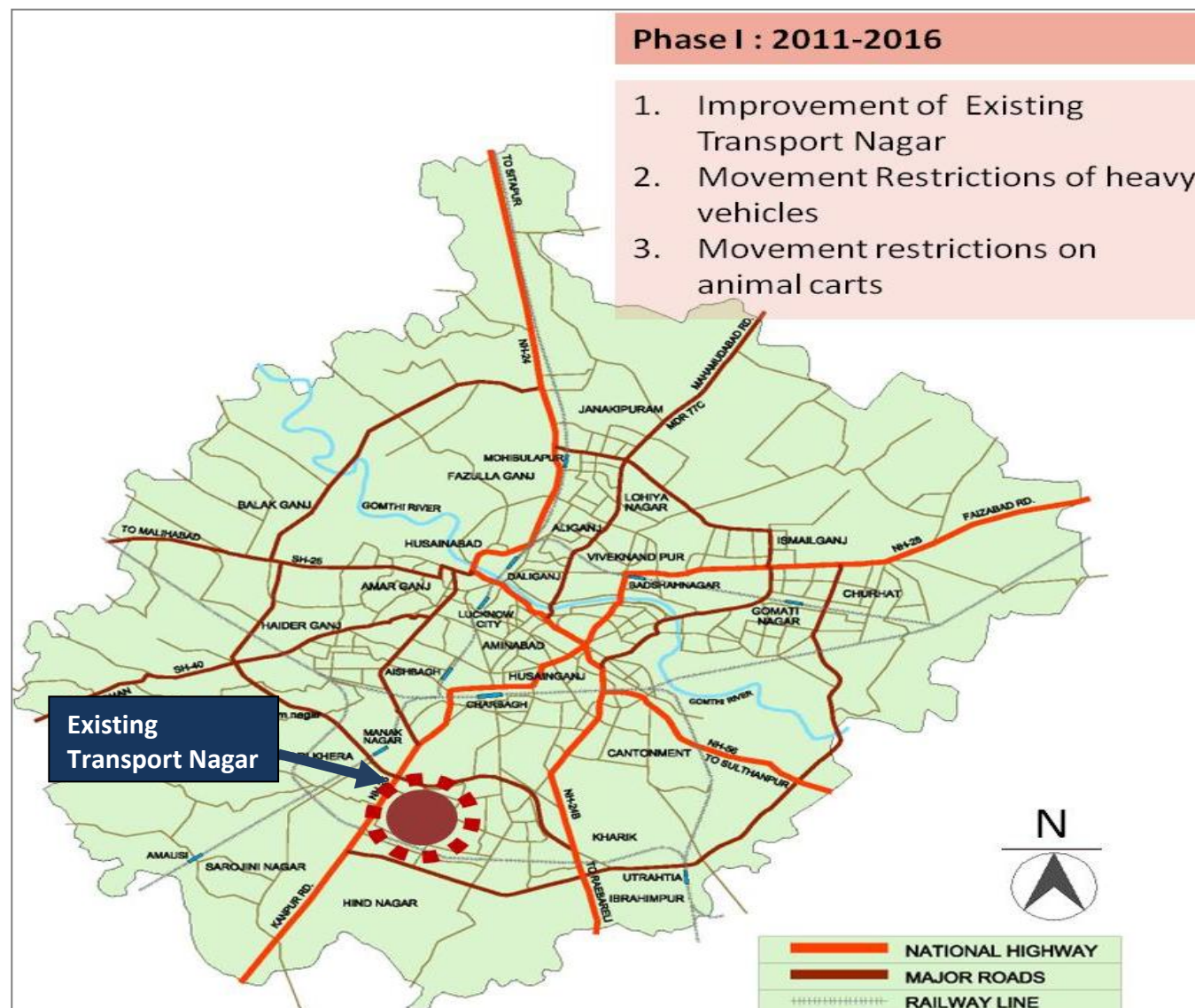


Figure 6-16: Location of existing truck terminal

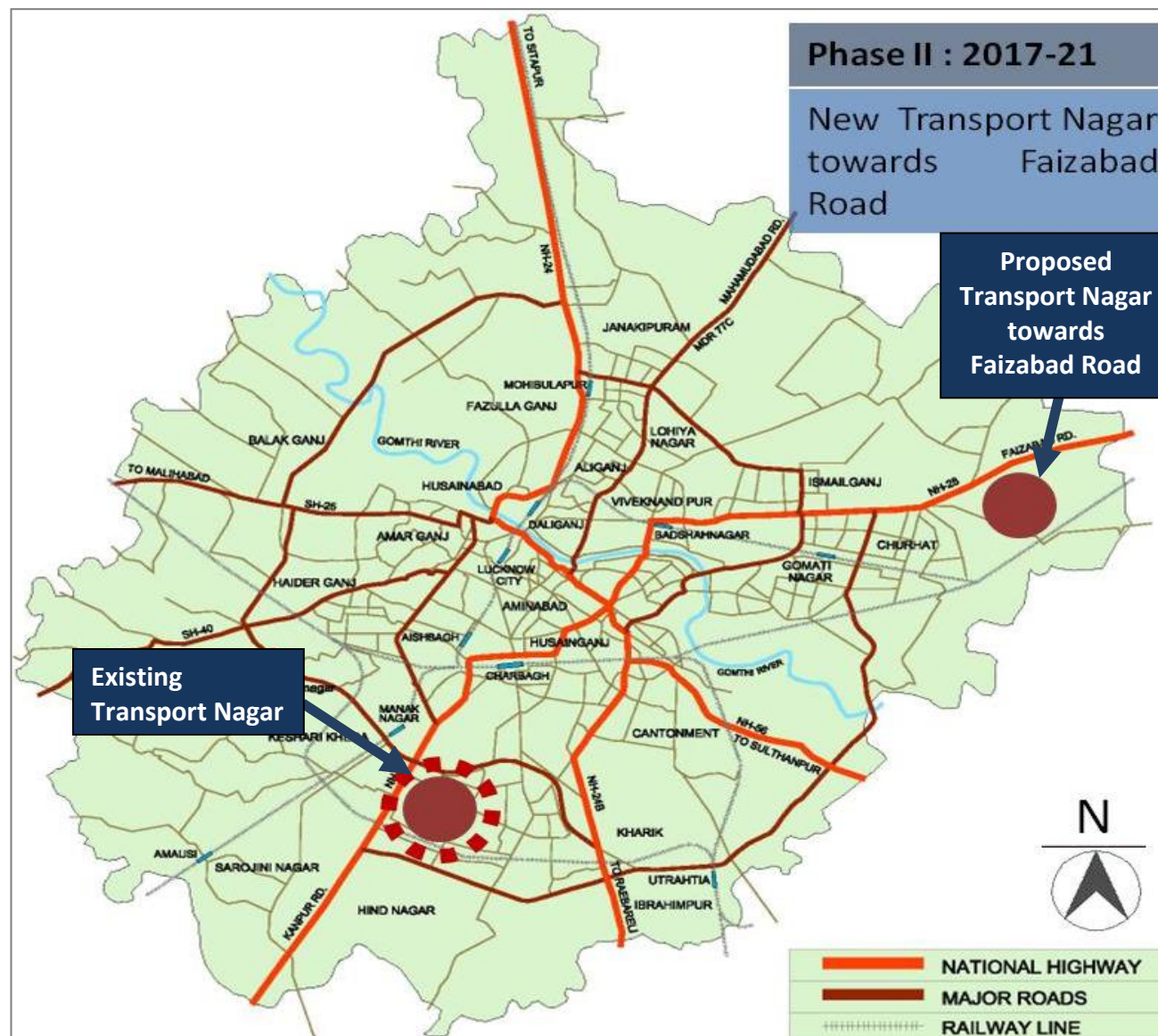


Figure 6-17: Location of proposed truck terminal



Figure 6-18: Location of proposed truck terminal and signal free bypass road

6.29. Traffic Management Plan

6.29.1. Junction Improvement

Junctions are the major sources for bottlenecks in the transportation network. As traffic increases on major roads, to improve safety and to provide orderly movement of vehicles, improvements of junction such as installation of traffic signals, geometric improvements etc. are necessary. The basic problems of junctions and suggested intervention measures are given in the **Table 6-5**.

Table 6-5: Problems and suggested interventions

Problems at Junction	Suggested Interventions
<ul style="list-style-type: none"> • Poor road geometrics • Lack of pedestrian facility • Commercial activities at the mouth of the junction • Boarding and alighting takes place at the junction only • Bus stand near side to the junction • Heterogeneous traffic movement • Parking of private vehicles • Encroachment by hawkers & shop keepers • No designated space for IPT, such as shared auto stoppage • Poor enforcement 	<ul style="list-style-type: none"> • Provision of footpath • Road Medians • Removal of temporary encroachment from the junction • Shifting of IPT/NMT/Bus stands at least 200 m away from the junction. • Improvement of turning radius • Pedestrian crossing demarcation • Road Marking

Based on the primary survey, and stakeholder consultation, the CMP for Lucknow has identified 23 junctions for improvement, which are as follows:

- | | |
|--|---------------------------------|
| 1. Allahabad Bank Chauraha, Hazratganj | 14. Chowk Chauraha |
| 2. Novelty Cinema Chowk, Lalbagh | 15. Kapoorthala Chauraha |
| 3. Kaiserbagh Rotary, | 16. Mafaire Cinema Intersection |
| 4. Nehru Crossing , Rakabganj | 17. High Court Intersection |
| 5. Alambagh Chauraha | 18. Haathi Park Intersection |
| 6. Naka Junction | 19. Times of India Intersection |
| 7. Aminabad Chowk | 20. Dainik Jagran intersection |
| 8. GB Road /Gautam Buddha Road Road Chauraha | 21. Mahanagar Intersection-1 |
| 9. Medical College Chauraha | 22. Mahanagar Intersection-2 |
| 10. Polytechnic Chauraha | 23. Teli Bagh Intersection |
| 11. Huseria Chauraha | |
| 12. Engineering Chauraha | |
| 13. Charbagh Tiraha | |

Figure 6-21 shows the proposed intervention measures for Kaiserbagh rotary and Nehru crossing, Rakabganj respectively as concept of junction improvement, with improvements such as dismantling of existing median, structures, pedestal, provision of footpaths and separators, provision of road marking etc.

1. Allahabad Bank Chauraha,
Hazratganj
2. Novelty Cinema Chowk,
Lalbagh
3. Kaiserbagh Rotary,
4. Nehru Crossing , Rakabganj
5. Alambagh Tiraha
6. Naka Junction
7. Aminabad Chowk
8. GB Road Chauraha
9. Medical College Chauraha
10. Polytechnic Chauraha
11. Huseria Chauraha
12. Engineering College
Chauraha
13. Charbagh Tiraha
14. Chowk Chauraha
15. Kapoorthala Chauraha
16. Mafaire Cinema
Intersection
17. High Court Intersection
18. Haathi Park Intersection
19. Times of India Intersection
20. Dainik Jagran intersection
21. Mahanagar Intersection-1
22. Mahanagar Intersection-2
23. Teli Bagh Intersection

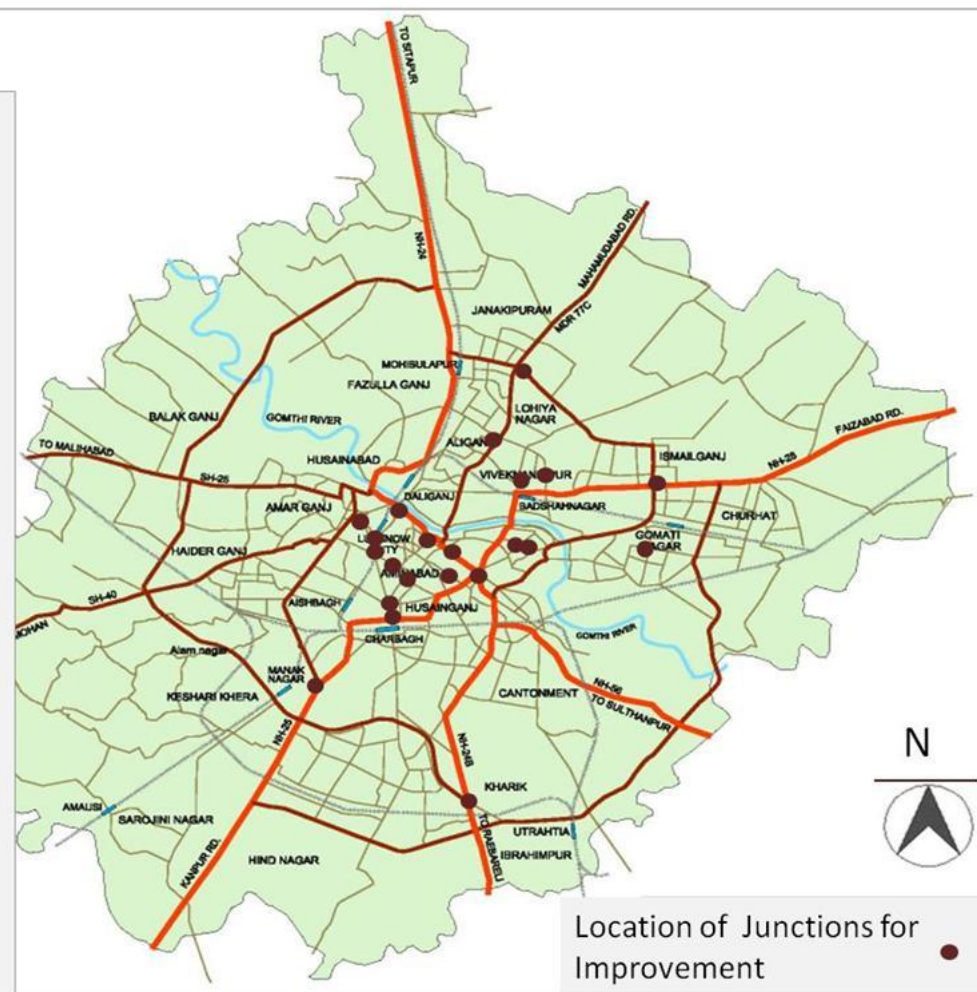


Figure 6-19: Location of junctions identified for improvement

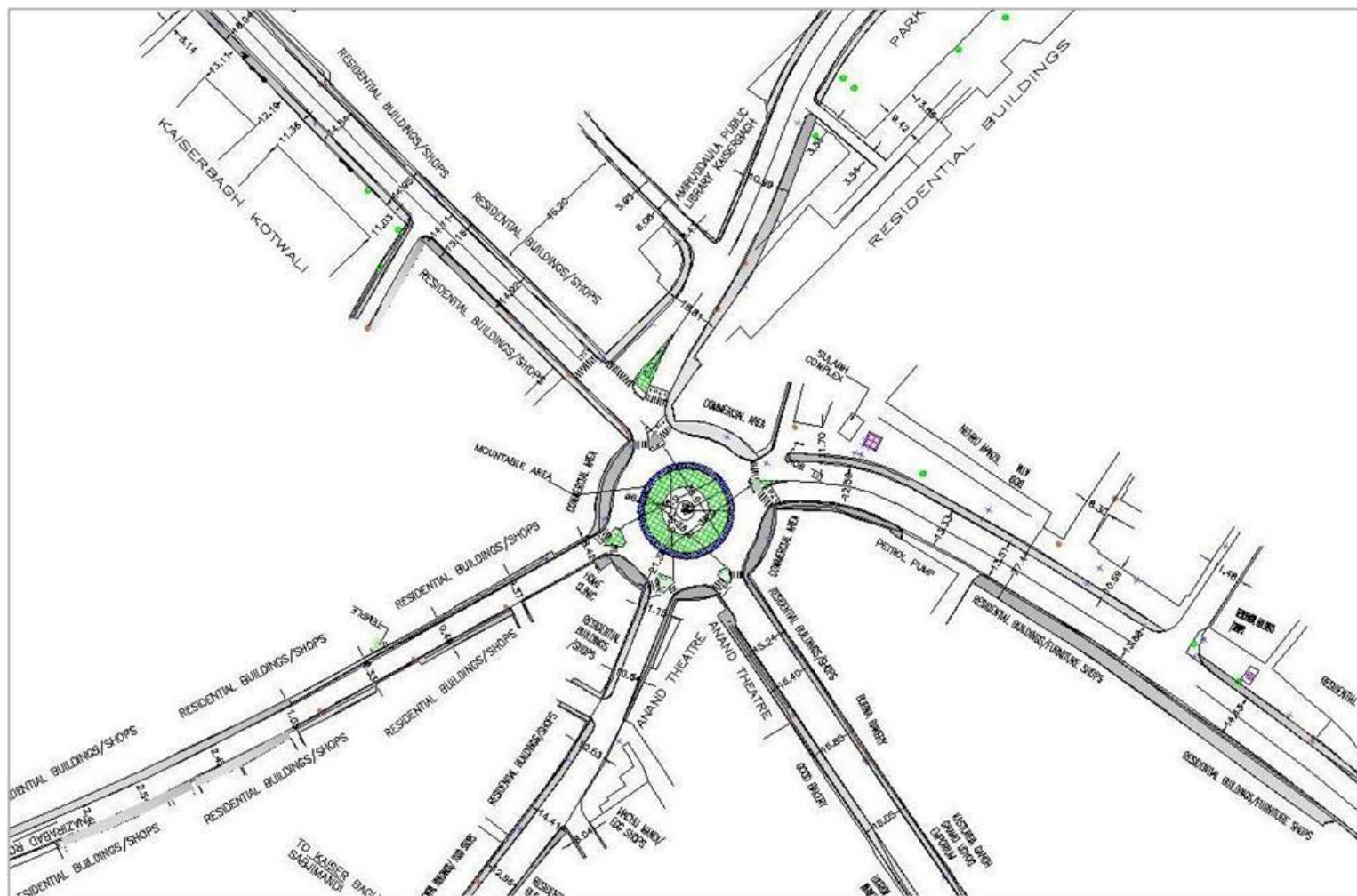


Figure 6-20: Suggested improvement measures for Kaiserbagh Chowk

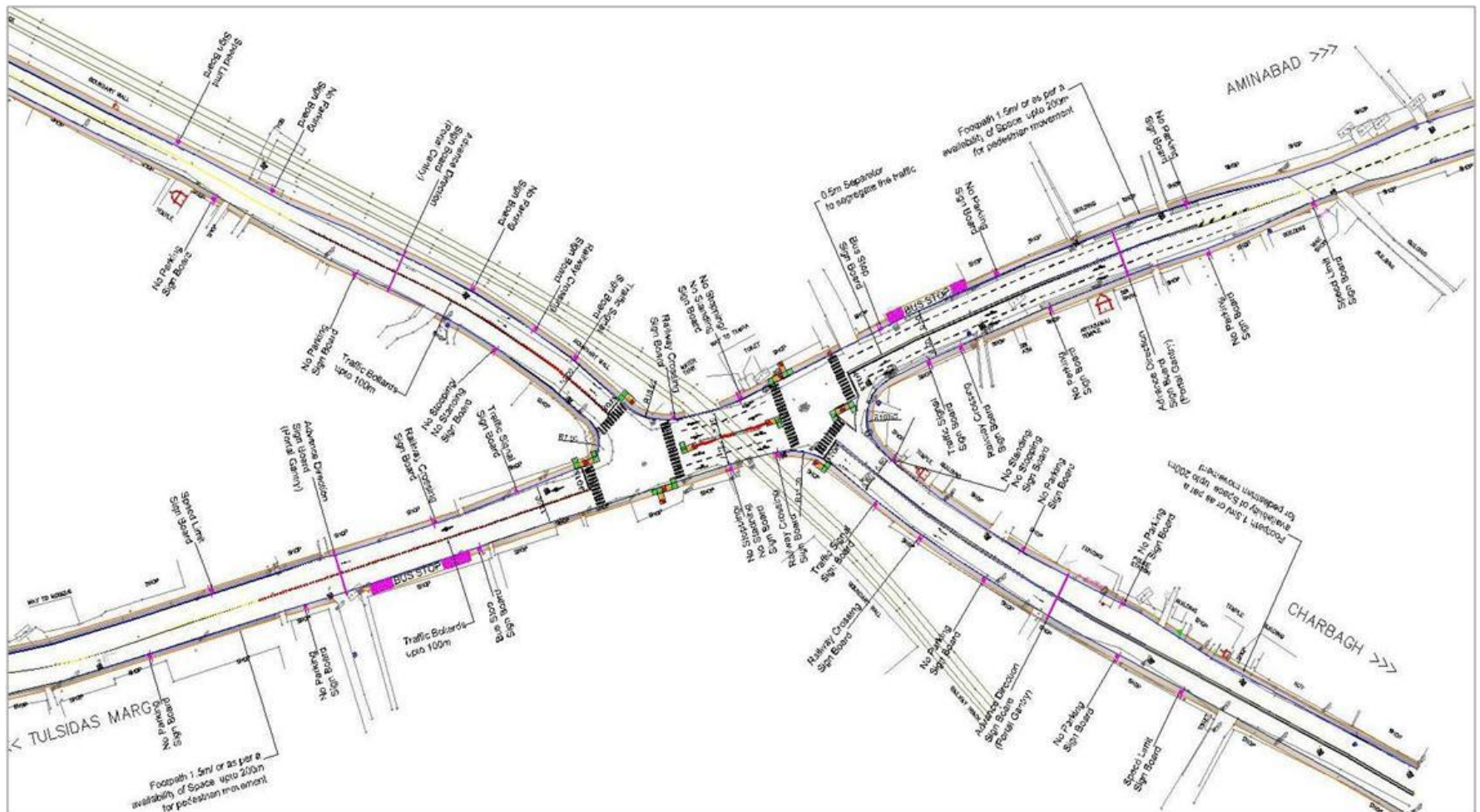


Figure 6-21: Suggested improvement measures for Rakabganj Chowk

6.29.2. Pavement Markings and Signage

It is recommended that proper signs should be marked at appropriate locations. Road signs are classified into three categories: Mandatory/Regulatory signs, Cautionary/Warning signs, and informative signs. It is recommended that signs near schools should be installed on priority basis. Traffic control facilities such as Center line, Traffic lane lines, Stop lines, Pedestrian crossings, Parking space limits, Kerb marking for visibility, Obstruction marking etc. must be provided keeping in view all users of the road and especially for night time driving.

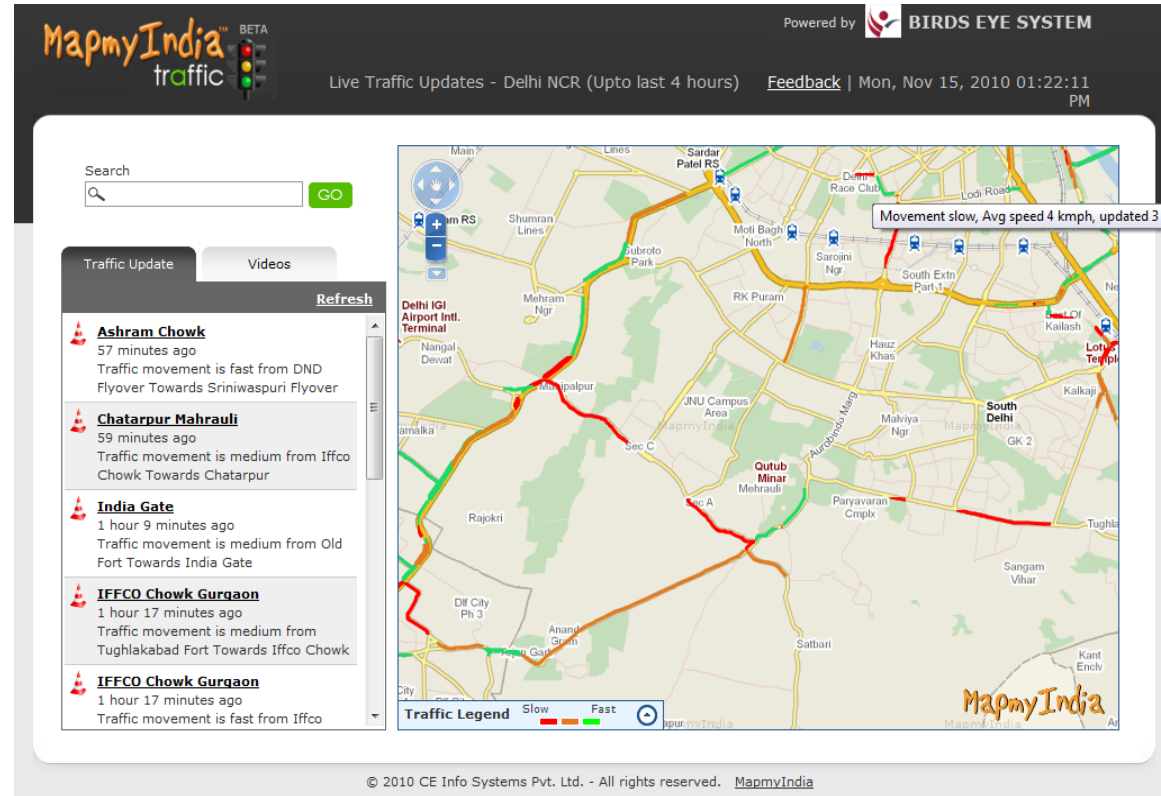


Figure 6-22: Traffic signages

All the traffic signs should be facilitated as per the guidelines provided in IRC publication 67-2001. **Figure 6-22** which shows the different traffic signages.

6.29.3. Traffic Information and Management Control Centre (TIMC)

The Area Traffic Control Systems shall link various elements of Intelligent Transportation Systems such as vehicle-actuated traffic signals, surveillance cameras, and enforcement cameras etc., enabling decision makers to identify and react to an incident in a timely manner based on real-time data. The ATC will help reduce incident response times, lower incident rates (mainly secondary incidents), disseminate traveler information and hence reduce congestion and enhance safety. As a first step, simple real time traffic monitoring equipments are proposed to be installed that result in traffic assessment on various corridors within the city and can be accessed by the users and enforcement agencies on the web.



6.29.4. Area Traffic Control Mechanism (ATC)

Based on the traffic movement pattern, the following corridor should be brought under ATC system (**Figure 6-23**):

1. **Corridor-1:** Joining Kanpur Road from Airport, Station Road, Vidhan Sabha Marg, Ashok Marg, Faizabad Road upto Polytechnic Chauraha
2. **Corridor-2:** Joining NH-24B from near to Command Hospital, NH-56, M.G Road, University Road, Kurshi Road, MDR-77, Sitapur Road
3. **Corridor-3:** Joining State Highway-25 from Machchhi Bhawan to Dubagga Chauraha
4. **Corridor-4:** Joining Tulsi Das Marg from Medical College Chauraha, State Highway-40 upto near Alamnagar station

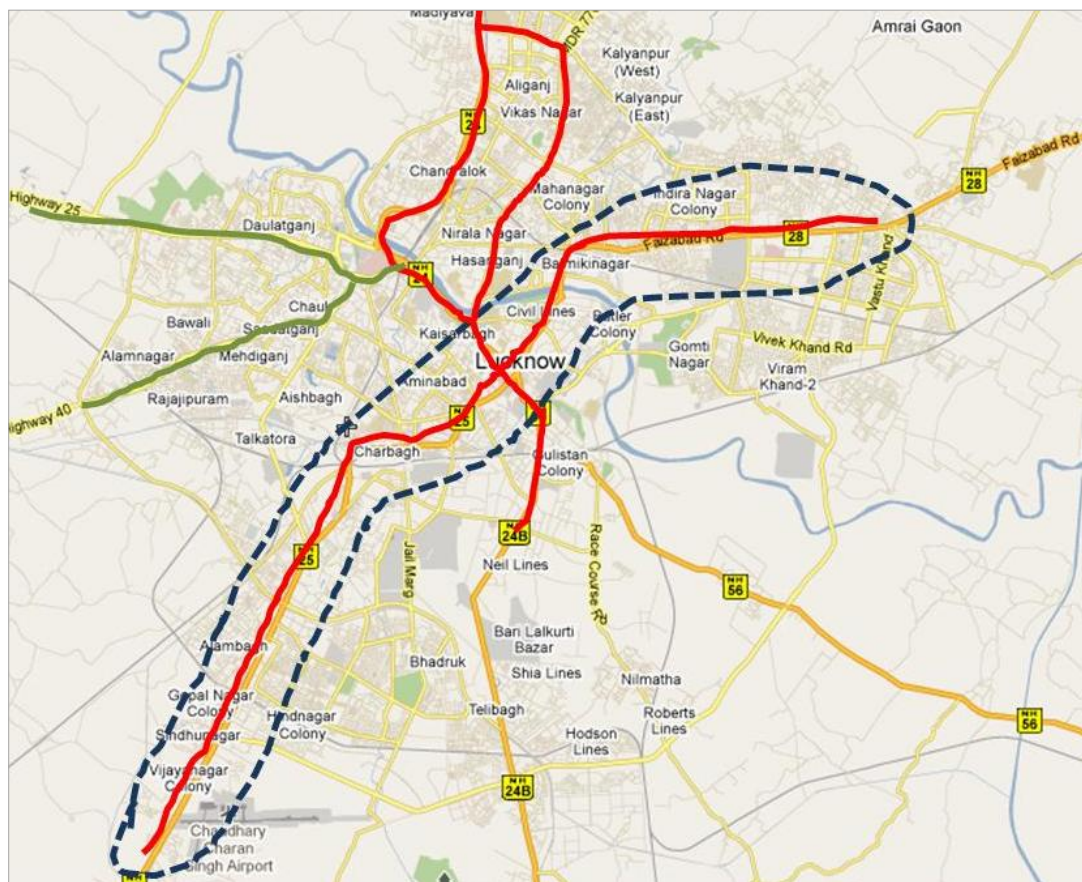


Figure 6-23: Suggested corridors for area traffic control system

The junctions along the above-mentioned corridors should be brought under Area Traffic Control system with signal optimisation technique.

6.29.5. Safety Measures

Poor road geometry and lack of traffic sense of both drivers and pedestrians increases the incidence of accidents. Many of the accidents occur due to the casual approach of the road users towards driving rules, safety precautions, and regulations. The following action programmes are proposed for implementation to enhance the safety of the road users:

- ❖ Black spots need be identified along the major roads and specific improvements must be proposed at those locations. A Road Accident Analysis System based on the accident database must be implemented for accurate reporting and use in geometric improvements
- ❖ All speed breakers and humps be marked and signed adequately for night time visibility
- ❖ All traffic signage should be made retro reflective
- ❖ Create traffic safety patrol programmes for student volunteers at all schools
- ❖ Install pavement markings at all radial arterials and other major sub-arterials
- ❖ Provision of adequate street lighting on all arterials, sub-arterials, collectors, and local roads
- ❖ Setting up of a Road Accident Analysis System (RAAS)

6.29.6. Parking Management Plan

Lucknow city is facing acute shortage of parking facilities. Lack of adequate off-street parking places has further aggravated the situation leading to on-street parking in almost all the roads. Although some of the on-street parking facilities are regulated by Lucknow Nagar Nigam, a large number of on-street parking takes place due to lack of proper enforcement. Presently, Lucknow Development Authority (LDA) and Lucknow Nagar Nigam (LNN) have proposed the construction of a number of off-street parking facilities within the city to solve the chaotic parking problem of Lucknow to some extent. The CMP for Lucknow on the one hand proposes the creation of off-street parking facilities in order to augment the parking supply, and, on the other hand, seeks to

discourage the use of private vehicles by promoting public transport, and thereby tries to reduce the demand for parking. The locations of proposed for off-street parking are as furnished below; and the phase wise details are shown in **Figure 6-24** and

Figure 6-25:

1. Hazratganj
2. Sarojini Naidu Park
3. Dayanidhi Park
4. Lalbagh (Opposite LMC office)
5. Near Charbagh
6. Near Kaisarbagh UPSRTC Workshop
7. Near Aminabad Hanuman Temple
8. Near Thakurganj
9. Chandra Sekhar Azad Park (Indira Nagar)
10. Alambagh Market



Referring to **Figure 6-25**, the construction of off-street parking space at Hazratganj, Sarojini Naidu Park, Dayanidhi Park, Lalbagh (opposite LMC office) has already been started. In order to reduce the parking demand, a draft parking policy measures have been framed for Lucknow, which is given in Annexure 6.

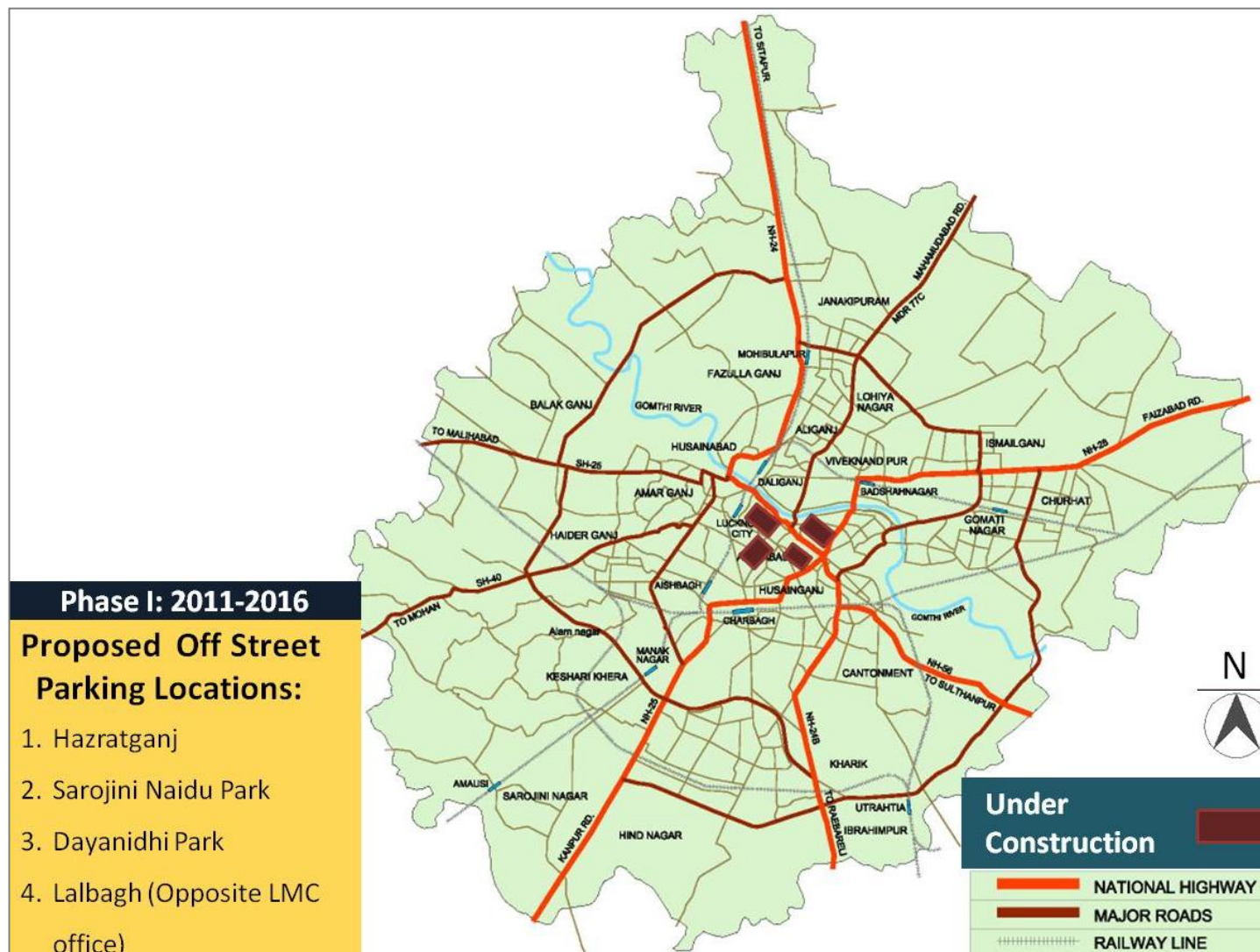


Figure 6-24: Off-street parking locations in phase I

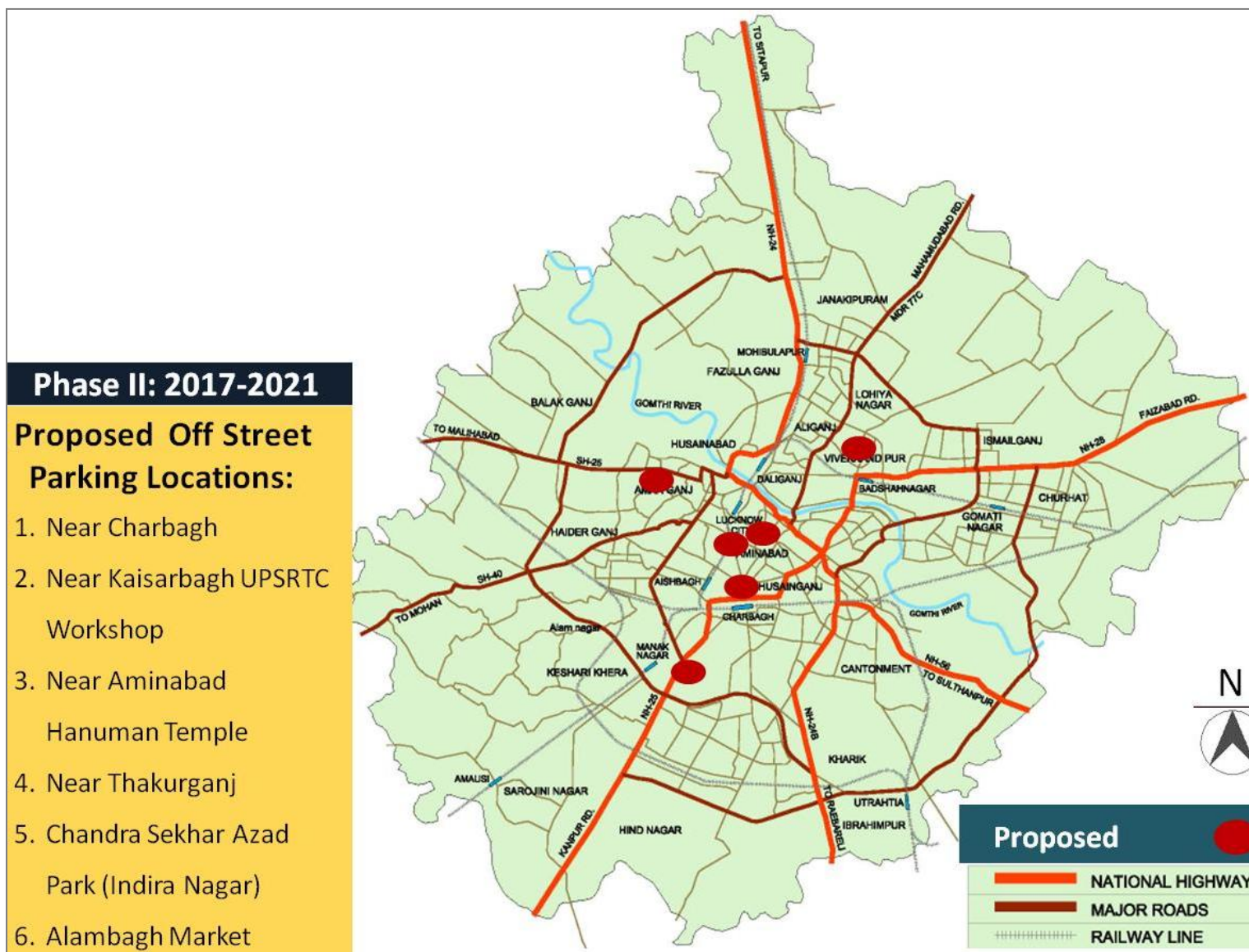


Figure 6-25: Off-street parking locations in phase II

6.29.7. Traffic Management - One Way System

As part of the study, the CMP has identified the following areas for traffic improvement schemes such as creation of one-ways, provision of signages, relocation of parking, IPT Stands, etc. However, the areas identified in this report needs to be further studied and analyzed with detailed schemes and costing for implementation.

- 1) Qaiser Bagh Bus Stand
- 2) Chowk
- 3) Hazratganj / Novelty Cinema
- 4) Mahanagar
- 5) High Court
- 6) Charbagh Railway Station
- 7) Alambagh Bus Stand
- 8) Gomti Barrage

Referring to **Figure 6-26** shows the proposed traffic management schemes for Aminabad / Qaiser Bagh area as concepts for traffic management schemes for an area which include the following measures:

1. Implementation of One-ways

- Aminabad Road - Mohan Market to Kaiserbagh Chauraha (0.5 km)
- Aminabad Road - R. K. Tandon Road to Mohan Market (0.5 km)
- Jhandewala Park - Tempo Stand to Gangaprasad Road to Jugal Kishor Jewelers (1 Barricade, 4 Signages)
- Dr. R. K. Tandon Marg - Central Methodist Church to Qaiser Bagh Circle (3 Barricade, 3 Signages)
- Bisheshwanath Road – Qaiser Bagh Circle to Ema Thomson Girls College (2 Barricades, 3 Signages)

2. Improvement of Junctions

- Aminabad Intersection-1
- Aminabad Intersection-2

3. Relocation of IPT stand

- Existing on-street IPT stand at Gangaprasad Marg and one adjacent to basement parking entrance is should be shifted to off-street space over basement parking which is presently being used for surface parking.

4. Relocation of Rickshaw Stand

- Existing on-street rickshaw stand at Aminabad Intersection-2 should be shifted to the corner space adjacent to the intersection of Aminabad Road and Shri Ram Road. Proposed space is presently occupied by a transformer which has to be shifted to some other location.

5. Provision of Semi-high Mast Lighting

- Qaiser Bagh Circle
- Aminabad Intersection-1
- Aminabad Intersection-2

6. Removal of Encroachment

- Gangaprasad Road - Rakabganj Intersection to Aminabad Tempo Stand (0.9 km)
- Bisheshwanath Road - Ashok Marg to Qaiser Bagh Circle (1.4 km)
- Dr. R. K. Tondon Road - Burlington Intersection to Qaiser Bagh Circle (1.3 km)

7. Pedestrian only Lanes

- Aminabad Intersection-1 (Near Tunday Kababi) to entrance of Two-Wheeler parking adjacent to Hanuman Temple (0.1 km)

- Aminabad Intersection-2 (Intersection of Aminabad Road and Gangaprasad Road) to entrance of Hanuman Temple(0.12 km)

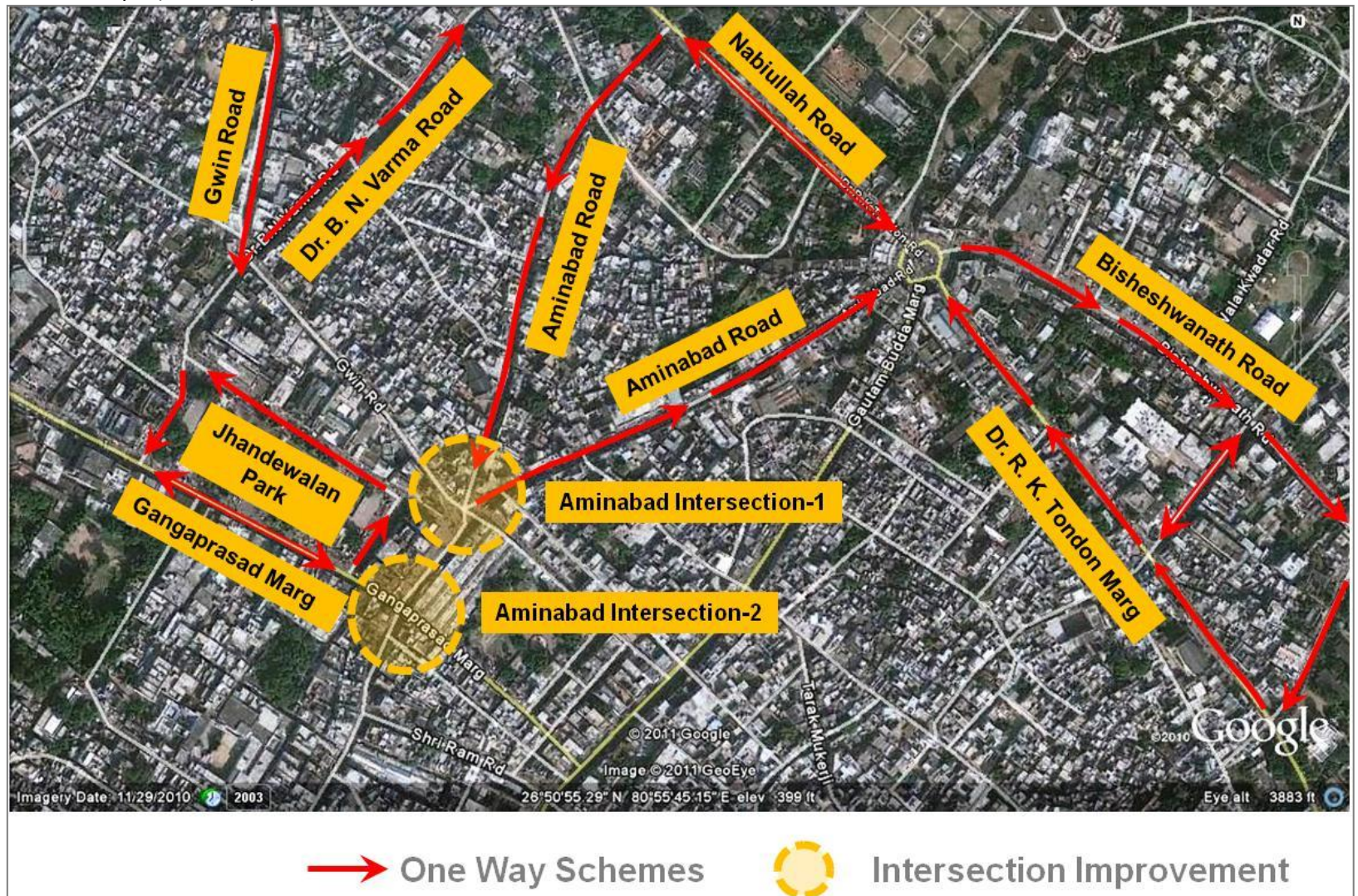


Figure 6-26: Proposed traffic management schemes for Aminabad / Qaiser Bagh area

6.29.8. Railway Over Bridges Plan:

Due to the existence of several railway crossings without any grade-separation, the traffic movement in the area is severely affected. The list of railway crossings in Lucknow that need immediate respite from congestion by building ROB is as:

1. Daliganj Crossing
2. Kukrail Nallah Crossing
3. NH-24 B (Near Bhadariya Bagh)

Figure 6-27 shows the locations where Railway Over Bridges are required.

6.29.9. Grade Separators/Flyovers and River Bridge

Due to high peak hour traffic, grade separated facilities are recommended at the following Intersections (refer to Figure 6-28):

1. Sikandarabagh Crossing
2. Along NH-25 near Vijaynagar Colony

As a part of smoothening goods movement, the CMP for Lucknow has proposed the development of signal-free outer Bypass road, which warrants, construction of two river bridges, eight flyovers and four railway over bridges. **Figure 6-29** shows the locations of the two river bridges, eight flyovers and four railway over bridges.





Figure 6-28: Proposed Locations for Flyovers



6.29.10. Education & Enforcement

Overall awareness of the traffic discipline and compliance with the traffic rules by road users in Lucknow is far below the desired level. Traffic Police in Lucknow will have to offer positive leadership in this direction to make people responsible and rule-abiding road users. Special traffic drives have to be planned by them for making the public aware of the traffic rules. Also, imposing fines at the spot procedure for defaulters may be reviewed in view of the large backlog of pending traffic offence cases. The Road Safety programmes is aimed at users and should serve three main purposes:

1. To inform the public about the new regulations or changes to the traffic regulation system
2. To influence the attitudes towards road safety
3. To persuade road users to change their behavior in relation to identified causal factors in road accidents

7. Implementation Programme & Costing



7.1. Phasing Plan

The projects identified would be phased depending upon several criteria like urgency of implementation, capital investment, ease of implementation, resource availability and environmental considerations. The phasing is generally done according to Long Term, Medium Term and Short Term requirements.

Projects, which do not require high capital investment and resource allocation and would prove useful in providing instant relief to the traffic problems of the city are given high priority and fall under Short Term Projects. Similarly, projects requiring high amounts of capital inflow and which have other issues like land availability problems and do not cater to immediate demand, are identified for medium and long term.

7.2. Project Prioritisation

As given in the above section, based on the detailed analysis, all the projects identified have been prioritised. As per NUTP, the prioritisation of projects is in the following order:

1. Public Transport
2. Pedestrianisation
3. Non-Motorised Transport
4. Para Transit Facilities (IPT)
5. TDM



6. Parking
7. Terminal Facilities
8. Intersection Improvements
9. Road Development
10. Bridges and Flyovers

The details of prioritisation are given in the **Table 7-1**

Table 7-1: Prioritisation and Phasing of Projects

Sl. No	Project Component	Phase		
		Short	Medium	Long
		2011-16	2017-21	2022-31
1	DEVELOPMENT OF REGIONAL TOD HUBS AND MULTIMODAL TRANSIT HUB			M
2	DEVELOPMENT OF INTERCHANGE HUBS		M	M
3	NETWORK IMPROVEMENT COMPLETE WITH WIDENING, MARKINGS AND SIGNAGES	M	M	M
4	ROAD DEVELOPMENT	M	M	
5	PUBLIC TRANSPORT STRATEGY			
5. (a)	Level I City Bus Service & IPT Management	H	H	M
5. (b)	Level II – Bus Based Transit System & High Density Bus Service	H	H	M
5. (c)	Level III - Rail Based Transit System			M
6	INTELLIGENT TRANSPORT SYSTEM FOR MOBILITY CORRIDORS			
6. (a)	Electronic Fare Collection	M	M	
6. (b)	Passenger Information System	M	M	
6. (c)	Operations Management	M		M
6. (d)	Vehicle Prioritisation			M
7	NON-MOTORISED TRANSPORT PLAN			

Sl. No	Project Component	Phase		
		Short	Medium	Long
		2011-16	2017-21	2022-31
7. (a)	Footpath	H	H	
7. (b)	Bicycle Tracks	H	H	M
7. (c)	Pedestrian Signals at Intersections	H		
7. (d)	Grade Separated Pedestrian Crossing Facilities	M	M	
7. (e)	Cycle Rickshaw Management	H	H	
7. (f)	Core Area NMT Plan	H		
8	FREIGHT MANAGEMENT STRATEGY			
8. (a)	Improvement of Existing Transport Nagar	H		
8. (b)	New Transport Nagar & Signal Free Bypass Road			M
9	TRAFFIC MANAGEMENT PLAN			
9. (a)	Intersection Improvement	H	H	
9. (b)	One Way Management	H	H	
9. (c)	Signal Coordination and Optimisation	H	L	M
9. (d)	Traffic Management and Information Centre	H	M	
9. (e)	Multilevel Car Parking	H	M	
10	OTHER PLANS			
10. (a)	Railway Station Improvement		M	M
10. (b)	Railway Over Bridges		H	M
10. (c)	Grade Separators (Flyovers)		M	L

❖ H- High , M - Medium and L- Low

7.3. Cost Estimation

The mobility plan components discussed in the previous sections were considered in the estimation of block cost estimate for implementing the elements in the future. The approximate capital cost, excluding land acquisition, for implementing the mobility plan is about Rs. 28,988 Crores. The breakup of phase wise project cost are given in the Table 7-2 to Table 7-4 below:

Table 7-2: Detailed costing of Projects in Phase I

Sl.No	Project	Quantity	Unit	Unit Rate (Rs Crores)	Cost (Rs Crores)
1	City bus service(Bus Augmentation)	500	Buses	0.24	120
2	Area Redevelopment Plan		LS		20
3	Construction of Footpath	90	Km	0.45	41
4	Grade Separated Pedestrian Facilities	5	Nos	3.5	17.5
5	Road Marking		LS		4
6	ITS on Buses	500	LS	0.05	25
7	ITS on Bus Stops	600		0.06	36
8	Strolling Zones	2	Nos	5	10
9	NMT Network	60	Km	0.5	30
10	Cycle rickshaw Management/Auto Rickshaw		LS		40
11	Hawkers Management		LS		10
12	Creation of Off-street parking facilities	4	Nos	10	40
13	Upgradation of Existing Terminal	3	Nos	3	9
14	Bus Stops	600	Nos	0.2	120
15	Improvement of Existing Freight Terminal	1	Nos	20	20
16	Intersection improvement	23	Nos	0.25	5.75
17	Road Development	36	km	6	216
18	Road Widening(3 to 4 lane)	5	Km	3	15
19	Construction of RoB	3		30	90

Sl.No	Project	Quantity	Unit	Unit Rate (Rs Crores)	Cost (Rs Crores)
20	Traffic Management Schemes		LS		60
21	Public Education and Awareness Programme		LS		5
Total Cost in Crores					934

Table 7-3: Detailed costing of Projects in Phase II

Sl.No	Project	Quantity	Unit	Unit Rate (Rs Crores)	Cost (Rs Crores)
1	City bus service(Bus Augmentation)	1200	Buses	0.29	342.34
2	Area Redevelopment Plan		LS	0.00	20
3	Construction of Footpath	95	Km	0.53	51
4	Road Marking		LS	0.00	4
5	ITS on Buses	1200	LS	0.06	71.3
6	ITS on Bus Stops	400		0.07	28.5
7	Strolling Zones	2	Nos	5.94	11.9
8	NMT Network	95	Km	0.59	56.5
9	Cycle rickshaw Management/Auto Rickshaw		LS	0.00	40
10	Hawkers Management		LS	0.00	10
11	Creation of Off-street parking facilities	6	Nos	11.89	71.3
12	Development of New Terminal cum Depot	5	Nos	35.66	178.3
13	Bus Stops	400	Nos	0.24	95.1
14	Development of Freight Terminal	1	Nos	23.77	23.8
15	Road Development	85	km	7.13	606.2
16	Road Widening(3 to 4 lane)	5	Km	3.57	18
17	Haider Canal Road	10	Km	52.00	520
18	Kukrail Bandha Road	8	Km	8.00	65

19	Mass Transit Corridor				
	Road Based	140	Km	23.8	3328.3
	Increase in frequency of Intercity Train	71	Km	35.7	2531.9
	Multi Modal Transit Hub			1000	1000
20	Railway Station Upgradation	6		20	120.0
21	Construction of Flyover	2		61.81	123.6
22	Traffic Management Schemes		LS		60
23	Public Education and Awareness Program		LS		5
Total Cost in Crores					9,382

Table 7-4: Detailed costing of Projects in Phase III

Sl.No	Project	Quantity	Unit	Unit Rate (Rs Crores)	Cost (Rs Crores)
1	City bus service(Bus Augmentation)	1800	Buses	0.32	581
2	Area Redevelopment Plan		LS	0.00	20
3	Construction of Footpath	95	Km	0.61	57
4	Road Marking		LS	0.00	4
5	ITS on Buses	1800	LS	0.07	121
6	ITS on Bus Stops	600		0.08	48
7	Strolling Zones	2	Nos	6.72	13
8	NMT Network	125	Km	0.67	84
9	Cycle rickshaw Management/Auto Rickshaw		LS	0.00	40
10	Hawkers Management		LS	0.00	10
11	Development of Freight Terminal	2	Nos	26.90	54
12	Road Development	110	km	8.07	888
13	Kukrail Bandha Road	8	Km	8	65

Sl.No	Project	Quantity	Unit	Unit Rate (Rs Crores)	Cost (Rs Crores)
14	Mass Transit Corridor				
	Rail Based (Metro)	38	Km	333	12671
	Increase in frequency of Intercity Train	71	Km	30	2130
	Multi Modal Transit Hub			1000	1000
15	Construction of Flyover	7		52	364
16	Construction of Bridge	2		153	306
17	Construction of RoB	5		30	150
18	Traffic Management Schemes		LS		60
19	Public Education and Awareness Program		LS		5
Total Cost in Crores					18,672

7.4.Funding Options

Since cities and towns in India constitute the second largest urban system in the world and contribute over 50% of the country's GDP, they are central to economic growth. For the cities to realise their full potential and become effective engines of growth, it is necessary that focused attention be given to the improvement of infrastructure in an organised manner. As such, the JnNURM was launched in December 2005 with the aim to encourage reforms and fast track planned development of identified cities. Focus is to be on efficiency in urban infrastructure and service delivery mechanisms, community participation, and accountability of ULBs/ Parastatal agencies towards citizens. The period of the Mission is seven years, up to 2012. During this period, funds shall be provided for proposals that would meet the Mission's requirements. Assistance under JnNURM is additional central assistance, which would be provided as Grant (100 % Central grant) to the implementing agencies.

The funding from JnNURM is supported by counterpart funding in the form of grants from the State and the ULBs, for which the ratio has been fixed by the Mission for different categories of cities. In the case of Lucknow, the funding pattern is as follows:

- Government of India grant under JnNURM: 50%
- State Government grant under JnNURM: 20%
- Contribution from Cities/ ULBs: 30%

7.5. Alternative Sources of Funding

For the projects, which are not admissible under JnNURM, the alternative sources of funding available are given below.

Real Estate Development - It is one of the most widely used source for raising funds particularly for projects like public transport, flyovers etc. In this process, property developers are invited to develop the land along the transport corridors and share profit arising out of such sale of property. The model is widely accepted around the globe and has been well adopted in India by a number of states like Maharashtra and cities such as Indore and Ahmadabad, etc.

Dedicated Urban Transport Fund - Various states such as Tamil Nadu and Punjab have created dedicated Road Fund for development of roads, by levying cess on turnover, betterment levy, shops and establishment levy, tax on employment, surcharge on octroi and other levies. In Madhya Pradesh, the Infrastructure Initiative Fund has also been created. Cities like Surat in Gujarat have also set-up a dedicated fund for Urban Transport. The following types of cess/levy can be used to mobilise resources to the afore-mentioned Fund:

Viability Gap Funding - In a recent initiative, the Government of India has established a special financing facility called "Viability Gap Funding" under the Department of Economic Affairs, Ministry of Finance, to provide support to PPP infrastructure projects

that have at least 40% private equity committed to each such project. The Government of India has set certain criteria to avail this facility under formal legal guidelines, issued in August 2004, to support infrastructure under PPP framework.

Viability Gap Funding can take various forms such as capital grants, subordinated loans, O&M support grants and interest subsidies. It will be provided in installments, preferably in the form of annuities. However, the Ministry of Finance guidelines require that the total government support to such a project, including Viability Gap Funding and the financial support of other Ministries and agencies of the Government of India, must not exceed 20% of the total project cost as estimated in the preliminary project appraisal, or the actual project cost, whichever is lower.

Projects in the following sectors implemented by the Private Sector are eligible for funding:

- (a) Roads and bridges, railways, seaports, airports, inland waterways
- (b) Power
- (c) Urban transport, water supply, sewerage, solid waste management and other physical infrastructure in urban areas
- (d) Infrastructure projects in Special Economic Zones
- (e) International convention centers and other tourism infrastructure projects

Cess on Turnover - A substantial amount of revenue could be generated through cess on turnover, particularly in cities, based on industry, trade and commerce activities. Such cess has already been levied for Bangalore MRTS project.

Betterment Levy through Value Capture Mechanism - It is a fiscal instrument to generate funds by recouping the land value increment. It aims to recover the project cost from the beneficiaries of the project. This method has been experimented in the case of Bangalore for LRT project in the form of metro tax. In Mumbai, for the improvement of transportation system, resource



mobilisation is proposed through raising revenues from value capture resources, which include contribution from employees, transport development levy, development cess on daily rail and intercity bus tickets, surcharge on seasonal tickets, property development levy, etc.

Shops and Establishment Levy - This method has the potential to be one of the large revenue gathering measures, particularly in Indore city, where the predominant economic base is trade and commerce:

- **Tax on Employment** - An additional source of revenue can be generated by an additional levy on the employer. This has been successfully adopted in cities of developed countries like Paris and France.
- **Surcharge Levy on Octroi Rates** - This method involves levying a surcharge on Octroi. In areas where there is a proposal for abolishment of Octroi, a substitute in the form of Entry Tax has been enforced which has potential to generate sizeable source of revenue.
- **Sale of Government Land and other Property** - It is an efficient source of raising resources by local bodies. Cities in India have been raising funds through sale of government land for road infrastructure improvement projects.

Besides the above-identified sources, the city can also access carbon credits and grants from other international sources including GEF, DFID, GIZ, etc. It can also access loans from international banks like ADB, World Bank, etc.

8. Institutional Framework



8.1. Introduction

City transport system generally involves several organisations that look after various forms and aspects of the transport system and network and have overlapping functions and areas of work. The existing institutional setup in Lucknow includes a variety of institutions sharing their responsibilities in different aspects of governance of Lucknow city. Lucknow Nagar Nigam (LNN), which is primarily responsible for the governance of the city and for providing urban infrastructure and services to its citizens, is one of them for instance. Aside from the local level institutions, various departments and agencies from the State Government play important roles. Therefore, to delineate areas and to remove ambiguity of functions, the institutional framework has been proposed.

Departments and Organisations involved in Urban Affairs and Urban Transport

- Housing and Urban Planning Department (GoUP)
- Urban Development Department (GoUP)
- Public Works Department
- National Highway Authority of India (NHAI)
- Superintendent of Police (Traffic), Lucknow
- Lucknow Nagar Nigam (LNN)
- Lucknow Development Authority (LDA)
- District Urban Development Agency (DUDA)
- Uttar Pradesh State Road Transport Corporation (UPSRTC)
- Indian Railways (Northern Railways and North Eastern Railways)
- State Pollution Control Board, Lucknow
- Regional Transport Office (RTO)
- Office of the Divisional Commissioner, Lucknow Division

(A) Existing City Level Institutions

- **Lucknow Nagar Nigam (LNN):** Local level governance; Primary Collection of Solid Waste; Maintenance of Storm Water Drains; Maintenance of municipal roads; Allotment of Trade Licenses under the Prevention of Food Adulteration Act; O&M of internal sewers and community toilets; Street lighting
- **Lucknow Development Authority (LDA):** Preparation of Master Plans for land use; Development of new areas as well as provision of housing and necessary infrastructure.
- **District Urban Development Authority (DUDA):** Implementing agency for plans prepared by SUDA. Responsible for the field work relating to community development – focusing on the development of slum communities, construction of community toilets, assistance in construction of individual household latrines, awareness generation, etc.
- **Lucknow City Bus Services Limited:** A newly created special purpose company with share of UPSRTC, LDA, LNN to monitor and regulate city bus service in the city.

(B) Existing State Level Institutions

- **State Urban Development Authority (SUDA):** Is an apex policy-making and monitoring agency for the urban areas of the state. Responsible for providing overall guidance to the District Urban Development Authority (DUDA) for implementation of community development programmes.
- **UP Awas Vikas Parishad (UPAVP):** Is a Nodal agency for Housing in the state. Involved in planning, designing, construction and development of almost all types of urban development projects in the state. Autonomous body generating its own resources through loans from financial institutions.

- **UP State Transport Corporation (UPSRTC):** Provides intra-city and state-wide public transport; maintenance of buses, bus stands.
- **Public Works Department (PWD):** Construction of main roads and transport infrastructure, including construction and maintenance of Government houses and Institutions.
- **State Tourism Department (STC):** Responsible for promotion of tourism
- **UP Pollution Control Board (UPPCB):** Pollution control and monitoring, especially river water quality and regulating industries.
- **Town and Country Planning Department (TCPD):** Preparation of Town Plans, including infrastructure for the state (rural and urban)
- **Office of the Commissioner, Lucknow Division:** Coordination of activities of various institutions

8.2. Issues with the Present Institutional Set up

As observed, there are multiple organizations that are involved in urban and rural planning for the City and Region. The municipal corporation's role in urban transport is miniscule and so is their area of control. The PWD and NHAI are in charge of constructing roads and maintaining them; however, their functioning is independent of the urban/rural planning body of the state. Bus operations, land ownership issues, collection of parking fees and traffic violation fines, NMT planning, pedestrian safety, etc are several issues that are interconnected, but they fall under the ambit of completely disconnected organisations. Some of these issues are listed below:

- There is no clear segregation between the planning and implementing bodies.

- There is lack of coordination amongst all the departments in the urban transport sector.
- All departments related to urban transport do not function in coherence.
- Road projects are implemented in isolation with other projects, which should otherwise be an integral part of road development like footpath, cycle tracks, pedestrian facilities, etc.
- There is no control over mushrooming growth of IPT modes in the city, which lead to issues of road congestion and also competing environment with the buses for passengers.
- Operation issues in public transport due to poor route and service planning.
- There is no dedicated organisation that is in charge of long-term urban transport planning for the city.

Thus, the need is felt for setting-up an umbrella level organisation for the overall planning and monitoring of the Urban Transport in the city.

8.3. Proposed Institutional Framework

8.3.1. Unified Metropolitan Transport Authority (UMTA)

In order to facilitate integration of transport services holistically and pragmatically, an “institution” needs to be created to coordinate the activities and functions of multiple organisations dealing with complex issues of urban transport. With the formation of a State-level UMTA, part of the problem would be sorted out. However, this would have a macroscopic view of resolving policy issues for all urban centers within the state. Still, there is a need to set-up a localised organisation that results in coordinated strategic level planning at the city level and deals with more day-to-day issues of urban transport.

8.3.2.City Level Unified Metropolitan Transport Authority

With a view to coordinate all urban transport activities in the city, it is recommended that a UMTA be set up at the city level also that acts as a planning and decision-making body for all matters related to urban transport in the city.

It is recommended that the city level UMTA be set up on an executive order for the ease of formation; however, it must be given a legal backing so that its functioning falls under an act and commands greater authority.

8.3.3.Broad Functions

The following functions are proposed to fall under the purview of the city level UMTA:

- Undertake overall planning for public transport in the city, covering all modes - road, rail, water and air transport systems
- Allocate routes amongst different operators
- Procure public bus services for different routes through contracting, concessioning, etc.
- Ensure compliance of terms and conditions of license
- Recommend revocation of license for non-compliance of terms and conditions of the license
- Carry out surveys and manage a database for scientific planning of public transport requirements
- Co-ordinate fare integration among different operators of public transport and determine the basis for sharing of revenues earned from common tickets or passes

- Operate a scheme of passes for the users of public transport and channelise subsidies to operators for any concessions that are offered in accordance with government policy
- Regulate the arrangement amongst operators for the sharing of their revenue derived from the use of passes
- Promote efficiency in public transport operation
- Protect the interest of the consumers
- Settle disputes between different operators and between operators and infrastructure providers
- Levy fees and other charges at such rates and in respect of such services as may be determined by regulations

8.3.4. Proposed Structure of UMTA

The National Urban Transport Policy, 2006 and GoI recommends setting up of UMTA in all million-plus cities, the extract of which is re-produced herein below:

“The current structure of governance for the transport sector is not equipped to deal with the problems of urban transport. Those structures were put in place well before the problems of urban transport began to surface in India and hence do not provide for the right co-ordination mechanisms to deal with urban transport.

The Central Government will therefore recommend the setting up of Unified Metropolitan Transport Authorities (UMTAs) in all million-plus cities to facilitate more co-ordinated planning and implementation of urban transport programmes and projects and an integrated management of urban transport systems. Such Metropolitan Transport Authorities would need statutory backing in order to be meaningful.

The Central Government would also encourage the setting up of professional bodies that have the capacity to make scientific assessment of the demand on various routes and contract services that can be properly monitored. Towards this end, it would encourage the setting up of umbrella bodies that regulate the overall performance of the Public Transport System and ensure that the city has a Comprehensive Public Transport System”.

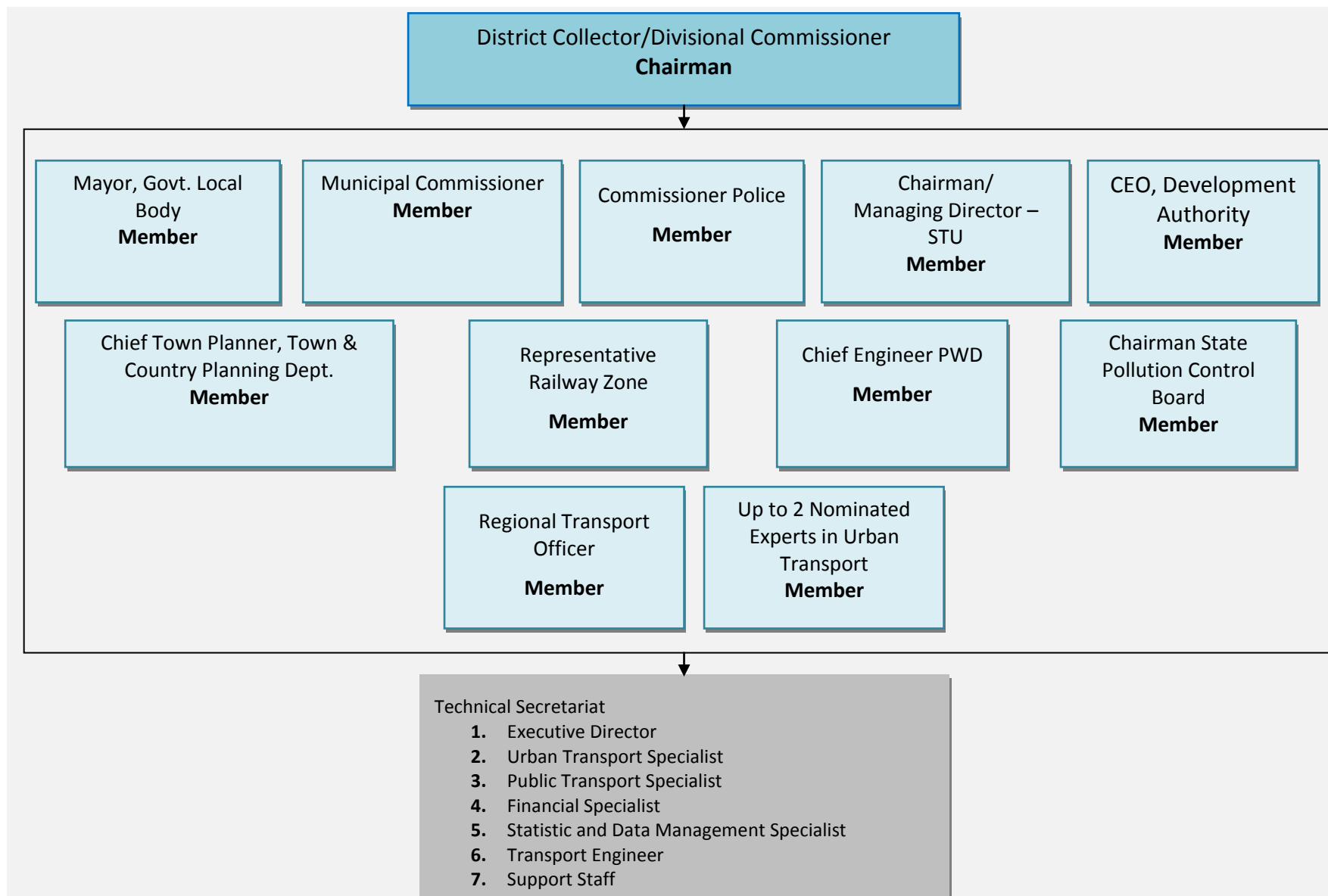
The overall aim of the UMTA will be to promote public transport in the urban areas through formulation of policies, programmes, rules and regulations related to urban transit. Its function is to facilitate/ co-ordinate planning and implementation of urban transport programmes and projects in an integrated management framework. To be effective, such Urban Metropolitan Transport Authority would need statutory backing.

The National Urban Transport Policy clearly identifies land use and transport as two intricately linked elements of urban system that has bearing on each other. Hence, the distinctive role of UMTA regarding formation of progressive land use and transportation policy for metropolitan area becomes critical.

8.3.5.Composition of UMTA

As per the National Urban Transport Policy (NUTP-2006), representation of agencies involved in the preparation of land use and transportation plan is required in UMTA. In the light of the above guidelines/recommendations, the following structure is proposed for UMTA:





Besides the above members, Government of UP could invite representatives from other government departments, Vice Chairman (VC) of the concerned city development authority, bus operation unions, auto rickshaw unions, etc. as considered necessary from time to time.

8.3.6. Legal backing of UMTA

In order to give UMTA objectives, functions and operations a legal status, a draft Act has to be prepared by UMTA to be taken up for approval by the State Cabinet after finalisation. The draft Act shall cover the following:

1. Objectives and functions of UMTA
2. Operational area of UMTA
3. Powers and delegation of powers of UMTA
4. Authority to have power to acquire land by agreement
5. Power of Government to transfer to the Authority lands belonging to it or to other ULBs, etc.
6. Power of Authority to borrow
7. Laying of annual estimate of income and expenditure
8. Authority to approve or amend such estimate
9. Estimates to be submitted to Government for sanction
10. Supplementary estimates may be prepared and submitted when necessary
11. Provisions regarding expenditure
12. Accounts and audit

-
13. Schedule of officers and employees to be submitted for sanction of Government
 14. Appointments, etc., by whom to be made
 15. Powers of entry
 16. Directions by the Authority
 17. Members and officers to be public servants
 18. Power to make rules
 19. Power to make regulations

8.3.7. Manpower Requirement and Staffing Plan

UMTA shall have to avail the services of an expert team of traffic and transportation planners, engineers, urban planners and other technical advisers. In order to strengthen its human resource, UMTA shall have to form a schedule of officers and employees whom it shall deem it necessary and proper to maintain for the purposes of UMTA Act. In addition to this, various powers related to appointment, promotion, suspension, etc shall also have to be worked out as per the Government's schedule.

8.3.8. Urban Transport Fund (UTF)

As cities and towns are the generators of national wealth, there is a growing recognition that the resources needed for urban development be generated from within the urban economies by use of principles like "beneficiaries pay", "users pay" and "polluters pay". Provision of public transport/transit facilities act as 'facilitators' and go a long way in triggering the multiplier effect in the city economy. As per the guidelines of National Urban Transport Policy, an Urban Transport

Fund is desired to be set up to sustain and expand the transit operations (city buses) and to develop the transit infrastructure (bus stands, terminals, inter-changes, depots, workshops, etc).

A reasonable quality of service has to be maintained in order to encourage residents to use public transport instead of private vehicles. From domestic and worldwide experience, we know that as the fares are regulated, city bus operations would be a loss-making proposition from operations' point-of-view. There would be a viability gap and hence, non-operational revenues and state support would be required to bridge the gap.

Public transport sector in most cities have been running in losses leaving little or no scope for enhanced services to the users. On the physical infrastructure side, vehicle sales generate large revenues, through taxation. Most of the proceeds, however, are treated as general taxes and do not trickle down to the urban area level as a ready pool of resources for urban transport projects.

It is thus suggested that a separate collection of funds be generated locally so that the same may be spent locally on development and maintenance of urban transport infrastructure. This fund can be managed by a professional fund manager appointed by the city level Unified Metropolitan Transport Authority so that the balances in this fund can earn appropriate returns, in accordance with prevailing market potential.

Any local investment proposal that would require funding/part-funding from the Local Govt. /State Govt. could be posed to the UTF for financial support. Approval could be given by the UMTA, after due appraisal by the Local Administrator/Secretariat. An Urban Transport Fund at State and City level has to be created to support the Public Transport system. The State Government is actively considering the possible streams for this fund as:

- Cess/Tax/Additional Duty

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- 1) Cess on fuel: A small cess of 50 paise per litre can be levied, with amendment to the Act.
 - 2) Higher Registration Charges on private vehicles
 - 3) Rationalisation of MV taxes on Private Vehicles: By increasing taxes on cars, 2 wheelers etc. As the diesel cars contribute to the pollution load in greater degree, the MV tax on cars can be increased to a higher degree.
 - 4) Luxury tax and professional taxes, as levied by Bangalore
 - 5) Additional stamp duty (5%) on registration of property
- Advertisement Rights

Coupled with an appropriate advertisement policy, allowing the SPV (company/ULB/STU responsible for bus operation) rights on the Bus Stops/Terminals and on other infrastructure created especially for bus priority measures would also yield advertisement income to flow into the Urban Transport Fund.

8.4. Eligibility Criteria and Approval Mechanism from the Fund

The Fund, in due course of time, due to its intrinsic purpose of set-up, shall be approached for funding by various urban transport projects besides the SPV for the bus operations. A suitable mechanism shall have to be evolved for the concerned secretariat to judge/appraise the claim, put it up for approval from UMTA, and disbursement of the same to the concerned agency for implementation. The detailed guidelines on the type of claims and the appraisal criteria shall be evolved on the lines of the existing MoUD guidelines and procedures.

9. Environmental and Social Impact Assessment



9.1. National Level Policy and Legal Framework

As per Section 3 of EIA Notification S.O. 1533 dated 14th September 2006, the Central government formed a State-level Environment Impact Assessment Authority. All projects and activities are broadly categorised into two categories as Category A and B. The projects which have been classified as Category A projects are those having potential impacts on human health and natural and man-made resources. Those projects require prior environmental clearance from the Central government in the Ministry of Environment and Forests (MoEF). The projects categorised as Category B projects require prior environmental clearance from the State/Union Territory Environment Impact Assessment Authority (SEIAA). The SEIAA's decisions are based on the recommendations of a State or Union Territory-level Expert Appraisal Committee (SEAC) as to be constituted for in this notification.

9.2. Screening and Identification of Impacts

Environmental and social screening is intended to provide inputs into identification of potential impacts with the implementation of the CMP. Screening is conducted by identifying the interaction of environmental components on the project activities for various projects. Screening conducted for the identified projects and respective impacts identified are presented in the **Table 9-1** given below.



Table 9-1: Environmental Impacts of Important Projects

Broad Project Category	Activities / Sub Components	Impacts
Regional Hubs based on Transit Oriented Development principles	<ul style="list-style-type: none"> • Development of serviced land for high density development • Public transport interchange hubs 	<ul style="list-style-type: none"> • Land acquisition from farmers • Construction activity around the highway
Pedestrian / NMT Infrastructure Improvement	<ul style="list-style-type: none"> • Land acquisition for road widening and creation of service lane wherever necessary 	<ul style="list-style-type: none"> • Relocation of existing vending activity • Removal of squatters and encroachers from the footpaths • Causing livelihood losses even though they are illegal • Loss of shelter for temporary shops / residences for squatters and encroachers
	<ul style="list-style-type: none"> • Construction of new footpaths 	<ul style="list-style-type: none"> • Improvement in safety of pedestrians due to measures proposed
	<ul style="list-style-type: none"> • Pedestrian Infrastructure development like subways/foot over bridges/ signals etc 	<ul style="list-style-type: none"> • Improvement in pedestrian safety • Slowing of traffic at the time of constructing and erecting structures across major intersections
Public Transport Planning	<ul style="list-style-type: none"> • Dedicated public transport network 	<ul style="list-style-type: none"> • Land acquisition for dedicated lanes will cause R&R issues • Use of existing pavement width for dedicated bus lanes will cause removal of squatters and encroachments from road sides causing loss of livelihood and loss of shelter • Construction / reconstruction / improvement of bus lanes will be causing construction issues such as: <ul style="list-style-type: none"> ▪ Generation of noxious gases during construction, increasing air pollution ▪ Temporary increase in noise pollution during construction ▪ Contamination of road runoff with construction material stacked on road side

Broad Project Category	Activities / Sub Components	Impacts
		<ul style="list-style-type: none"> ▪ Traffic safety during construction ▪ Traffic diversions causing lengthening of routes increasing air emissions and exposing previously unexposed neighbourhoods to noise • Reduction of additional lane width for other traffics if existing road width is used for demarcating the dedicated bus lanes • Reduction in private vehicles causing reduction in air/noise pollution
	• Terminals/Depots/Commuter Amenity Centers	<ul style="list-style-type: none"> • Acquisition of land for the facilities causes R&R issues as loss of livelihood, loss of shelter, severance of community & social ties • Increase of noise and air pollution in the areas of terminals and depots • Improvement in approaches to the terminals and depots causing impacts on adjacent landuses and land acquisition • Additional land acquisition, if any, for the approach road improvement will lead to R&R issues along the roads and cause impacts on livelihood and shelter • Construction of stage impacts include the increase in air and noise pollution • Contamination of road runoff with stacked construction materials • Improvement of traffic conditions during operation stage causing reduction in air and noise pollution
	• Bus-Stops and FOBs/Sub-ways	<ul style="list-style-type: none"> • Temporary interruption to traffic and increase of emissions from vehicles due to higher idling times

Broad Project Category	Activities / Sub Components	Impacts
		<ul style="list-style-type: none"> • Temporary increase of noise levels due to idling and traffic snarls • Alternate traffic diversion routes increasing route length and consequently emissions • Alternate traffic diversion routes exposing previously low traffic routes to higher urban traffic and increasing air/noise pollution • Removal of squatters and encroachers from the footpaths causing livelihood losses at approaches to the sub-ways / FOBs • Loss of shelter for temporary shops / residences for squatters and encroachers at approaches to the sub-ways / FOBs • Contamination of runoff from road with construction material as sand / cement / silt from stacked excavated earth
Others-Road Infrastructure	<ul style="list-style-type: none"> • Junction/Rotary Improvements 	<ul style="list-style-type: none"> • Additional land requirement for junction improvements will cause R&R impacts as loss of livelihood and loss of shelter • May cause removal / displacement of squatters & Encroachers • Air and noise pollution from construction impacts • Contamination of runoff from road with construction material as sand / cement / silt from stacked excavated earth
Freight Management	<ul style="list-style-type: none"> • Banning and restrictions 	<ul style="list-style-type: none"> • Reduction in urban congestion due to banned movement of freight in the day hours • Banning of use of animals for movement of goods in the city may result in <ul style="list-style-type: none"> ▪ Animal welfare and safety ▪ Improved speeds in CBD area due to reduction in

Broad Project Category	Activities / Sub Components	Impacts
		congestion
	<ul style="list-style-type: none"> Relocation of Activity inside existing freight terminal 	<ul style="list-style-type: none"> Resistance by operators for relocation Improved air quality in the surrounding residential areas due to shifting of transport nagar
	<ul style="list-style-type: none"> Creation of new freight terminal 	<ul style="list-style-type: none"> Acquisition of land in the peripheries Contamination of runoff from road with construction material as sand / cement / silt from stacked excavated earth

9.3. Location Impacts

The location impacts being analysed are associated with site selection and project location on environment and resettlement or livelihood related impacts on communities. Some of the generic impacts associated with location of project facilities that involves construction activities either by acquiring additional land and / or public land encroached by residents are as below:

- Major environmental features as lake fronts, parks etc., in the urban areas would generally be avoided and hence environmental impacts on these areas would be minimal to absent
- Projects do not have any major environmental features that are sensitive to acquisition of land as it is nominal in case of the conceived projects
- Removal of encroachments and squatters leading to loss of livelihood and / or shelter
- Vulnerable PAP within the encroachers would be further impacted by the pressure of relocation as well as loss of income and their removal
- Break-up of established social fabric that can cause severance of established relationships amongst the community
- Temporary loss of services provided by the encroaching PAPs due to their removal

Some of the specific impacts associated with construction of bridges and flyovers involves disruption to existing traffic flow, especially, if located in the congested urban stretches. These would also involve land acquisition (either temporary or permanent) and would also impact the squatters and encroachers affecting residences and / or livelihood.

They would cause traffic congestion and delays and may also involve changes in the project design and alternatives. Project interventions as ITS application and improvement in public transport infrastructure would only improve the environment rather than causing pollution though resettlement impacts would be present to a limited extent.

9.4. Construction Impacts

Impacts resulting from pre-construction and construction activities including site clearance, earthworks, civil works, etc are identified in this section. Pre-construction and construction impacts arise due to dismantling of existing facilities, use of heavy construction machinery, spillage/disposal of construction debris, runoff from construction site, inadequate or inappropriate drainage of the construction site, inadequate safety measures, etc. These are some of the direct impacts of construction in the project area.

In addition to the above, there are few indirect impacts or impacts that result from construction activities though not causing the impacts, support to cause the impacts. Some of these impacts include generation of vectors and vector borne diseases, spread of STD / HIV amongst the construction workers and within the community in the vicinity of construction activities, etc. The above environmental impacts are generic in nature occurring along all the project activities where civil works are involved. Impacts that are specific to the construction activities in a project intervention are presented below:

- Construction activities in case of reconstruction of footpaths or construction of new foot paths would cause temporary interruption to traffic and increase of emissions from vehicles due to higher idling times apart from temporary increase of noise levels due to idling and traffic snarls.
- Loss of adequate frontage in few cases of foot path construction or provision of additional cycle lanes and bus lanes
- Relocation of utilities in the pre-construction stage causing temporary disruption to services. These impacts would be more severe in case of construction of exclusive bus lanes and foot paths.
- Safety of pedestrians and traffic in the area is likely to be affected due to the progress of construction activities.
- Contamination of runoff from road with construction material as sand / cement / silt from stacked excavated earth.
- Construction activities elevate the air pollution and noise pollution in the project area temporarily. Air pollution is due to generation of noxious gases emanating from asphalt plants, construction equipment, crushers, etc., while noise pollution is due to operation of various types of construction equipments.
- Stacking of construction waste causing interruption to traffic and pedestrian movements.
- Runoff from stacked construction waste entering the water bodies and existing drainage systems causing clogging of drain outlets as well as the drains themselves.

Project interventions as procurement of low emission vehicle fleets, traffic signal prioritisation, ITS, provision of signages, etc., involve minimal construction activities and hence, environmental and social benefits from these activities will outweigh any minimal impacts that may occur.

9.5. Operation Impacts

These are the Impacts associated with the operation and maintenance of the infrastructure built in the project. The project interventions are conceived to provide maximum benefits to the community with the implementation of the project. The project



interventions, as could be judged from the discussion so far, involve environmental and resettlement impacts during pre-construction and construction stages of the project and appropriate mitigation and management measures would be undertaken to avoid the same.

Negative environmental / social impacts in the operation stage would mostly be limited to air and noise pollution along the improved road infrastructure as well as the parking areas. While there would be loss of usual transport routes for provision of pedestrian routes or NMT, overall improvement in environmental quality is anticipated in the operation stage.

While in previously polluted and congested core city areas / heritage areas would be experiencing better environmental quality than before the project implementation, due to pedestrianisation and encouraging NMT, pedestrian safety would also be improved with the implementation of the project.

Implementation of ITS and traffic signal prioritisation interventions would also aid in better management of traffic leading to improvements in air and noise quality.

9.6. Social Impact

The impact of the proposed projects from the social angle is analysed at a broader perspective. It is found that most of the projects have significantly less impact with respect to Rehabilitation and Resettlement. Land acquisition for some of the projects is inevitable. The proposed projects significantly improve mobility with reduced travel time. The broad impacts have been compiled in the **Table 9-2**:



Table 9-2: Project Impacts

Project	Right of Way / Land Acquisition	Requirement of Rehabilitation & Resettlement	Improve Mobility	Reduction in Travel Time
Bus Fleet Augmentation	No	No	Yes	Yes
Bus Based Mass Transit System	No	No	Yes	Yes
High Capacity Mass Transit	Yes	Yes	Yes	Yes
Intermodal Stations	Yes	Yes	Yes	Yes
Bus Terminals	Yes	Yes	Yes	Yes
Bus Shelters & Bus Bays	Yes	Yes	Yes	Yes
Grade Separators & ROBs	Yes	Yes	Yes	Yes
Road Widening	Yes	Yes	Yes	Yes
New Roads	Yes	Yes	Yes	Yes
Ring Road	Yes	No	Yes	Yes
Foot Path cum drains	No	No	Yes	NA
Pedestrian FoB /Subway	No	No	Yes	NA
Major Junction Improvements	No	No	Yes	Yes
Area Traffic Control	No	No	Yes	Yes
Signages and Road Markings	No	No	Yes	Yes
Core Area Plans	No	No	Yes	Yes
Off-Street Parking	Yes	Yes	Yes	NA
Freight Hubs	Yes	Yes	Yes	NA

10. Outcomes

10.1. Level of Service

The CMP for Lucknow has proposed various phase-wise mobility improvement measures in terms of projects and policy interventions in consistent with the goals and objectives set for Lucknow. The outcomes of the projects proposed could be assessed in terms of improvements in the Level of Service (LOS) for the 10 Benchmarks defined by the Ministry of Urban Development, Government of India. The overall LOS achieved for all the Benchmarks are given in **Table 10-1**. A significant improvement can be observed from the existing LOS. These could be attributed to various factors as given below:

Table 10-1: Overall LOS

Overall LOS			
Sl.No	Indicators	LOS - Existing	LOS - Improved
A	Overall Public Transport Facilities City-wide	3	2
B	Overall Pedestrian Infrastructure Facilities	3	2
C	Overall NMT Facilities	4	2
D	Level of usage of ITS Facilities	4	2
E	Travel Speed along major Corridors	2	1
F	Availability of Parking Spaces	3	2
G	Road Safety	4	2
H	Pollution Levels	2	1
I	Integrated Land-use Transport Integration	4	2
J	Financial Sustainability of Public Transport	3	1

10.2. Public Transport Facilities

The improvement in LOS of Public Transport (**Table 10-2**) is primarily due to the following:

- Introduction of an organised public transport under the umbrella of an SPV and being monitored by a City-Level UMTA
- Improved supply and service standards of public transport by introduction of additional buses
- Improved service coverage along mobility corridors and restructuring of city bus services
- Improved bus technology by introduction of buses as per Urban Bus Specifications issued by MoUD, GoI.

Table 10-2: LOS for Public Transport Facilities

S No.	Indicator	LOS - Existing	LOS - Improved
1	Presence of Organized Public Transport System in Urban Areas	3	2
2	Extent of Supply Availability of Public Transport	3	2
3	Service Coverage of Public Transport in the city	3	1
4	Average waiting time for Public Transport users (min)	4	3
5	Level of Comfort in Public Transport	2	1
6	% of Fleet as per Urban Bus Specifications	3	1

10.3. Pedestrian Infrastructure Facilities

The introduction of pedestrian facilities would result in an overall improvement of LOS for pedestrian infrastructure facilities. The details are given in Table 11-3, which could be attributed to the following:

- Introduction of 5 grade-separated pedestrian facilities and pedestrian green phase at 15 critical locations as given in Section 6.25. This would provide safe passage to pedestrians as well as reduce their waiting time.

- As part of the overall pedestrian mobility plan, it is proposed to introduce street lighting on all roads.
- Introduction of a pedestrian network providing continuous footpaths across the city (refer Section 6.13).
- Pedestrian prioritised zone of core city area

Table 10-3: LOS for Pedestrian Infrastructure Facilities

S No.	Indicator	LOS - Existing	LOS - Improved
1	Signalised Intersection Delay (%)	3	1
2	Street Lighting	3	3
3	% of City Covered	3	2

10.4. NMT Facilities

The significant outcomes of the study has been improvement in LOS for NMT facilities from 4 to 2 (**Table 10-4**). This could be attributed to adoption of following interventional measures:

- Development of NMT network along major corridors (Section 6.24)
- Parking norms to prevent roadside parking along important roads

Table 10-4: LOS for NMT Facilities

S No.	Indicator	LOS - Existing	LOS - Improved
1	Percentage of network covered	4	2
2	Encroachment on NMV roads by vehicle parking	4	2
3	NMT parking facilities at interchanges	4	2

10.5. Usage of Intelligent Transport System (ITS) Facilities

The improvement in LOS for ITS facilities as given in **Table 10-5** is due to the following:

- Provision of traffic surveillance through CCTV and ATC along identified corridors (refer to Section 6-16)
- Introduction of PIS and GPS in buses as given Section 6-16

Table 10-5: LOS for Intelligent Transport System (ITS) Facilities

S No.	Indicator	LOS - Existing	LOS - Improved
1	Availability of Traffic Surveillance (%)	4	2
2	Passenger Information System (PIS) %	4	3
3	GPS/GPRS (%)	4	3
4	Signal Synchronisation (%)	4	1

10.6. Travel Speed (Motorised and Mass Transit) along major Corridors

Travel speed along all major corridors would improve considerably due to provision of public transport, NMT and other facilities in the city. This is reflected in the improvement of LOS for travel speed as given in **Table 10-6** below:

Table 10-6: LOS for Travel Speed

S No.	Indicator	LOS - Existing	LOS - Improved
1	Travel Speed of Personal Vehicles along key corridors	2	2
2	Travel Speed of Public Transport along key corridors	2	1

10.7. Availability of Parking Spaces

Inadequacy of parking space is one of the major issue in Lucknow city due to which on-street parking occurs in all most all the roads. As part of the mobility plan, it is proposed to create designated parking spaces at interchanges and market areas (refer to Section 6.29.8), which would result in the improvement of the LOS for Parking.

Table 10-7: LOS for Availability of Parking Spaces

S No.	Indicator	LOS - Existing	LOS - Improved
1	Availability of on-street paid public parking spaces (%)	3	2
2	Ratio of Maximum and Minimum Parking Fee in the city	3	2

10.8. Road Safety

At present the fatality rate for Lucknow is 16 accidents per lakh population. One of the goals of the CMP for Lucknow is to reduce accidents by 50% and the projects evolved are oriented towards the same. The LOS have been calculated based on the assumption that the accident rate would come down by 50% with the adoption of measures like promotion of public transport, provision of mobility corridors, adoption of road hierarchy system and enforcement, application of ITS, traffic surveillance, NMT and pedestrian infrastructure, road markings and signages, etc. Accordingly, the estimated LOS is given in **Table 10-8**.

Table 10-8: LOS for Road Safety

S No.	Indicator	LOS - Existing	LOS - Improved
1	Fatality rate per lakh population	4	2
2	Fatality rate for pedestrian & NMT (%)	4	2

10.9. Pollution Levels

The existing pollution levels in the city in terms of NOX and SO2 are already low due to a number of policy decisions taken by the city/ state/ central government; however, the SPM and RSPM levels are high in certain areas. With the improved mobility of vehicles and reduced idling of vehicles, it is expected that these would also reduce. Accordingly, the estimated LOS is given in **Table 10-9**.



Table 10-9: LOS for Pollution Level

S No.	Indicator	LOS - Existing	LOS - Improved
1	SO ₂	1	1
2	NO	1	1
3	SPM	2	1
4	RSPM	3	1

10.10. Integrated Land Use Transport System

The improvement of LOS for land use transport system can be attributed to the following:

- Completion of the network (refer Section 6.1)
- Increase in FSI along major transit corridors
- Introduction of mobility corridors which would provide a dedicated corridor for movement of public transport

Table 10-10: LOS for Financial Sustainability of Public Transport

S No.	Indicator	LOS - Existing	LOS - Improved
1	Population Density- Gross	4	2
2	Mixed Landuse on Major Transit Corridors	2	1
3	Intensity of Development- City wide	3	3
4	Intensity of Development- along transit corridor	4	2

10.11. Financial Sustainability of Public Transport

With the introduction of an organised public transport under the umbrella of an apex body (such as the Lucknow City Bus Service Limited, the SPV for city bus service) and improved service coverage and supply, and rationalisation of routes of IPT mode, it is expected that the profitability of public transport would improve and revenue from other sources such as advertisements etc would increase thereby improving the LOS as given in **Table 10-11**.

Table 10-11: LOS for Financial Sustainability of Public Transport

S No.	Indicator	LOS - Existing	LOS - Improved
1	Extent of non-fare revenues	4	2
2	Staff/ bus ratio	2	1
3	Operating ratio	3	1

10.12. Conclusion

During the last decade, the urban sprawl in Indian cities has extended far beyond the existing territorial jurisdiction of the city administration resulting in high usage of private modes. Despite substantial efforts, cities are facing difficulty in coping with increase of private vehicles along with improving personal mobility and goods distribution. Lucknow city has been experiencing high growth of population over the years, which can be attributed to high natural growth and migration from the adjacent rural areas and towns with expectation of better employment and livelihood opportunity.

With rapid pace of urbanisation together with increase in population and private vehicles in Lucknow city will pose an unimaginable load on city's already struggling transport infrastructure. On the other hand the share of public transport is also declining leading to more usage of private vehicles for mobility needs and increased demand for parking of private vehicles.

The National Urban Transport Policy (NUTP), 2006, therefore emphasises on personal mobility to achieve cost-effective and equitable urban transport measures within an appropriate and consistent methodology. Accordingly, the Comprehensive Mobility Plan (CMP) for Lucknow city lays out a set of measured steps that are designed to improve transportation in the city in a sustainable manner to meet the needs of a growing population.

Minutes of the Stakeholder Consultation Meeting on “Comprehensive Mobility Plan (CMP) for Lucknow” held on 25-03-2011 at 1530 hrs under the Chairmanship of Divisional Commissioner, Lucknow Division

Location: - Conference Hall, Office of the Divisional Commissioner, Lucknow Division

Divisional Commissioner welcomed the participants and requested representatives of M/s. Urban Mass Transit Company (UMTC) to make presentation on the “**Comprehensive Mobility Plan for Lucknow**”. UMTC made a presentation on the various aspects of the study to the stakeholders from the city, which included representatives from Municipal Corporation, RTO, Development Authority, UPSRTC, Traffic Police, etc.

Major Key points discussed in the presentation are as follows:

1. The consultant has given a detailed introduction of the scope and components of a CMP, introduction to the study area, the data collection process and the primary survey locations were discussed.
2. The major problems and issues identified in the city were presented. These were identified as deteriorating road conditions, buses being run on low frequency, unorganised parking, traffic congestion and absence of proper traffic management. Other problems which emerged are delay at intersection due to non-standard configurations, absence of traffic management plan / ITS implementation, high growth of two wheelers and unorganised Public Transport system.
3. Eight Mobility Plan Strategies were identified by the consultant, which are:
 - (i) Land Use and Transport Integration Plan
 - (ii) Development of Mobility Corridors
 - (iii) Making Public Transport a Choice Mode
 - (iv) Non-Motorised Transport Strategy
 - (v) Freight Mobility Plan

(vi) Travel Demand Management

(vii) Traffic Engineering Measures

4. The Mobility Plan of Lucknow has the following objectives:

- a. Development of a ring – radial network focused towards improving accessibility within the study area and providing connectivity to the new growth centers.
- b. Concept of Transit Oriented Development with the development of sub-city centres in order to decongest the core city area.
- c. Development of New Arterial Road:
 - i. Haider Canal- M. G Road- Kukrail Canal-Faizabad Road-Ring Road
 - ii. Bandha Road along Gomti River-River Bus Rapid Transit System (BRTS)
- d. Public transit strategy for 2016, 2021 and 2031 was presented wherein public transport needs will be developed in phased manner, depending upon the increasing travel demand along the major radiating road network of the city. The choice of mode could be made by the city based on available of funds for implementation. Proposal for Mass Rapid Transit System such as elevated BRTS, Metro etc. was also given.
- e. Decongestion plans were discussed for core city area by segregating lanes for motorized and non motorized modes, one way system for approach roads.
- f. Promotion of Non-Motorised and pedestrian mobility facilities which included network for NMT and pedestrian, as well as detailed area wise pedestrian strategy and creation of pedestrian facilities at intersection.
- g. Freight mobility plan giving location of proposed facilities and their phased development was also discussed.
- h. Travel demand management, including one-way streets, area traffic control, access control policy, public awareness and education programme, etc.

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- i. Junction improvements required.
 - j. Need for a parking policy for the city was discussed and the same will be included in the CMP was conveyed by the consultants
 5. At the end of the presentation, the following suggestions were received from the participants:
 - a) Divisional Commissioner has appreciated the scientific concept used by UMTC for deciding the location of pedestrian facility. Lucknow Development Authority (LDA) and Lucknow Nagar Nigam have been asked to follow such scientific concept in designing pedestrian facility.
 - b) Divisional Commissioner & Vice Chairman, LDA requested UMTC to provide cost-revenue comparison of different kind of public transport system such as elevated BRTS, Metro, LRT etc.
 6. UMTC has agreed to incorporate the feasible suggestions in the final report.

List of the Participants

1. Divisional Commissioner, Lucknow
2. Vice Chairman, Lucknow Development Authority (LDA)
3. Additional Commissioner, Lucknow Nagar Nigam
4. Mr A. K Pandey, Regional Transport Officer (R.T.O.)
5. Mr. Ravi Jain, Town Planner, Lucknow Development Authority (LDA)
6. Ms. Sadhna Goswami, S.P. (Traffic)
7. Mr. S.M Tripathi, Chief Engineer, Lucknow Development Authority (LDA)
8. Mr Rajeev Chauhan, Regional Manager, UPSRTC
9. Mr. J. N Srivastav, Chief Engineer, Directorate, Urban Transport
10. Shahan Shah, Engineer, Directorate, Urban Transport
11. Mr. R. K Tiwari, Directorate, Urban Transport
12. Mr. S. Ramakrishna, UMTC
13. Ms. Kanika Kalra, UMTC
14. Mr. Ranjan Jyoti Dutta, UMTC

Draft Minutes of the Stakeholder Consultation Meeting cum Presentation on “Comprehensive Mobility Plan (CMP) for Agra Kanpur & Lucknow” held on 14-06-2011 at 1700 hrs under the Chairmanship of Mr. V N Garg, Commissioner, Uttar Pradesh Infrastructure and Industrial Development Corporation (IIDC).

Location: - Conference Hall, Shastri Bhawan, Lucknow

UMTC team made a presentation on Comprehensive Mobility Plan (CMP) for Agra, Kanpur and Lucknow to the stakeholders.

Major Key points discussed in presentation are as follows:

1. UMTC team gave a detailed introduction of the aim, objective, scope and components of a CMP, introduction to the study area, the data collection process and the primary surveys carried out were discussed.
2. UMTC team has presented City Specific Strategies as follows:

City Name	Mobility Strategies
Kanpur	Development of a ring – radial network focused towards improving accessibility within KDA and providing connectivity to the new growth centers.
	Public transit strategy for 2016, 2021 and 2031, was presented wherein public transport needs were proposed to be developed in phased manner, depending upon the increasing travel demand along the major radiating road network of the city. The choice of mode could be made by the city based on an alternatives analysis.
	Detailed decongestion plans were discussed for Mulganj area by segregating lanes for motorised and non-motorised modes, one-way system for approach roads for Railway Station and Canal Road and Express Road.
	Non-Motorised and pedestrian mobility plan including network for NMT and pedestrian as well as

	detailed area wise pedestrian strategy and creation of pedestrian facilities at intersection.
	Freight mobility plan giving location of proposed facilities and their phased development.
	Travel demand management including one-way streets, area traffic control, access control policy, public awareness and education program etc.
	List of Junction for improvements
Lucknow	Development of a ring – radial network focused towards improving accessibility within the study area and providing connectivity to the new growth centres.
	Concept of Transit Oriented Development with development of sub-city centres in order to decongest the core city area.
	Development of New Arterial Road: <ul style="list-style-type: none"> • Haider Canal- M. G Road- Kukrail Canal-Faizabad Road-Ring Road • Bandha Road along Gomti River
	Public transit strategy for 2016, 2021 and 2031, was presented wherein public transport needs were proposed to be developed in a phased manner, depending upon the increasing travel demand along the major radiating road network of the city. The choice of mode could be made by the city based on an alternatives analysis.
	Decongestion plans were discussed for core city area by segregating lanes for motorised and non-motorised modes, and one-way system for approach roads.
	Promotion of Non-Motorised and pedestrian mobility facilities, which included network for NMT and pedestrian as well as detailed area wise pedestrian strategy, and creation of pedestrian facilities at intersection.
	Freight mobility plan giving location of proposed facilities and their phased development was also discussed.
	Travel demand management including one-way streets, area traffic control, access control policy, public awareness and education programme etc.
	List of Junction for improvements

Agra	Development of a ring – radial network focused towards improving accessibility within ADA and providing connectivity to the new growth centers.
	Detailed redevelopment plans for Agra Fort area, Agra Fort Station, Mandi area (Hing ki Mandi, Kinari Baazar and surrounding areas), Raja ki Mandi Station, Raja ki Mandi Market and Shahganj
	Public transit strategy for 2016, 2021 and 2031, including improvements in public transport share, augmentation of the buses, restructuring of bus routes and higher order mass transit corridors and proposed infrastructure augmentation
	Non-Motorised and pedestrian mobility plan which included network for NMT and pedestrian as well as detailed area-wise pedestrian strategy and creation of pedestrian facilities at intersection.
	Freight mobility plan giving location of proposed facilities, corridors etc
	Travel demand management including one-way streets, area traffic control, access control policy, public awareness and education programme, etc.
	List of Junctions for improvements
	Tourist Management plan which included a HoHo bus service in lines of Delhi, pedestrian and cycling network and bicycle sharing schemes around major tourist attractions

3. At the end of the presentation, the following suggestions were received from the stakeholders:

- a) IIDC Commissioner & Principal Secretary, Urban Development Department, GoUP appreciated the process of developing Comprehensive Mobility Plan
- b) Commissioner & Principal Secretary, Urban Development Department, Government of Uttar Pradesh requested UMTC to provide cost of projects identified in the mobility plan along with timelines for implementation.

4. UMTC has agreed to incorporate suggestions and comments in the final report.

List of the Participants

1. Mr. V N Garg, Commissioner, Uttar Pradesh Infrastructure and Industrial Development Corporation (IIDC)
2. Mr. D.S. Misra, Principal Secretary, Urban Development Department, Govt. of UP
3. Mr. Narendra Bhushan, MD, UPSRTC
4. Mr. S.P. Misra, Special Secretary, Urban Development Department, Govt. of UP
5. Mr. B. Kumar, Special Secretary, Law Department, Govt. of UP
6. Mr. Alok Kumar
7. Mr. Manoj Kumar, Assistant Secretary, Finance Department, Govt. of UP
8. Mr. Shivanand, Special Secretary, Transport Department, Govt. of UP
9. Mr. H.S. Gaba, CGM, UPSRTC
10. Mr. A.K. Pandey, Regional Transport Officer (R.T.O.)
11. Mr. R. Verma, GM (O), UPSRTC
12. Mr. A. Srivastav
13. Mr. Verma, CTCP
14. Mr. S. Ramakrishna, UMTC
15. Mr. Kishor Nathani, UMTC
16. Mrs. Kanika Kalra, UMTC
17. Mrs. Sonia Arora, UMTC
18. Miss. Ishita Chauhan, UMTC
19. Mr. Ranjan Jyoti Dutta, UMTC

Draft Minutes of the Stakeholder Consultation Meeting cum Presentation on Draft Final Report of Comprehensive Mobility Plan (CMP) for Agra, Kanpur, Lucknow, Mathura & Meerut held on 9-11-2011 at 1530 hrs under the Chairmanship of Mr. V N Garg, Commissioner, Uttar Pradesh Infrastructure and Industrial Development Corporation (IIDC).

Location: - Conference Hall, Shastri Bhawan, Lucknow

UMTC team made a presentation on the Draft Final Report of Comprehensive Mobility Plan (CMP) for Agra, Kanpur, Lucknow, Mathura & Meerut to the stakeholders.

Major Key points highlighted/discussed in the presentation are as follows:

1. UMTC team provided an overview of the concepts, which is applicable to all the cities. It was highlighted that CMP is a macro-level document which provides the vision, direction and the costing and phasing over the planning horizon of 20 years.
2. UMTC gave a detailed city-specific recommendations and strategies along with costing and implementation phasing plan for short, medium and long-term interventions.
3. UMTC has also mentioned that it has completed the process of preparation of CMP for 5 cities instead of 6 cities by excluding Allahabad city from its mandate since the same is under preparation by Allahabad Development Authority. However, in the case of Mathura, while individual meeting with stakeholders has been completed, a common stakeholder meeting is yet to be convened by the DM.
4. At the end of the presentation, the following suggestions were received and decision taken from/ by the stakeholders:
 - a) Principal Secretary, Urban Development Department, GoUP has stated that Comprehensive Mobility Plan for Allahabad city, which was initially part of the UMTC mandate, also needs to be prepared by UMTC on the same lines as given in the original MoA.

- b) Principal Secretary, Urban Development Department, Government of Uttar Pradesh, while appreciating the need of the CMP over the horizon of 20 years, also expressed the need to provide executable plan for immediate interventions which can bring about discernable benefits. UMTC stated that such a plan is being prepared for Lucknow and Kanpur, which is a separate assignment/ mandate - Traffic Improvement and Management given to UMTC. After detailed discussion, it was decided that UMTC would proceed with preparation of such a plan for four (4) cities under a separate mandate on a fee for Allahabad, Agra, Mathura and Meerut on the similar lines of Lucknow and Kanpur. The fee for such a mandate would be arrived at keeping in view the fee for Lucknow and Kanpur as also the city profiles of the respective cities.
- c) Urban Development Department shall communicate to all the concerned departments, authorities and agencies of the respective cities to co-ordinate, cooperate and provide necessary inputs, suggestions, secondary information and assistance to UMTC in carrying out primary surveys as required from time to time in order to complete the entire exercise in a timely manner.
- d) Mr. J N. Srivastav, CE, Urban Transport shall be the nodal officer for all the assignments.
- e) The common stake holder meeting at Mathura needs to be completed on priority and a letter to this effect would be written by UDD, Government of UP to DM Mathura shortly.
- f) The CRRI report on Lucknow, which is available with LDA, needs to be provided to UMTC through Mr. J N. Srivastav, CE, Urban Transport.
- g) While the draft CMPs are approved for finalisation and submission by October 2011, the Traffic Improvement and Management plans would be provided as a separate document and a presentation would be made on 3rd of October 2011 to IIDC on this subject.
- h) UMTC to assist UDD, Government of UP for reimbursement of fees as per the UDD, Government of India's instructions on the subject.

The meeting finished with thanks to the Chair.

List of the Participants

1. Mr. V N Garg, Commissioner, Uttar Pradesh Infrastructure and Industrial Development Corporation (IIDC)
2. Mr. D.S. Misra, Principal Secretary, Urban Development Department, Govt. of UP
3. Mr. Navneet Sehgal, Secretary, Urban Development Department, Govt. of UP
4. Mr. A. Srivastav
5. Mr. N.R. Verma, CTCP
6. Vice Chairman, LDA
7. Vice Chairman, ADA
8. Mr. Ravi Jain, Town Planner, LDA
9. Mr. Ashutosh Srivastav, LDA
10. Mr. J N. Srivastav, Directorate of Urban Local Bodies
11. Mr. Umakant Pathak, Section Officer, Urban Development Department, Govt. of UP
12. Mr. Rajnikant Pandey, Review Officer, Urban Development Department, Govt. of UP
13. Mr. S. Ramakrishna, UMTC
14. Dr. R.S. Moorthy, UMTC
15. Mrs. Kanika Kalra, UMTC
16. Mrs. Sonia Arora, UMTC
17. Miss. Ishita Chauhan, UMTC
18. Mr. Ranjan Jyoti Dutta, UMTC
19. Mr. Gaurav Dubey, UMTC

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