MANIPUR GAZETTE

सत्यमेव जयते

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GOVERNMENT OF MANIPUR
SECRETARIAT: MUNICIPAL ADMINISTRATION HOUSING & URBAN DEVELOPMENT DEPARTMENT

NOTIFICATION

Imphal, the 16th January, 2025

No. SCS-801/1/2025-MAHUD-MAHUD(1): WHEREAS, the urban areas in the State are emerging as centres of economic growth. This growing importance of urban areas in the economic sphere and the opportunities it presents has led to migration and increase in rate of urbanization. Town Planning Department, Manipur has requested School of Planning & Architecture, to prepare **City Comprehensive Mobility Plan (CCMP) for Imphal.** The ultimate purpose of a CCMP is provide short, medium and long-term strategies to provide access and mobility of a city's population. To achieve this purpose, the study envisages short, medium and long-term mobility management measures to facilitate safe and efficient movement of people for the present and future of Imphal.

2. And, Whereas, the study conducted traffic and transportation study in detail for Imphal Municipal Corporation Area that will guide the urban development of study area in future and to undertake identified transport infrastructure projects to ease the existing congestion level.

3. And, Whereas, traffic and other surveys viz., Traffic Characteristics, Travel Characteristics, Road Network Characteristics, IPT user Characteristics and Parking Characteristics were carried out on normal working days.

4. And, Whereas, the key challenges are (1) the radial form of regional and arterial corridors, (2) the absence of bypass or ring corridor, (3) movement of heavy vehicles through the city, (4) lack of non-motorized movement provision and (5) high dependency upon private modes of traffic.

5. And, Whereas, for the purpose aforesaid and for other purposes connected therein and incidental thereto, it is felt necessary by the State Government to have a City Comprehensive Mobility Plan (CCMP) for Imphal.

6. **Now, therefore, the State Government hereby publishes the City Comprehensive Mobility Plan (CCMP) for Imphal for promotion of ease of transit by recommending measures to be adopted by the public and private agencies for consideration and implementation as ANNEXURE.**

The ANNERXURE will be available at the Town Planning Department Official Website https://tpmanipur.mn.gov.in.

M. JOY SINGH,
Commissioner (MAHUD),
Government of Manipur

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ANNEXURE to Notification No.SCS-801/1/2025-MAHUD-MAHUD(1) dated 16.01.2025

Town Planning Department

Government of Manipur

City Comprehensive Mobility Plan for Imphal

Final Report

December 2024

School of Planning & Architecture, New Delhi

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1 Introduction

1.1 Project Description

Town Planning Department of Manipur has requested School of Planning and Architecture New Delhi to prepare City Mobility Plan for Imphal and Thoubal & Congestion Threshold Analysis for Moirang Town of Manipur.

1.2 Objectives of the Study

The ultimate purpose of a CCMP is to provide short, medium and long-term strategies to provide access and mobility for a city's population. To achieve this purpose for Imphal, Thoubal and Moirang, the following key objectives are presented:

a) To provide long terms vision and goals for desirable urban mobilities
b) To identify feasible short-, medium- and long-term mobility management measures and transport infrastructure needs to facilitate safe and efficient movement of people for the present and future.

1.3 Scope of Work

In line with the objectives, the Consultants shall carry out the services:

a) To collect and study secondary traffic and other related data from concerned authorities;
b) To study existing road network and transport infrastructure in the study area;
c) To identify survey locations and conduct traffic surveys as per guidelines and in consultation with the concerned authorities on identified locations for following surveys:
    i. Traffic Volume Count (Mid-Block & Outer Cordon Point)
    ii. Origin-Destination Survey at Outer Cordon Point
    iii. Public Transport Survey
    iv. Speed & Delay Survey
    v. Parking Survey
    vi. Road Inventory
    vii. Household Survey (2% of Total Households in the study area)
    viii. Terminal Survey
    ix. Intermediate Public Transport (IPT) Survey
    x. Pedestrian Counting Survey (Mid-Block & Intersection)
d) To assess base year and horizon year travel demand in case study areas
e) To study the impact of future development proposals in and around Imphal and Thoubal and carry out congestion threshold analysis in Moirang town
f) To prepare comprehensive transport improvement strategies with the conceptual proposals in Imphal, Thoubal and Moirang
g) To prepare a phasing plan for the identified transport improvement proposals

The CCMP shall be prepared for Municipal Corporation of Imphal and Thoubal Municipal area while congestion threshold analysis for Moirang Municipal area respectively.

2 Profile of Study Area

2.1 Introduction to Imphal Study Area

The North East region of India, often referred to as the 'Seven Sisters,' encompasses seven states: Arunachal Pradesh, Assam, Manipur, Meghalaya, Mizoram, Nagaland, and Tripura. The Ministry of Development of North Eastern Region, Government of India, includes Sikkim within this region due to its proximity and similar development needs. Excluding Sikkim, the region spans over 262,230 sq km (7.9% of India's territory) with a population of 4.4 crores (3.2% of India's population), as per the 2011 Census. Geographically, the North East shares borders with Bangladesh, Bhutan, China, Myanmar, and Nepal. It connects to the rest of the country through the narrow Siliguri Corridor in West Bengal, known as 'Chicken's Neck.' The region is culturally rich, with over 220 ethnic indigenous groups, primarily concentrated in Arunachal Pradesh, Manipur, Meghalaya, Mizoram, and Nagaland.

Manipur, a landlocked border state in the northeastern part of India, shares a 352 km international boundary with Myanmar in the southeast. It is surrounded by Nagaland in the north, Assam in the west, and Mizoram in the south, covering a total area of 22,327 sq km. Geographically, Manipur is divided into a centrally located valley and surrounding hills. The city of Imphal, situated in parts of Imphal East and Imphal West districts, is the only Class I city in Manipur. Despite occupying only 3.7% of the state's area, it accommodates 9.8% of the total population. This geographic and demographic distribution reflects the concentrated urban development in Imphal.

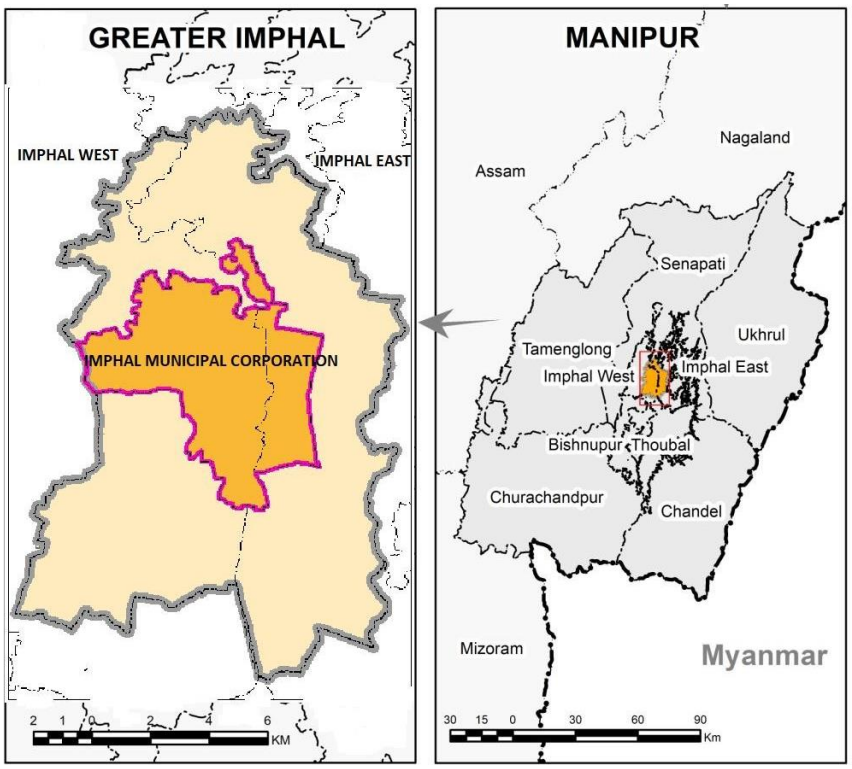


Figure 2-1: Location and Administrative Boundary of Manipur and Imphal Valley

2.2 Demographic Profile

The population of Manipur as per the 2011 Census is 28.6 lakh consisting of 14.4 lakhs males and 14.2 lakhs females. In absolute terms, the population of Manipur has increased by 5.62 lakhs during the decade 2001-2011. The decadal growth rate in 2011 over 2001 was found to be 24.50 %. The district-wise distribution of population has been provided in Table 2.1. Among all 9 districts of Manipur in 2011, 4 valley districts viz. Imphal East, Imphal West, Bishnupur and Thoubal contained 57% of the total state population.

Table 2-1 District wise Population of Manipur (2011) (Population in lakh)

District	Total Population	Rural Population	Urban Population	Urbanisation (%)
Senapati	4.8	4.72	0.08	**1.67**
Tamenglong	1.40	1.21	0.19	**13.57**
Churachandpur	2.74	2.56	0.18	**6.57**
Ukhrul	1.84	1.57	0.27	**14.67**
Chandel	1.44	1.27	0.17	**11.81**
Bishnupur	2.38	1.5	0.88	**36.97**
Thoubal	4.22	2.71	1.51	**35.78**
Imphal West	5.18	1.95	3.23	**62.36**
Imphal East	4.56	2.73	1.83	**40.13**
Manipur State	**28.56**	**20.22**	**8.04**	**29.20**

Source: Office of the Registrar General of India, 2011

In 2016, Manipur government created seven new district by bifurcating above existing district listed in Table 2.2. The newly created districts are as follows:

Table 2-2: Newly Formed Districts of Manipur

Existing Districts(till 2016)	New District
Imphal East	**Imphal East**
	Jiribam District
Senapati District	**Senapati District**
	Kangpokpi District
Thoubal District	**Thoubal District**
	Kakching District
Chandel District	**Chandel District**
	Tengnoupal District
Ukhrul District	**Ukhrul District**
	Kamjong District
Churachandpur District	**Churachandpur District**
	Pherzawl District
Tamenglong Distrcit	**Tamenglong Distrcit**
	Noney District

Source: Manipur Gazette, Government of Manipur , 2016.

The density of population of Manipur is 128 persons/sq.km in year 2011 as against 103 persons/sq.km in2001 Census. Analysing the spatial pattern of population density, it is observed that the valley districts consist of more population density than the hilly districts. Among the 9 districts of Manipur (Census 2011), 4 districts which form the valley region of Manipur, consists of the highest population density. Imphal, the capital city of Manipur and the only Class I city in Manipur, is in the northern portion of this valley area. Most urban centres are situated in these four valley districts, reflecting in their rate of urbanisation (Figure 2-2).

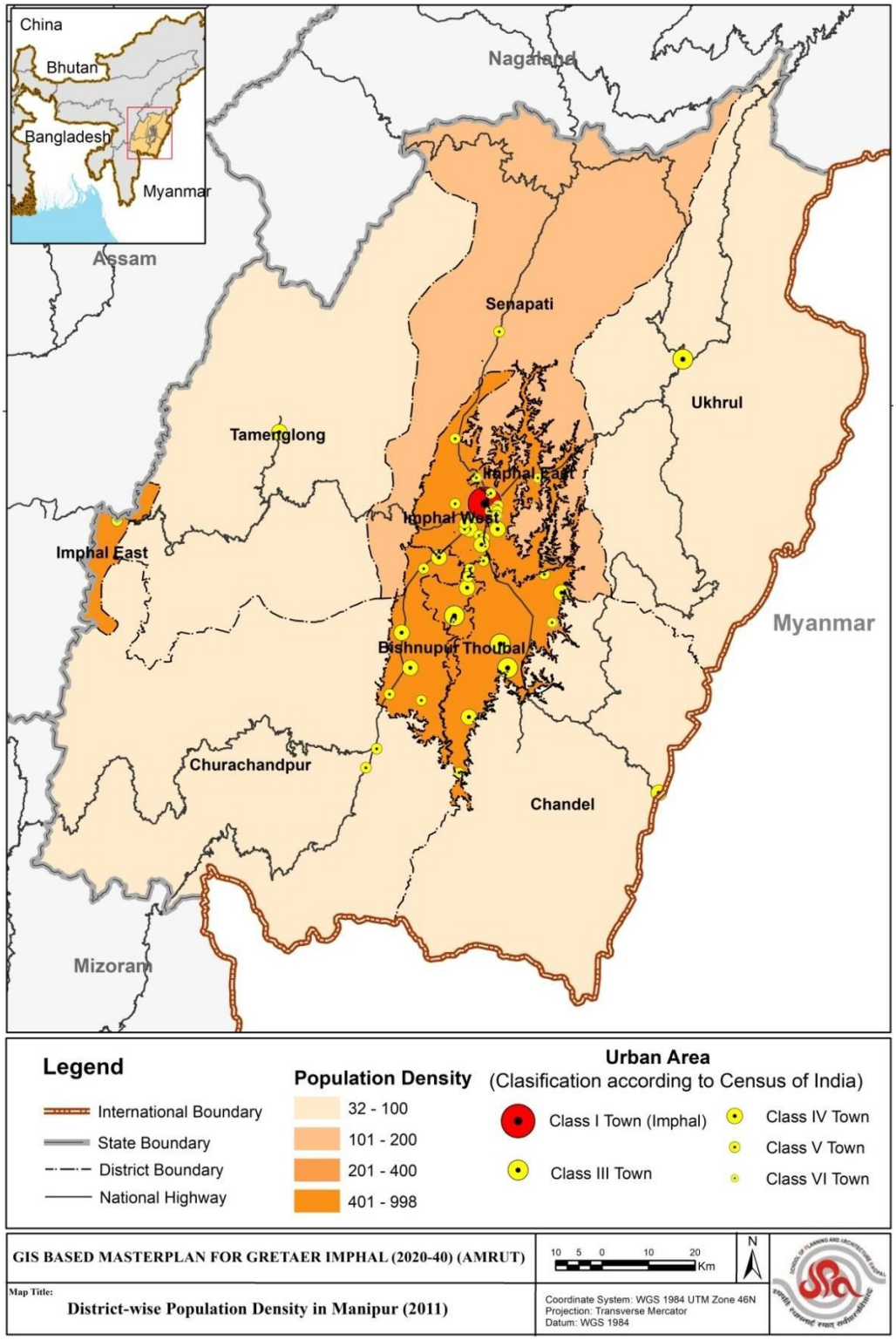


Figure 2-2: District wise Population Density of Manipur (2011)

Source: Census of India 2011 and Administrative Atlas, Census of India, 2011. Note: District Boundary of 2011 has been use as the population data is of 2011

2.3 Socio-Economic Profile

2.3.1 Workforce Participation

The workforce participation rate in Manipur is 45.09, which is much higher than the national average of 25.51 (Census, 2011). While analysing the distribution, it is observed that there is not much deviation among hill districts and valley districts regarding workforce participation rate (Figure 2-3). Imphal East and Imphal West district has a low workforce participation rate because of the prevailing urban economy in most part of the two districts.

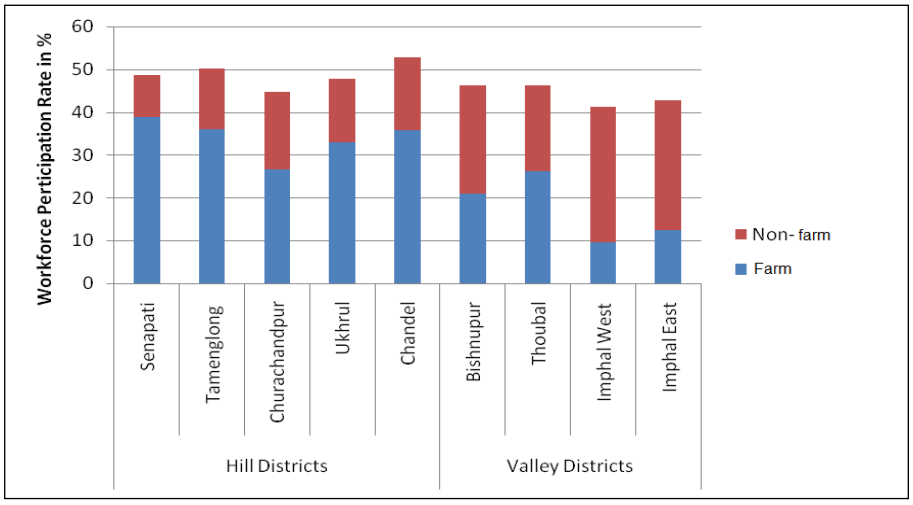


Figure 2-3: District-wise Workforce Participation in Manipur, 2011

Source: Census of India, 2011

Regarding the composition of the workforce, it is found that the valley districts have more proportion of non-farm workforce (Figure 2-4 and Figure 2-5). It is mainly because most of the towns and cities are located in the valley area of Manipur, which contributes to an increase in non-farm economic activity. Thus, the concentration of workforce happens where the concentration of townsand cities area more. Imphal, the capital city of Manipur and the only Class I city in Manipur locatedin the northern portion of the valley area, covering the partially area of Imphal East and Imphal Westdistrict, contributes highly to increase of the non-farm workforce. Hence these two districts have a major share of the non-farm workforce.

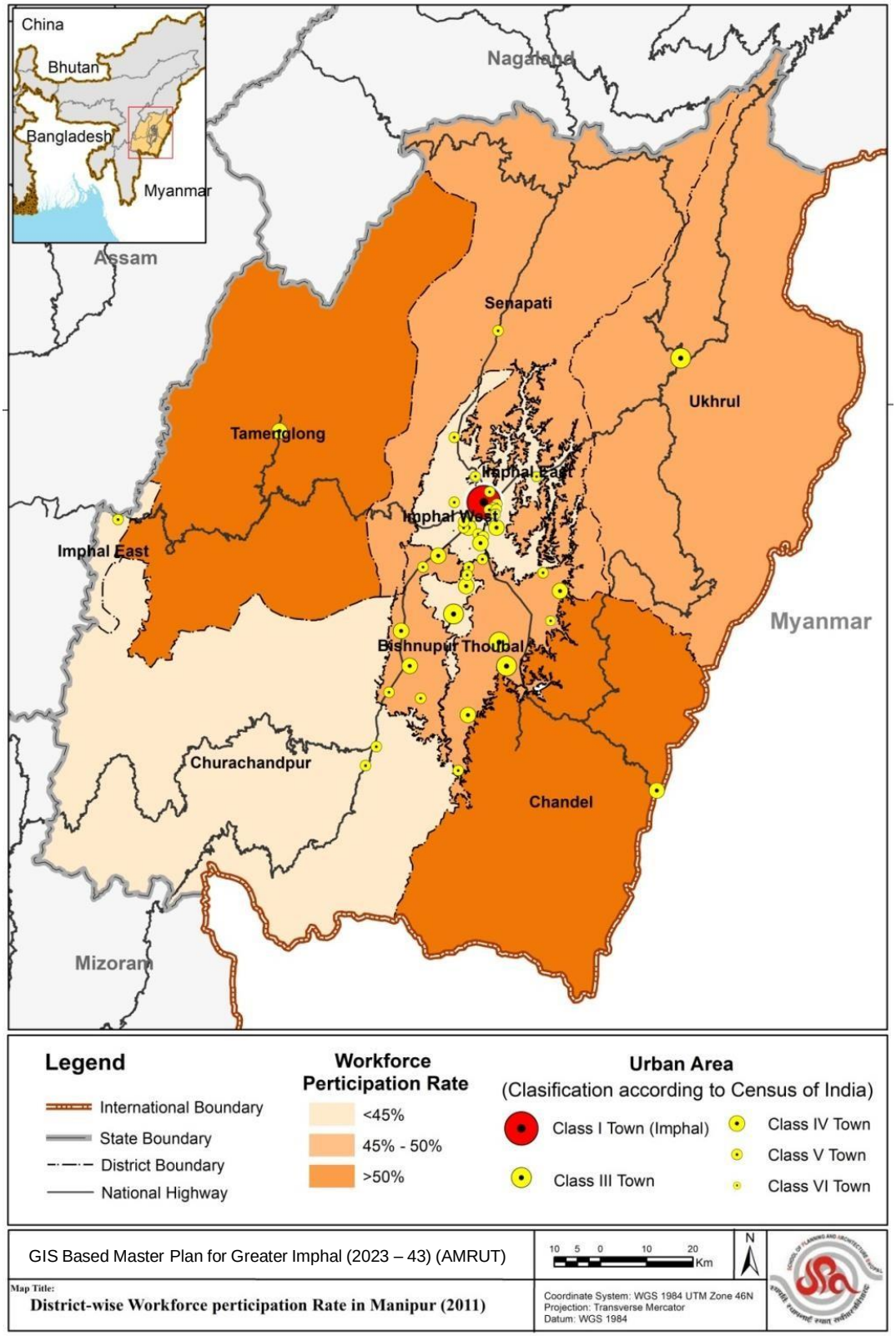


Figure 2-4: District-wise Workforce Participation Rate in Manipur (2011)

Source: Census of India 2011 and Administrative Atlas, Census of India, 2011.

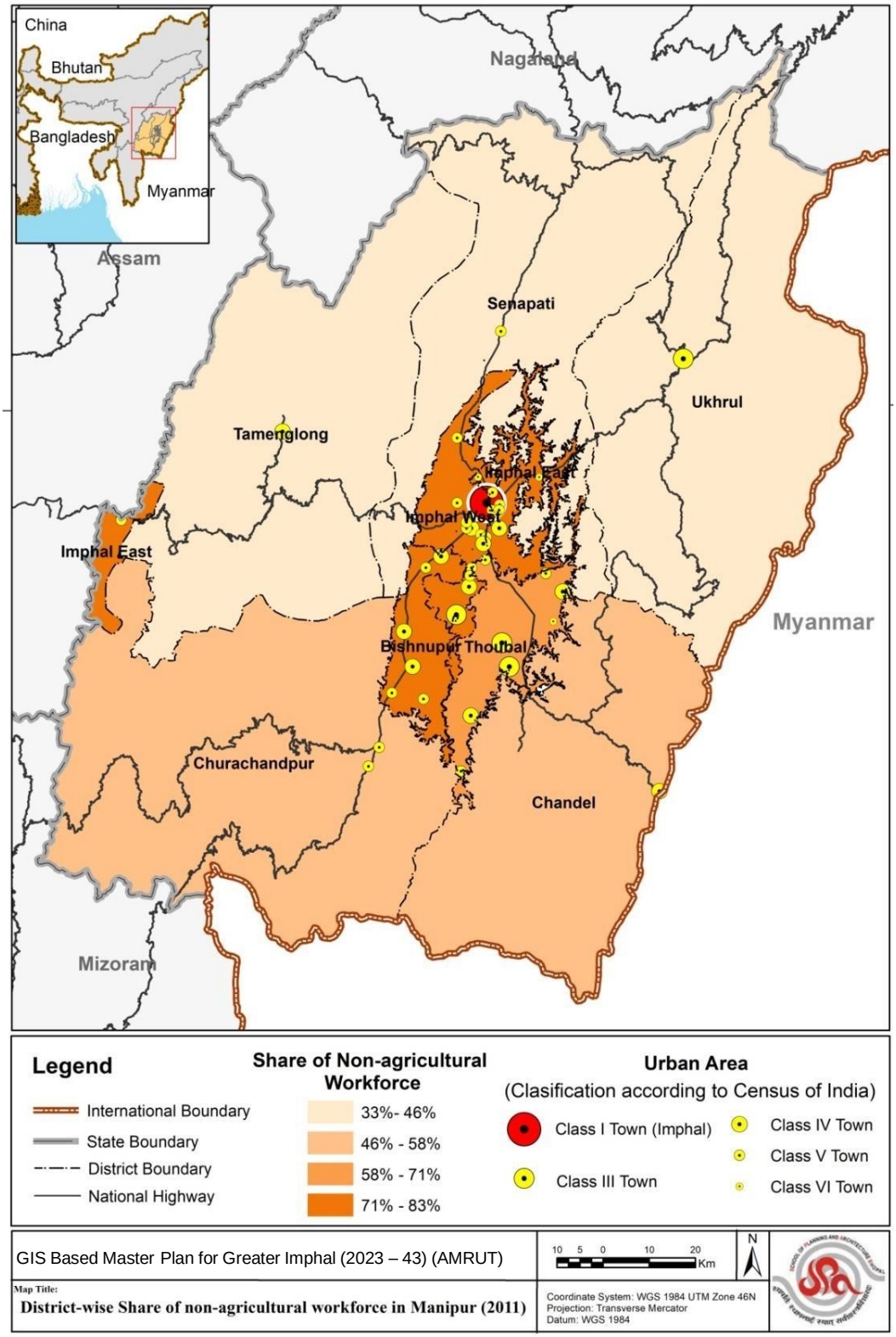


Figure 2-5: District-wise share of Non-Farm workforce in Manipur (2011)

Source: Census of India 2011 and Administrative Atlas, Census of India, 2011

2.3.2 Literacy

Manipur has a literacy rate of 76.9%, (Census 2011), which is more than the national average of 74%. Positive change has been observed during last two-decades in the literacy rate of Manipur, i.e., literacy level has increased from 66.6% in 2001 to 76.9% in 2011, which is a positive sign. Among districts, thereis no sharp difference between hill and valley districts in terms of literacy. Imphal West district, which is the most urbanised district in Manipur and contains part of Imphal City, the capital of Manipur, has the highest literacy rate (Figure 2-6).

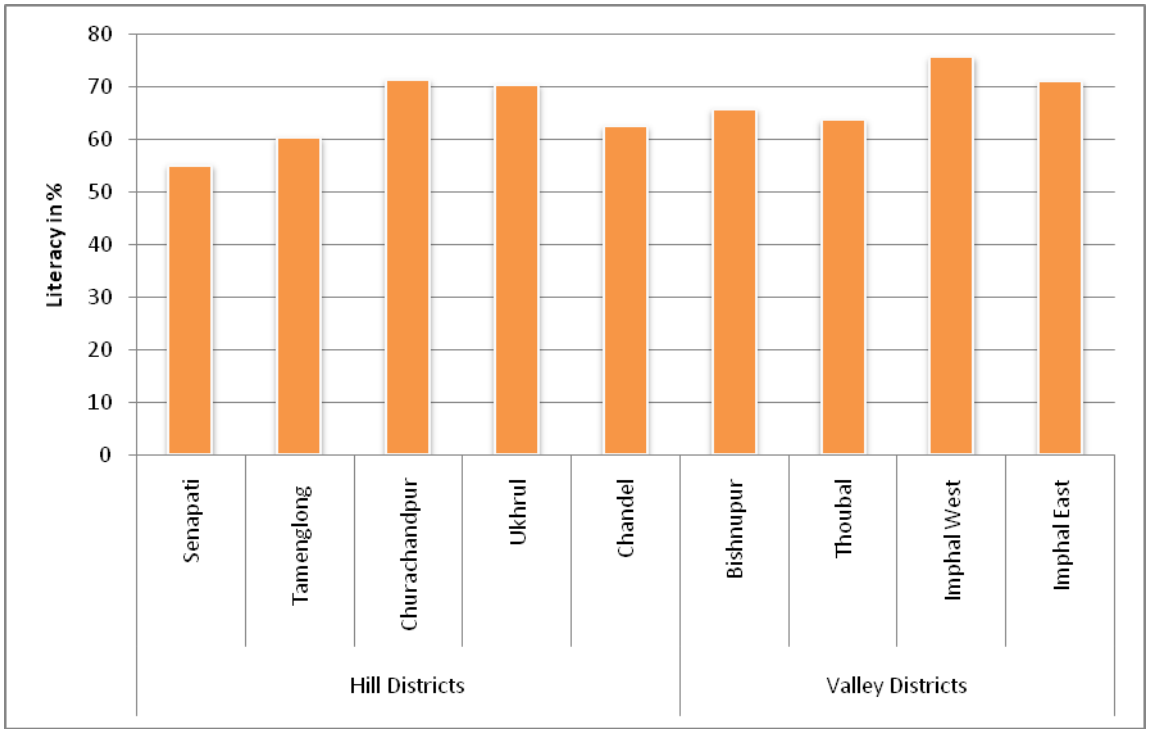


Figure 2-6: District wise Literacy in Manipur (2011)

Source: Primary Census Abstract, Census of India, 2011

2.3.3 Cast Composition

As per the 2011 Census, the share of SC and ST population of Manipur is 3.40% and 40.8%, as against national average of 16.2% and 8.2% respectively, which reflects a much larger share of ST population inthe state than the national average. Regarding the distribution of SC and ST populations, the proportion of the ST population is high in hill districts whereas the proportion of the SC population is high in valley districts. The share of the SC population is high in the districts of Thoubal and Bishnupur, situated in thevalley area. All the hilly districts contain more than 85% of the ST population due to the presence of the tribal communities in the forests, and among them, Tamenglong district contains 95.72% ST populationof its total population. (Table 2.3).

Table 2-3: District wise caste composition in Manipur

District	SC (%)	ST (%)	Others (%)
Senapati	0.21	87.49	**12.30**
Tamenglong	0.02	95.72	**4.26**

District	SC (%)	ST (%)	Others (%)
Churachandpur	0.16	92.94	**6.89**
Ukhrul	0.13	94.35	**5.51**
Chandel	0.37	88.97	**10.65**
Bishnupur	9.31	1.38	**89.30**
Thoubal	9.61	0.43	**89.95**
Imphal West	3.19	4.66	**92.14**
Imphal East	**3.47**	**6.06**	**90.46**

Source: Primary Census Abstract, Census of India, 2011

In Manipur, 33 tribal groups are recognized by the Government of India as Scheduled Tribes (STs), seven Scheduled Castes (SCs), and the Meiteis, the Pangans, and 'others' as separate population categories. (Figure 2-7).

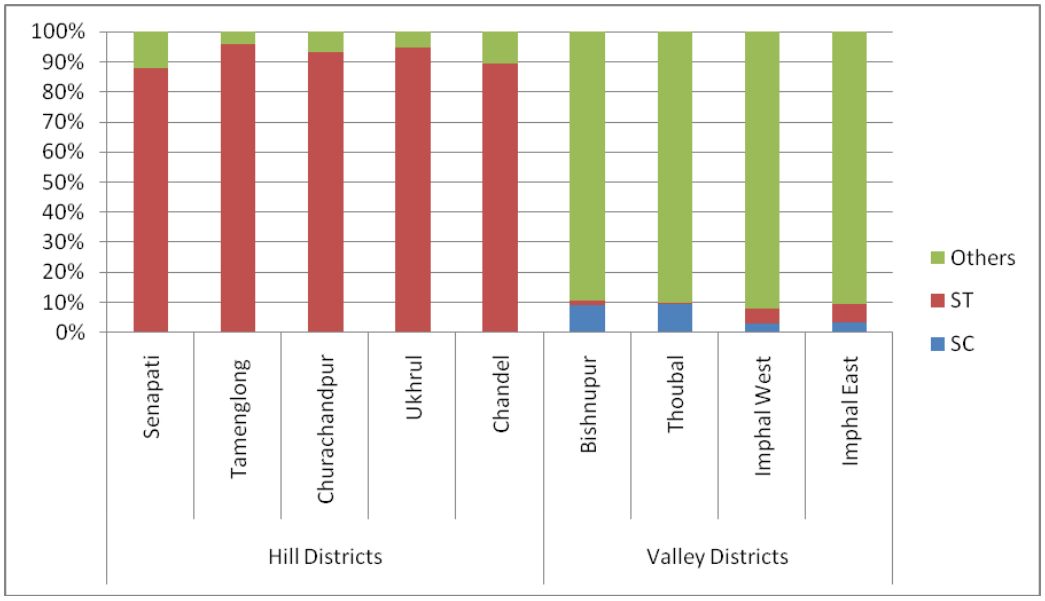


Figure 2-7: District-wise Caste Composition in Manipur

Source: Primary Census Abstract, Census of India, 2011

2.4 Transport System

2.4.1 Connectivity

Being the capital city of the state of Manipur, Imphal is well-developed and well connected by road transportation system.

Road: Road transport has been the only means of communication for the development of the State as there are no inland Waterways. Manipur has very recently been connected with Railways. All development activities, so far have been primarily dependent on the road transport facilities. National Highways are i) NH 2, ii) NH 37 and iii) NH 102 criss-cross the state connecting all districts. Imphal is joined by NH 2 with Nagaland in the north, in the west with Assam by NH 37 and Mizoram in the south by NH 2. It connects with an international border with Myanmar by Asian Highway (NH 2) through the border town Moreh. The Asian highway within Manipur state is a part of NH2 and NH 102 (Figure 2-8 and Figure 2-9). There is bus connectivity from Imphal to Ukhrul, Senapati, Bishnupur, Moreh, Kohima, Dimapur, and Guwahati.

Figure 2-8: National Highway Profile in Manipur

Air: Imphal International Airport, located approximately 8 km from the city center, serves as the primary air gateway for the region. The Imphal Airport is the second international airport in the northeast region, after Guwahati. It is the second largest airport in Northeast India, after Guwahati, connecting Imphal all the important towns and cities of India like Kolkata, Guwahati, Delhi, and Bangalore through regular flights operated by airlines such as Go Air, Air India, and IndiGo.

Railways: Currently, Imphal does not have direct rail connectivity. The nearest railway stations are located in Dimapur and Jiribam, approximately 215 km and 225 km away, respectively. These stations connect Imphal to the wider Indian rail network, with road transport options available for completing the journey to the city.

Bus Transport System: Imphal's road transport infrastructure is complemented by bus services facilitating crucial connections to major nearby cities such as Moreh, Moirang, Thoubal, Mao, and Jiribam. The Manipur State Transport operates both inter-state and intra-state routes with a fleet size of 34 buses, including sizes of 41, 51, and 34 seats, in addition to 17-seater travelers. Originally, these buses traversed 25 hill routes, but recent adjustments due to prevailing circumstances have reduced this number to 17 active routes through the hills, with the remainder of the fleet dedicated to city and student bus services, allocated across six and five routes respectively. Each route boasts a frequency of only one to two trips per day.

IPT: Autos and Tata Magic: Within Imphal, the local transport mix includes auto-rickshaws, e-rickshaws and Tata magic, catering to the daily mobility needs of residents and visitors. The transport landscape in Imphal is notably defined by the widespread use of auto-rickshaws and Tata Magic vehicles, which serve as a vital link in the city's public transport network. Auto-rickshaws, ubiquitous across the city, offer an accessible and cost-effective means for short-distance travel, catering to the daily commuting needs of the urban population. According to the records from the office of the Secretary/STA in Manipur, there are 77 associations managing 118 routes for these vehicles. Presently, there are 2,133 temporary contract carriage permits that are valid, while a significant number, 5,522, are operating without valid permits, making a total of 7,655 temporary permits issued. These three-wheelers are a popular choice among residents for

their convenience and agility in navigating through the streets of Imphal. Adding a significant dimension to the road transport system, Tata Magic vehicles have become a preferred mode for longer trips within and around Imphal. It is an ideal choice for both inter-city and intra-city travel, providing a reliable and efficient service for larger groups of passengers.

Inter-state Bus Terminal:

There is one Inter-state Terminal in Imphal city. Inter-state Bus terminal is known as ISBT and situated near Khumanlampak stadium. Bus services to Ukhrul, Senapati, Bishnupur, Moreh, Kohima, Dimapur, Guwahati and other destinations are operated from this terminal. Being located near core of the city, the buses navigate through the core city network causing more congestion on the already saturated network. The location of ISBT is very well suited for multi- modal integration terminal and is highly accessible by multiple modes of transportation.

Figure 2-9 shows the location of the ISBT, airport and proposed railway station.

2.4.2 Vehicle Registration

The vehicle registration data for Imphal reveals a significant inclination towards two-wheelers, with motorcycles and scooters making up 71% of the total registrations, amounting to 25,054 units indicating a strong preference for 2 wheelers. Motor cars accounted for a substantial 23%, with 8,120 registrations, indicating a preference for personal vehicles over public transportation among a sizable portion of the population. Goods carriers constituted 4% of the registrations, totaling 1,260 vehicles, which reflects the commercial activity within the city requiring the transport of goods. Three-wheelers represented the smallest share, with just 1% or 343 registrations. This data not only highlights the transportation choices of Imphal's residents but also points to potential areas for infrastructural development, such as enhancing public transportation systems to balance the heavy reliance on personal vehicles.

Table 2-4: Vehicle Registration - 2019

Mode	Vehicles	%
Motor Car	8120	23%
Three-Wheeler (Passenger)	343	1%
Goods Carrier	1260	4%
M-Cycle/Scooter	25054	71%

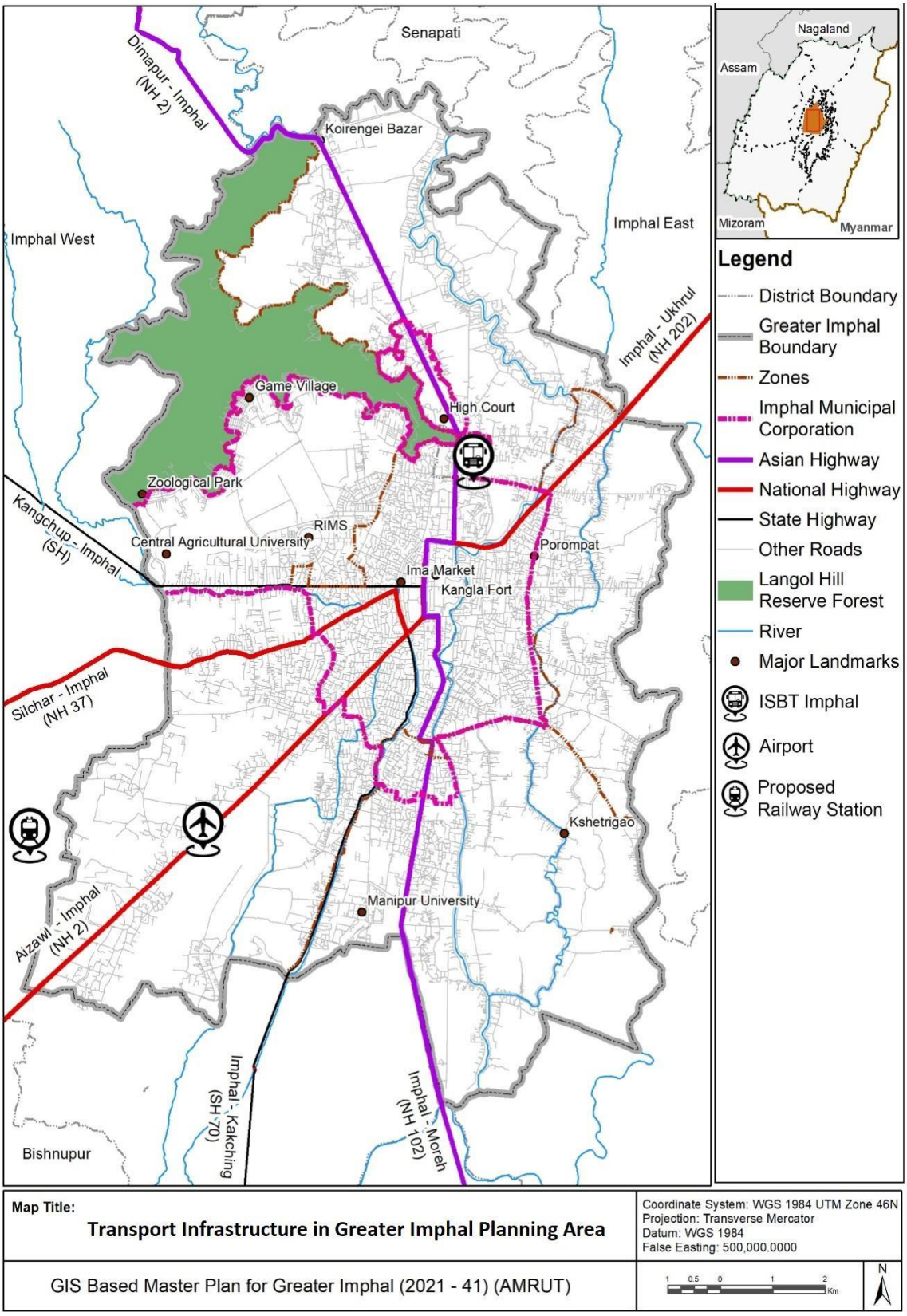


Figure 2-9: Transport infrastructure in the Greater Imphal Planning Area

Source: GIS Based Master Plan for Greater Imphal (2023 – 43) (AMRUT)

2.5 Tourism

Imphal, the capital city of Manipur, is the central hub for a network of routes leading to a variety of tourist attractions that highlight the region's natural beauty and cultural richness. The city itself is home to the historic Kangla Fort, a site of great archaeological and historical significance. Radiating from Imphal are roads that take travelers to Loktak Lake, the largest freshwater lake in the Northeast, renowned for its floating islands and the unique Keibul Lamjao National Park. To the east lies Ukhrul, a picturesque hill district ideal for trekking and exploring natural caves and waterfalls. Southeast of Imphal is Chandel, a cultural melting pot bordering Myanmar, while to the west, Tamenglong's lush forests are known for their exotic flora and fauna. The northern route leads to Senapati, offering a glimpse into the region's diverse ethnic communities and their traditions. Thoubal, not far from Imphal, is perfect for angling and boating activities. Moreh, a commercial town on the Indo-Myanmar border, provides a unique blend of cross-cultural experiences.

The route network around Imphal is critical for accessing these tourist spots. With Imphal as the hub, roads branch out towards various destinations, facilitating travel and tourism. The network connects Imphal to neighboring states and the borders of Myanmar, making it a strategic location for both domestic and international tourists. The connectivity also allows for the exploration of the unique culture of Manipur, its scenic landscapes, and the vibrant markets of Imphal, such as the Ima Keithel, where women traders sell a variety of goods. For any tourist in Imphal, the road network is the lifeline that opens up the treasures of the region for exploration and appreciation.

3 Review of Past Studies

3.1 Master Plan for Greater Imphal

To understand the present physical structure of the city, it is important to understand the past planning efforts for the Greater Imphal area. The Greater Imphal Master Plan of 2011 was published in the year 1994 to streamline the growth of the capital town of Manipur. Following sections contain reviews in terms of development strategies, urban form, issues and proposals.

3.1.1. Development Strategies

The Master Plan for Greater Imphal 2011, focused on the spatial distribution of various functions, road network, community facilities and employment of the city. The city of Imphal had a mono-centric development wherein the public activities are mostly concentrated in the centre and the existing radial roads converge at the central location at the Kangla Western Gate. The guidelines in the master plan were to improve the existing situation of the city and also to give a direction to the growth of city.

The plan intended to decongest the central area by proposing a sub-city centre towards the south of the central area at the major nodal point on NH 39. A new capitol complex was proposed at the foothills of the Langol Hills to accommodate new Secretariat, High Court and other state level facilities. In recent times, there have been a few government construction projects undertaken in the Langol area. Also, there was a proposal for the expansion of the zoological garden in the area. Many recreation facilities icluding rowing, parks and playgrounds, improvement of natural reservoir, etc. were proposed in the Master Plan of 2011.

3.1.2. Urban Form and Development Pattern

The urban form of Imphal and the development pattern was guided by natural features like hills and rivers, etc. To achieve a rational and efficient physical structure of the city, the Greater Imphal Master Plan 2011 was formulated to achieve the future desired form and structure of the city.

The development of the city was proposed to be majorly low rise, with transformation of rural character in some of the zones to urban character and higher density development at certain locations of concentration (high-rise buildings) including at the central area. It was also proposed to maintain the vernacular character of the region and also to provide differentiated spaces for different activities in such a way to enforce the particular function to take place. The planning and design guideline of the city was proposed to establish a hierarchy of activities along with the interrelationship of building mass and open spaces. The master plan suggested the need for Imphal city to have a properly defined central area to cope with future demands. It also talked about regulating the haphazard growth in the immediate surroundings of the core area. The residential area was envisaged to have a low rise and low density development and the concentration of high rise buildings in the core area for the economic and visual impact of the place.

3.1.3. Institutional Framework

The key agencies identified for implementation of the Imphal Master Plan 2011 included:

- Town Planning Department, Govt. of Manipur
- Planning and Development Authority, Manipur
- Imphal Municipal Corporation
- P.W.D., Govt. of Manipur
- P.H.E.D., Govt. of Manipur
- Department of Trade Commerce and Industries, Govt. of Manipur
- Department of Transport, Govt. of Manipur
- Manipur State Road Transport Corporation (MSRTC), Manipur
- Department of Agriculture, Govt. of Manipur
- Rural Development and Panchayati Raj Department, Govt. of Manipur
- Social Welfare Department, Govt. of Manipur
- Department of Education, Govt. of Manipur
- Manipur State Power Company Ltd., Govt. of Manipur
- Department of Sericulture, Govt. of Manipur
- Forest Department, Govt. of Manipur
- Directorate of Settlement and Land Records, Govt. of Manipur

3.2 Bus route operations

The concerned Transport Societies /Associations who are operating buses under stage carriage permits approached the State Transport Authority, Manipur for sanction of phasing out of their fleet of old/polluted buses with replacement by Maxi Cabs mostly Tata Magics & Tata Wingers under the contract carriage permits (u/s 74 of the M.V.Act' 88) in most of the monopolized routes accepting 3(three) major Corridors namely Burma Sugnu Line (Imphal to Sugnu/Serou/Chandel/Kakching/Pallel etc along NH/102, Imphal to Saparmeina/Kangpokpi/Senapati/Mao along NH/02, Imphal to Churachandpur via Moirang along NH/150 renamed as NH/02 (about 5-6 wingers introduced under the contract carriage permits by the bus operators besides 30 wingers being operated by the CITOS).

Table 3-1: Number of Vehicles Registered as on 31st March 2013

Categories of vehicles	Imphal West	Imphal East	Thoubal	Bishnupur	Kangpokpi	Senapati	Ukhrul	Churachandpur	Total
Truck	7866	677	849	1138	578	367	164	891	12530
Bus	1646	194	179	198	174	114		172	2677
M/Bus	542	1	147	160	115		1	138	1104
Jeep	10223	660	1170	281	369	234	219	287	13443
Car	18375	2115	334	380	252	407	247	852	22962
Taxi	1975	323	9	49		18	15	88	2477
Tractor	962	587	594	18		8	2	127	2298
Auto-rickshaw	7754	1831	956	402	274	425	45	928	12615
2 - wheelers	114977	12791	12801	1461	175	905	353	7391	150854
Trailers	395	2	66					56	519
Others	405	24	251				2	73	755
Total	165120	19205	17356	4087	1937	2478	1048	11003	222234

Imphal to Thoubal extended upto Kakching is categorized as Class-B Route; all passenger transport vehicles shall have to pay 5% of the permit fee more; as per Special Clause C of the Manipur Motor Vehicles taxation (Amendment) Act '2011.

3.3 Characteristics and issues in Bus transport sector

Some of the Characteristics and issues in bus transport sector are outlined below:

I. Status of operation of Buses/Medium Buses in the State (Stage Carriages) :
- After the liquidation of MSRTC, private bus operators have had been taking the responsibility of providing passenger transport services under the Stage Carriage permits granted by the State Transport Authority, Manipur u/s 72 of the M.V. Act'88 in both Urban & Rural areas connecting Imphal City through NHs, State Highways, Major District Roads, Other District Roads as well as other major Corridors.
- Class A & B Routes:
  (a) Imphal- Churachandpur route is categorized as Class-A Route; all passenger transport vehicles shall have to pay 10% of the permit fee more in addition to permit fees payable.
  (b) Imphal to Thoubal extended upto Kakching is categorized as Class-B Route; all passenger transport vehicles shall have to pay 5% of the permit fee more; as per Special Clause C of the Manipur Motor Vehicles taxation (Amendment) Act '2011.

II. Concept of Last Mile Connectivity & Feeder Services:
-The State Transport Authority, Manipur has envisaged the concept of introduction of Intermediate Public Transport Vehicles in the sectors like last mile connectivity & feeder services in the major corridors where Public Transport is operating with larger seating capacity vehicles with restriction of grant of Contract Carriage Permits in favour of Motor & Maxi Cabs for transportation of passengers along the major Corridors so as to encourage healthy competition in Urban Transport System besides redressing the traffic congestion in Imphal city.

III. Operation of Luxury Buses (33 seat capacity) operating under the Inter State Stage Carriage Permits under the provisions of Single Point/ Double Point Taxation

- As per records maintained in the office of the Secy/STA, Manipur, 120 deluxe busses are operating in the route Imphal- Guwahati via Dimapur/Kohima (30 buses under single point taxation & 90 buses under double point taxation which has no limit) with Inter State Stage Carriage Permits under the Reciprocal Agreement entered between the States of Manipur & Assam in the year 1993 under the provisions of section 88(5) & (6) of the MV Act' 88

IV. Operation of Maxi Cabs (12 seater excluding driver) under the All India permit for Tourist Transport Operators, Rules' 1993: As per record maintained in the office of the Secy/STA, Manipur, about 55 maxi cabs mostly Tata Wingers, Tata Sumos & Tata DIs are operating in the routes Imphal – Guwahati via Kohima/Dimapur with temporary permits (3 months subject to renewal) under the All India permit for Tourist Transport Operators, Rules' 1993.

4. Data collection

4.1. Introduction

Traffic and Transportation Surveys were conducted (Comprehensive Mobility Plan (CMP)) in detail for Imphal Municipal Corporation Area to identify transport infrastructure projects to ease the existing congestion level through various primary traffic surveys obtained from suitably selected traffic survey locations in the study area. As stipulated in the Terms of Reference, the following traffic surveys were carried out and details of the traffic surveys are discussed in the subsequent part of this chapter.

- Classified Traffic Counts
- Origin-Destination Survey
- Road Network Inventory
- Speed and Delay Survey
- Household Travel Survey
- Parking Survey
- IPT Survey

4.2. Primary Surveys

Traffic and other surveys, as defined below, have been carried out in the form of primary field surveys, data collection, assessment, analysis and evaluation. The surveys has been done as per the standard code provisions. The objective is to determine:

1. Traffic Characteristics
2. Travel Characteristics
3. Road Network Characteristics
4. IPT user characteristics
5. Parking Characteristics

The traffic surveys were carried out on a normal working day.

4.2.1. Classified Traffic Volume Counts (Outer Cordon, Mid-Blocks)

Classified vehicle and person travel volume counts conducted at identified locations for a continuous period of 12 hours (5:00 to 17:00 hours) including the morning and evening peak hours. The following data was collected (Table 4-1):

- Category wise hourly flow
- Category wise hourly turning movement
- Variation in flow before, during and after the peak.

The locations of surveys are presented in the below Figure 4-2.

Table 4-1: Traffic Volume Count survey locations

Outer-Cordon (OC)	Mid-Block (MB)
Uripok Kangchup Road	Indo Myanmar Road (DM College Imphal Ground)
Imphal Jessami Road	Imphal Jessami Road (Near Fort)
Keishamphat Airport Road	Near Imphal Municipal Corporation
MayaiLambi Road	Indo Myanmar Road (DM College Imphal Ground)
Imphal Dimapur Road	Mayai Lambi Rd (Pishum Ningom Leirak Ground)
Indo-Myanmar Road	

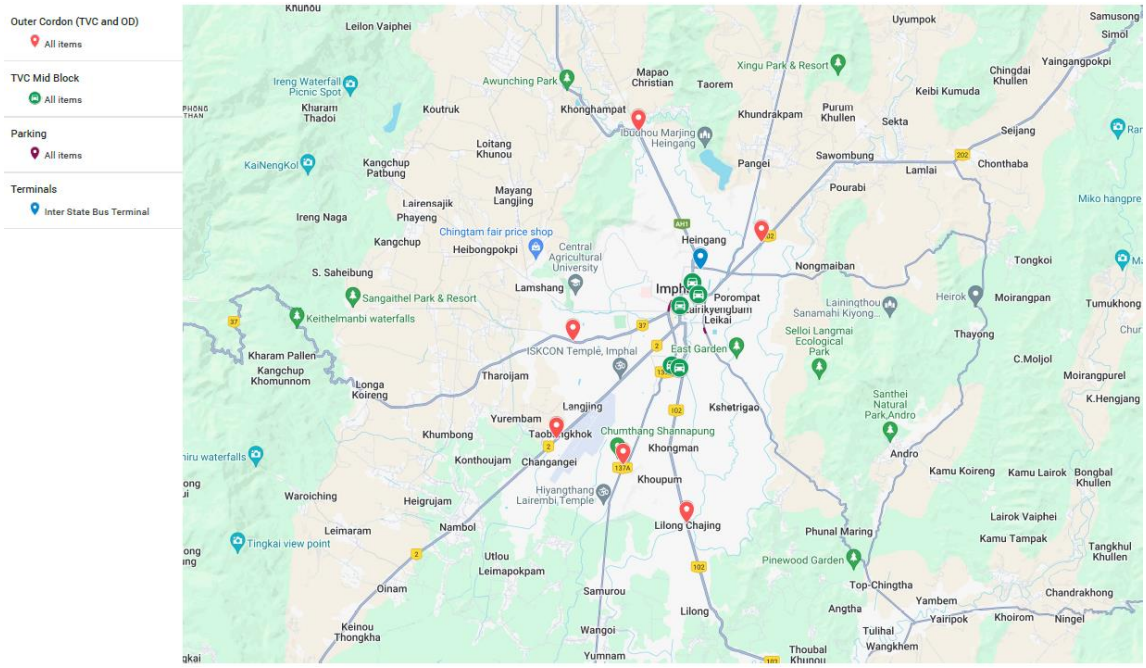


Figure 4-1 : Traffic Volume Count Survey Location in Imphal Municipal Corporation Area

4.2.2. Parking Survey

Parking in Imphal mainly consists of on-street parking as designated off-street parking locations are absent. Imphal Municipal Corporation regulates parking in Imphal. Parking demand is heavily influenced by surrounding land use. Each land use attracts and generates different levels of traffic and hence, generates different level of parking demand. Figure 4-3 shows the parking locations in study area where surveys were conducted.

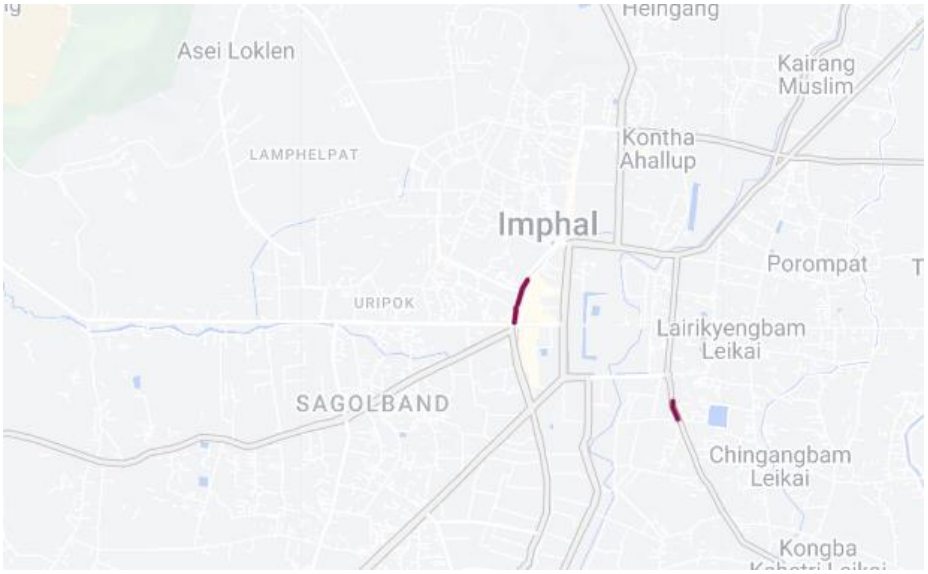


Figure 4-2 : Parking Location in Imphal Municipal Corporation Area

4.2.3. Origin-Destination Survey

Origin-destination surveys were conducted through roadside interviews on outer cordon for 12 continuous hours on a normal working day (to cover tourist travel characteristics). Travel counts at survey locations are done simultaneously to facilitate adjustment for sampling. The information obtained by trained enumerators and experienced supervisors include: type of vehicle, type of commodity carried, origin and destination, trip purpose, place of residence and employment of road user and frequency of travel. Based on the survey, travel desire pattern have been established.

4.2.4. Speed and Delay Surveys

These surveys have to establish road capacity and extent of congestion on key sections to determine possible improvements: widening, intersections, suggest required traffic control and traffic management measures. Speed delay surveys were carried out in both peak and anti-peak directions during peak and off-peak hours. The journey time and running speed was observed and impact of the prevailing traffic on journey and running speed during peak and off-peak hours for each section was established to indicate the level of congestion. Typical delays and their causes has been be identified. The study revealed the speed and delay characteristics along the existing road network which helps in identifying the bottleneck locations and their probable causes.

4.2.5. Household Survey

This aim of survey was to collect data on travel characteristics of household residents and general characteristics of the household influencing trip making. The study area was divided into zones. A sample size required as per standard transport planning procedures or minimum of 2% of household is about 1200 household as per the current household size was covered. Based on the survey, travel demand characteristics were established.

4.2.6. Road Inventory

An inventory was conducted along all major roads in adequate detail, including link lengths, cross-sectional details, type and general surface condition, street furniture, intersections, control devices, drainage condition, abutting land use etc.

4.3. Secondary Data Collection

Relevant past studies related data was collected, information and data pertaining to the study area and review the proposed developments in the study area in terms of industrial and infrastructure developments is an essential tool for understanding the past/existing development and future growth pattern in the study area. Coordination with concerned authorities as one of the most important parts of the study was looked after. Meeting with concerned authorities to collect the all relevant information and seek their cooperation was done.

4.4. Traffic Surveys

The coverage of above mentioned traffic survey listed out in Table 4-2.

Table 4-2 : List of traffic surveys

S. No	Survey Type	No of Locations	Duration & Details
1	Outer Cordon TVC & OD	6	12 Hours
2	Traffic Volume Count (TVC)	5	12 Hours
3	House Hold Survey Samples	Population (Covering Imphal)	1200
4	Intermediate Public Transport (IPT) Surveys	7	12 Hours
5	Parking On Street & Off street	02	12 Hours
6	Speed & Delay Surveys	100Km	Primary Network
7	Road Network Inventory survey	100Km	Primary Network

4.5. Key Challenges

Based on the analysis using available secondary data the major challenges identified with respect to mobility in the study area are as follows-

- The radial form of regional and arterial corridors is getting converged around the CBD (Ima market) area. This is leading to high congestion and corresponding delays for regional and local trips.
- The absence of bye pass or ring corridor not only delays the heavy vehicle movement through the city but is also responsible for roadside (on shoulder) parking of freight vehicles.
- As the arterial corridors are catering to local and regional traffic both, lack of uniformity and continuity in Right of Way (ROW) of such corridors is leading to bottleneck situations.
- NMT (non-motorized transport) provisions like pedestrian walkway, cycle tracks and street furniture including Public Transport stops/ shelters are observed to be missing along the major roads.

- The mobility in the city is highly dependent upon private modes as the share and accessibility of PT / IPT (public or intermediate public transport) is limited to few sub-zones of the city. Further, standardization of PT/ IPT operations using variables like tariff, frequency, routes and coverage is essential for improved service.

5. Analysis of Existing Traffic and Travel Characteristics

5.1. General

A comprehensive appreciation of the study area has been carried out to understand the growth and development pattern, traffic and travel characteristics, road network system and inventory in the study area. The salient features of the study area are discussed as below.

5.2. Road Network Characteristics

5.2.1. Road Hierarchy

The inventory characteristics of 513 km of road network in the study area consisting of Arterial, Sub-Arterial, Collector and Local Streets is shown in Table 5-1.

Table 5-1 Distribution of Primary Road Network Length

S. No.	Road Type	Length (in km)	Percentage of Roads
1	Arterial road	14.68	2.9
2	Sub- Arterial Road	13.43	2.6
3	Collector	158.35	30.9
4	Local roads	326.57	63.6
	Total	**513.03**	**100**

It is observed that, arterial road account for 2.9% share, sub-arterial roads 2.6% of road network share while collector streets share 30.9% of the total primary network, respectively. The share of secondary road network in form of sub arterial is relatively lower as per the desired road hierarchy. Figure 5-1 show the road network hierarchy.

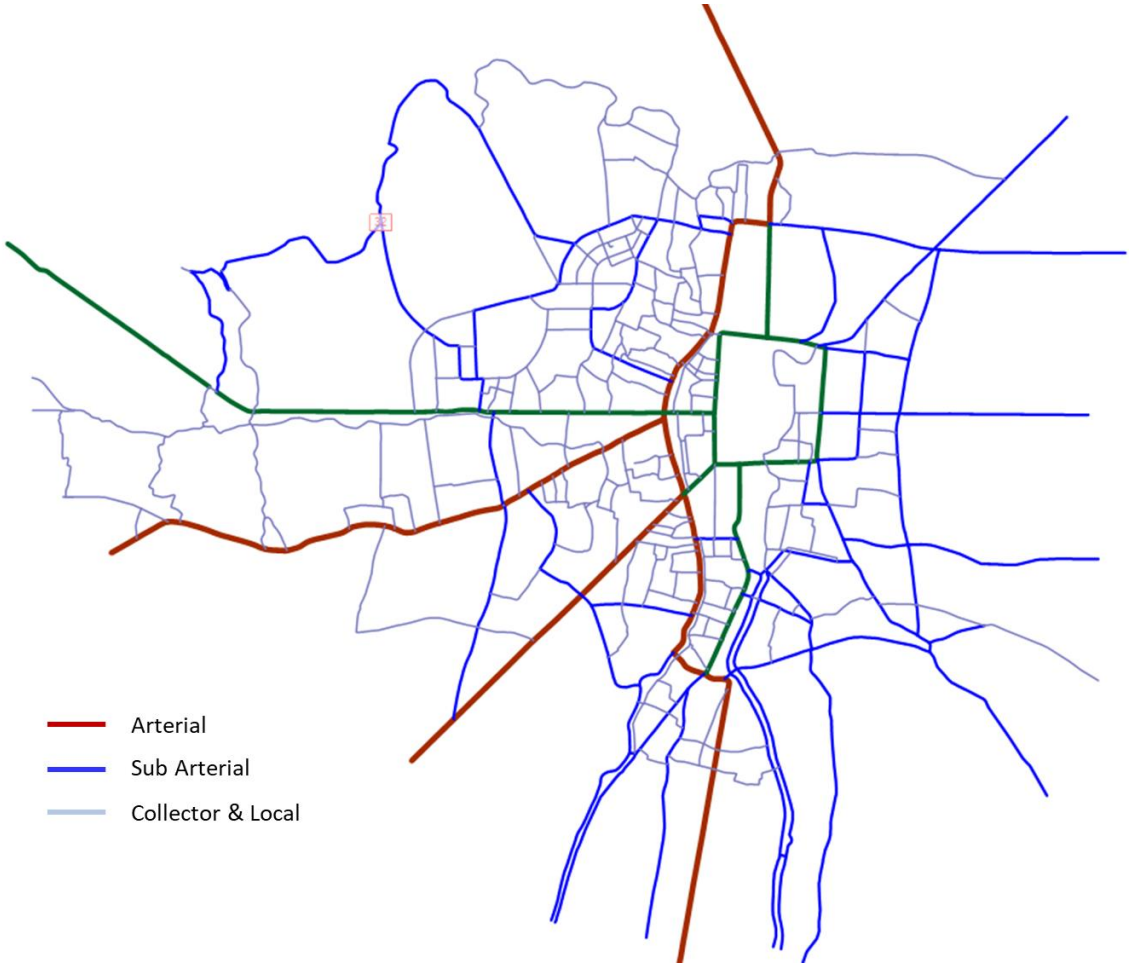


Figure 5-1 Existing Road Network hierarchy

5.2.2. Right of Way

The carriageway and other elements of the Right of Way (R.O.W.) need to be planned for considering the variations in road hierarchy, lane configuration, surrounding land use, parking demand and traffic saturation. Classified by hierarchy, some of the critical cross-sections with the indicative land use along them in the Greater Imphal Planning area are shown in the below Table 5-2 and Figure 5-2 with their respective locations in the map.

Table 5-2 Distribution of Right of Way

S. No	**Right of Way (**Row**)**	**Road Length (in Km)**	**% Share**
1	Less than 6	71.58	22.8%
2	6 to 11	186.96	59.6%
3	11 to 15	20.7	6.6%
4	15 to 20	8.09	2.6%
5	20 to 25	17.19	5.5%
6	25 to 45	9.33	3.0%
	Grand Total	**313.85**	**100.0%**

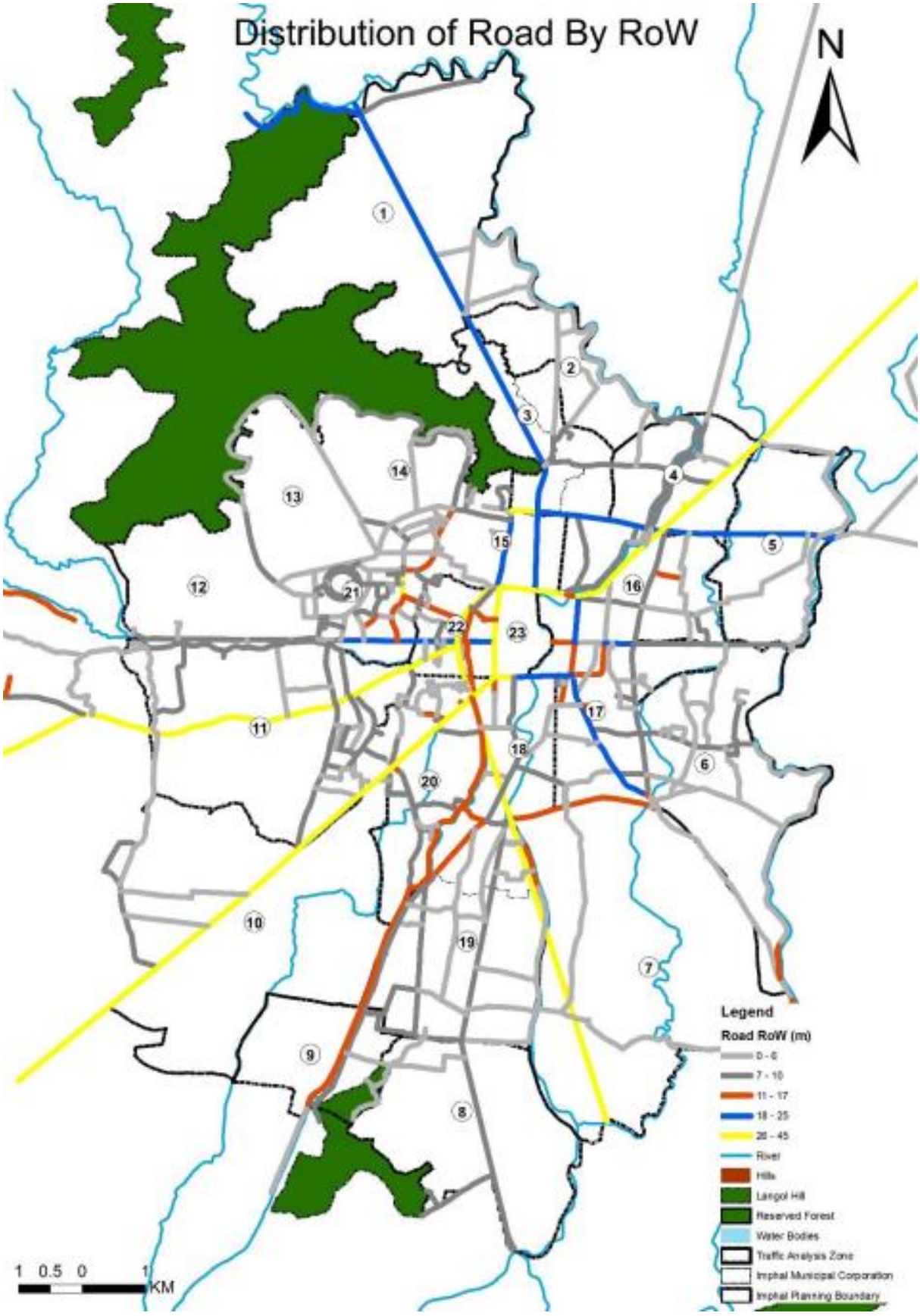


Figure 5-2: Distribution of Right of Way

5.2.3. Speed and Delay

Speed and delay surveys which are an integral part of any transportation planning related studies were carried out on the identified primary road network. The Table 5-3 shows salient characteristics of the speed and delay observed in the study area during peak hours. It is observed that speed ranges between 11 kph to 49 kph on the primary network

Table 5-3 Corridor speeds on the primary network

Origin	Destination	Distance (in KM)	Time (Minutes)	Speed (KMPH)
Kangla traffic point	Moirang	45.42	64.72	42
Kangla traffic point	Kharungpat	49.22	73.2	40
Kangla traffic point	Sora, Manipur	39.28	52.83	45
Kangla traffic point	Phunal Maring	16.78	37.57	27
Kangla traffic point	Leikoiching	21.13	41.9	30
Kangla traffic point	Laikot Kom	16.71	30.52	33
Kangla traffic point	Khundrakpam	11.2	24.43	28
Kangla traffic point	Khonghampat	11.95	20.07	36
Kangla traffic point	Longa Koireng	19.07	41.15	28

5.2.4. Footpath Availability

Footpath is available along the major arterial road and main CBD roads around 26.47 km of road network as shown in Table 5-4 below. The major road length of road network is without any footpath. The road length where footpaths are available mostly are encroached which hinders the movement of pedestrians.

Table 5-4: Footpath availability

Footpath	Road length (in Km)	% Share
Present	32.3	9%
Absent	337.4	91%
Total	**369.7**	**100%**

5.3. Traffic Characteristics

5.3.1. Traffic Characteristics at Outer Cordon Point

The traffic analysis revealed that in all 78,910 vehicles enter in and out of Imphal daily. In terms of direction split a total traffic volume of 39,107 PCUs are entering Imphal while 39,803 PCUs leave Imphal at the outer cordon locations every day. Among the outer cordon (OC) locations, maximum traffic in a day was recorded on OC-5 with 18,741 PCUs (23.7%) while lowest volume was encountered at OC-1 with 10,059 PCUs (12.7%). The directional distributions of traffic volume at outer cordon locations are show in Figure 5-3.

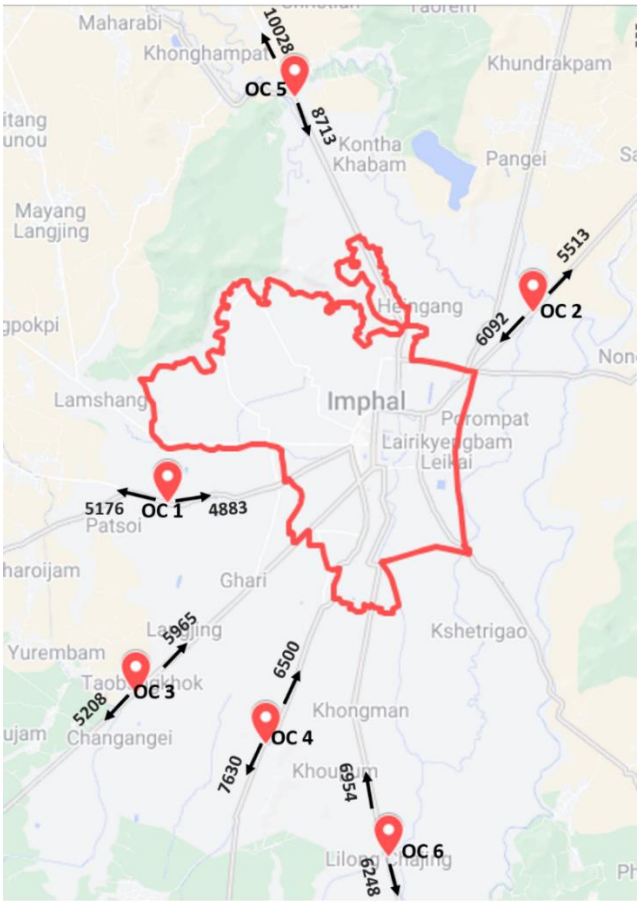


Figure 5-3 Traffic Flow Pattern (in PCUs) at Outer Cordon locations (12hours)

The Level of Service (LOS) is defined as a qualitative measure describing the operational conditions within a traffic stream. It characterizes traffic flow in terms of ratio between volume and capacity of the roads. Each level reflects progressively deteriorating traffic conditions. These levels are used to assess and compare the performance of roads and inform design or operational improvements.

The LOS is categorized into six levels, designated A to F, where:

- LOS A represents free-flow conditions with minimal or no restrictions.
- LOS F indicates forced or breakdown flow conditions with heavy congestion and stop-and-go traffic.

The Level of Service (LOS) at all the 6 locations was assessed to determine the existing situation of traffic and the available infrastructure. Peak hour LOS is assessed for all the location and is presented in Table 5-5. It can be seen that LOS at all the locations is satisfactory

Table 5-5 LOS at Outer Cordon Locations

S. No	Peak Time	Peak Hour Volume (PCU)	LOS
OC-1: Near Pole Star Public School (Jiribam Imphal Rd.)	12:15 to 13:15	998	A

S. No	Peak Time	Peak Hour Volume (PCU)	LOS
OC-2: Near American oncology institute (Imphal – Jessami Rd.)	09:45 to 10:45	1408	B
OC-3: Yumnam Khunou (NH-2)	14:15 to 15:15	2469	A
OC-4: Near Thoi Thoi adventure park (Mayi Lamb Rd)	12:15 to 13:15	1350	B
OC-5: Near Lilong Suptu Karong (Indo – Myanmar Rd.)	12:15 to 13:15	1280	B
OC-6: Near Pangmoul (NH-2.)	90:00 to 10:00	1403	A

The Level of Service (LOS) at all the 6 locations is shown in Figure 5-4.

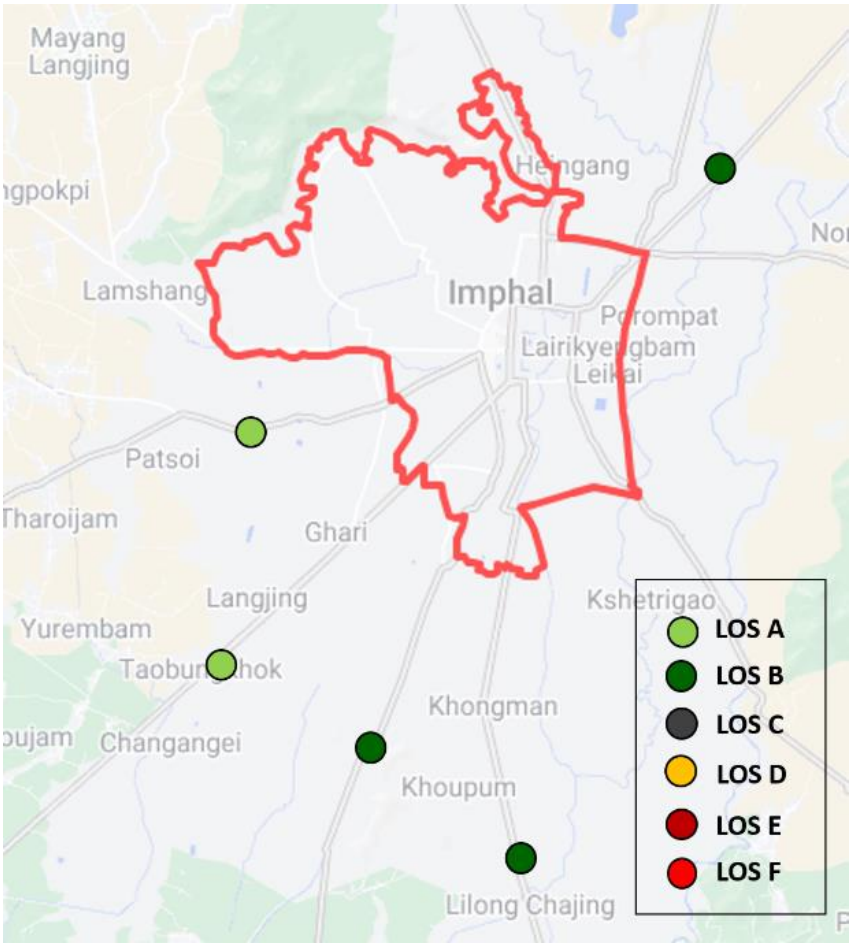


Figure 5-4 Level of Service at various Outer cordon survey locations

5.3.1.1. Traffic Movement Pattern at Outer cordon points

From the survey data analysis, it is observed that, almost 38% of traffic movement at outer cordon is external to external in nature (Through traffic). The external to internal and Internal to External traffic share is 33% and 29% respectively (Figure 5-5).

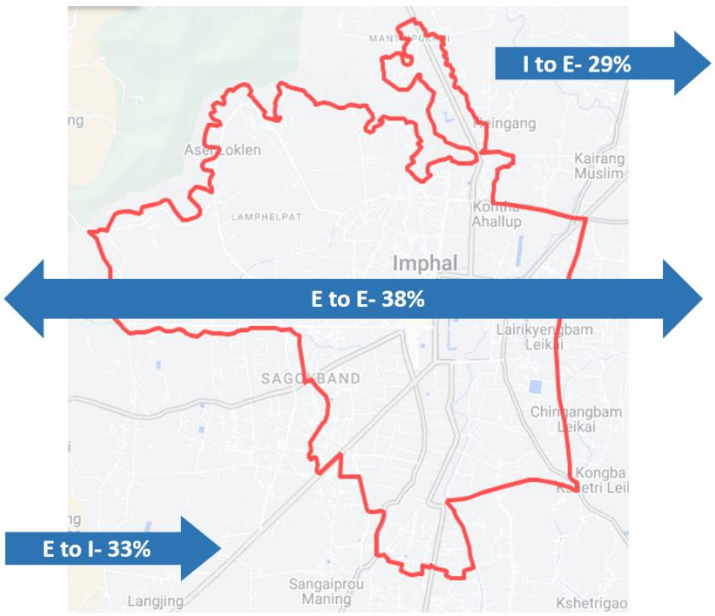


Figure 5-5 Traffic Desire Pattern

5.3.2. Traffic Characteristics at Mid-Block

On an average day about 92,544 vehicles pass through the mid-block locations, MB-1 accounting for 34.9% followed by MB-4 (27.2%), MB-2 (21.9%) and MB-5 (15.8%) respectively. The peak hour share at all mid-block location varies from 7% to 12% (Table 5-6). Figure 5-6 shows the average daily traffic volume at mid-block locations.

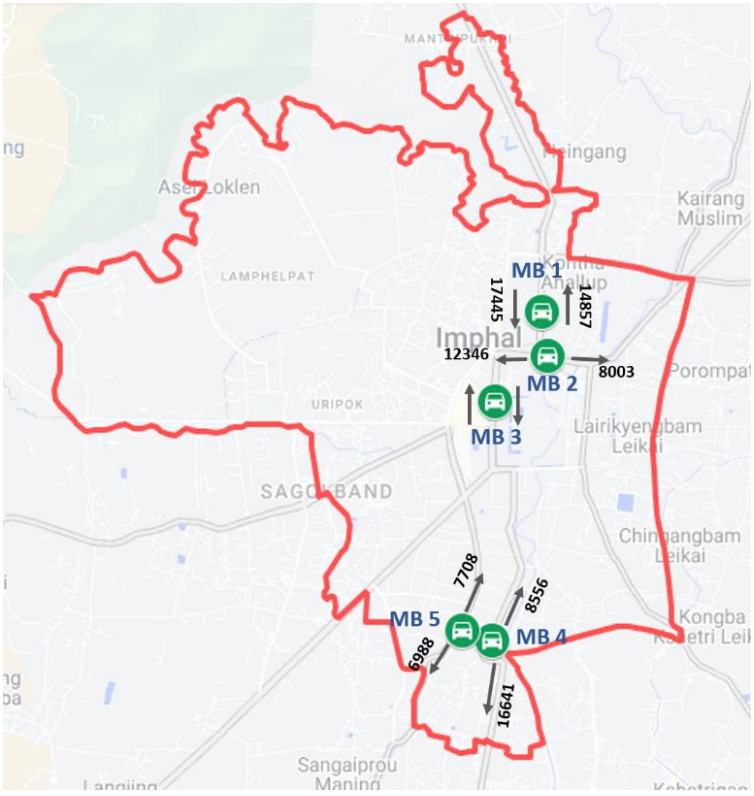


Figure 5-6 Average Daily Traffic at Mid-Block Location

The Level of Service (LOS) for all the 4 locations were analyzed to know the existing situation of the traffic flow with respect to the present carrying capacity of the road infrastructure. Figure 5-7 below shows the LOS at various mid-block locations.

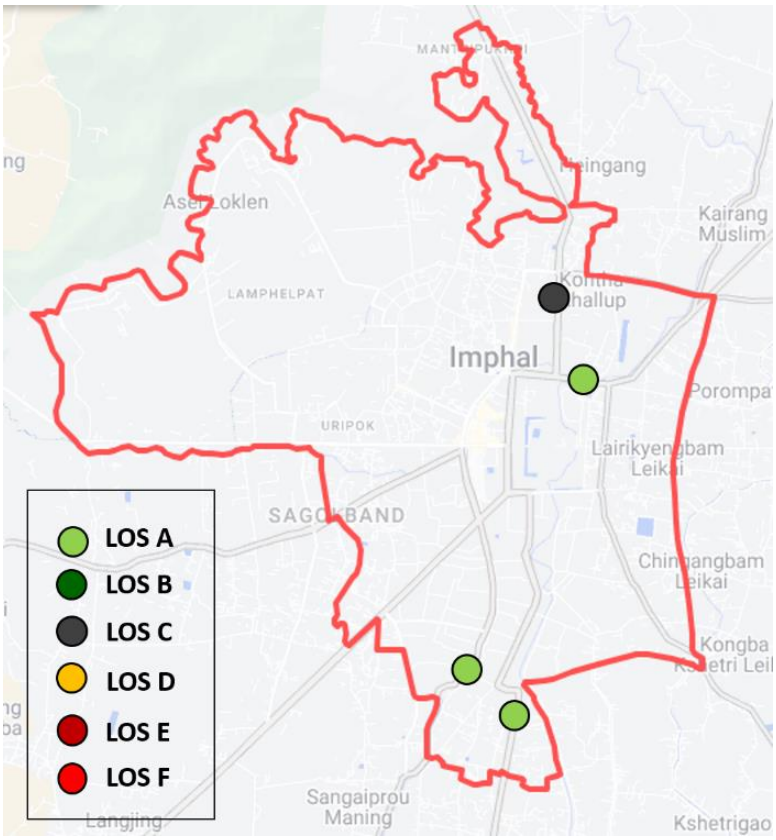


Figure 5-7 Level of Service at Mid-Block

Table 5-6: ADT Volume at Mid-Block

Location	ADT	Peak Hour time	Peak hour volume in PCU	Peak hour percentage
MB01	28153	09:30 to 10:30	3586	12.74%
MB02	15985	1600 to 17:00	2102	13.15%
MB04	24112	08:15 to 09:15	3021	12.53%
MB05	21709	15:30 to 16:30	1666	7.67%

5.4. Travel Characteristics

An appreciation of the demographic, socio-economic and travel characteristics of the people of an area is important to understand the travel needs of the people, their propensity to travel, preferences for travel modes etc. Such an understanding helps in rational policy formulation, decision making and in identification of relevant transport system to serve the area.

5.4.1. Household Socio-Economic Characteristics

As part of this effort extensive surveys of about 1200 households were carried out to determine the socio-economic and travel characteristics, such as household size, income, vehicle ownership, purpose wise trips, per capita trip rates, modal split and mode wise average trip length (ATL). The salient socio-economic characteristics of households in study area are as shown in the below sub sections.

Household Size

From the recorded samples, the average household size of the study area is estimated as 3.7. The Figure 5-9 below shows the distribution of household size in the study area.

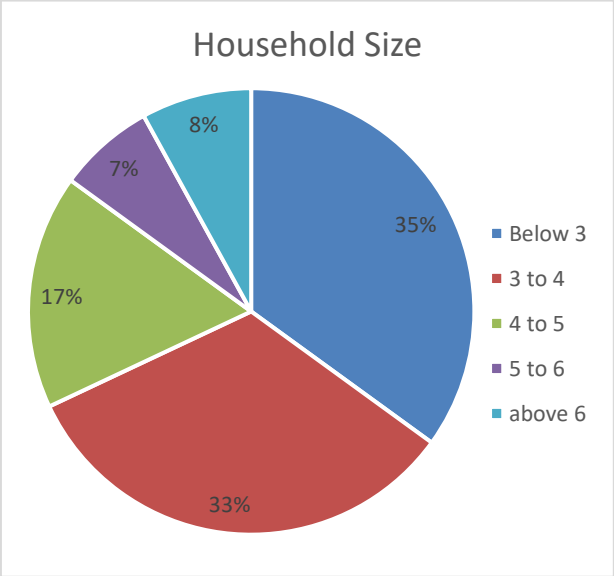


Figure 5-8: Distribution of Household Size

Vehicle Ownership

In terms of vehicular ownership, overall, about 60% of households own one vehicle while 28% owns two vehicle reflecting upon poor public transport forcing higher dependence on personalized modes of transport shown in Table 5-7.

Table 5-7 : Distribution of Vehicle Ownership

Vehicle Ownership	% Share
No Vehicle	11.80%
One Vehicle	59.90%
Two Vehicle	28.00%
Three Vehicle	0.30%
Total	**100.00%**

5.4.2. Travel Characteristics

The per capita trip rate (PCTR) assessed from the household surveys shows that the PCTR including walk trips is 1.32 while it is 1.19 without walk trips in study area as shown in Table 5-8 below.

Table 5-8: Per-Capita Trip Rate (PCTR)

Parameter	With Walk	Without Walk
PCTR	1.32	1.19

In terms of modal share, it is observed that nearly 35% trips are made by Auto Rickshaws followed by Two wheeler trip share of 31% and 13% share of four wheeler respectively in the study area (Figure 5-9).

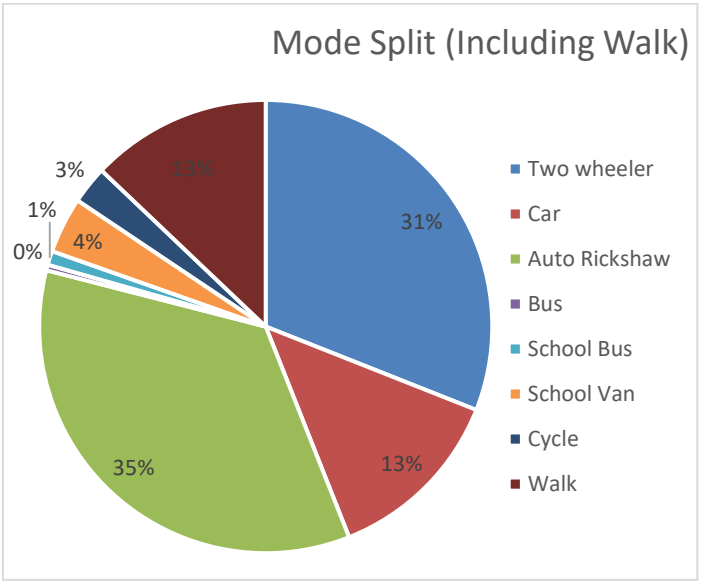


Figure 5-9 Distribution of trips by Mode of Travel (with Walk)

Amongst vehicular trips (excluding walk) Auto Rickshaw account for 40% share followed by cars (15%), Two wheelers (36%) and buses (6%) share respectively in study area (Figure 5-10).

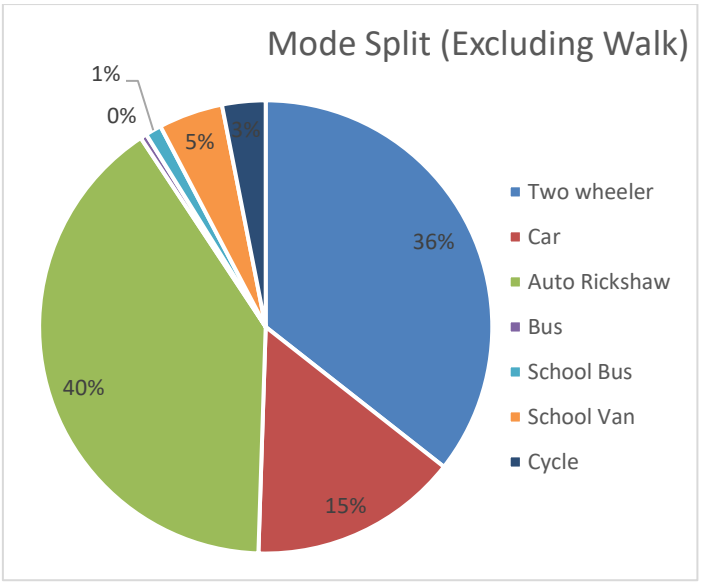


Figure 5-10 Distribution of trips by Mode of Travel (without Walk)

In terms of purpose of travel, it is observed that work trips [work and business] account for 51% share followed by 31% share of education related travel and 14% of trips for shopping respectively in study area (Figure 5-11).

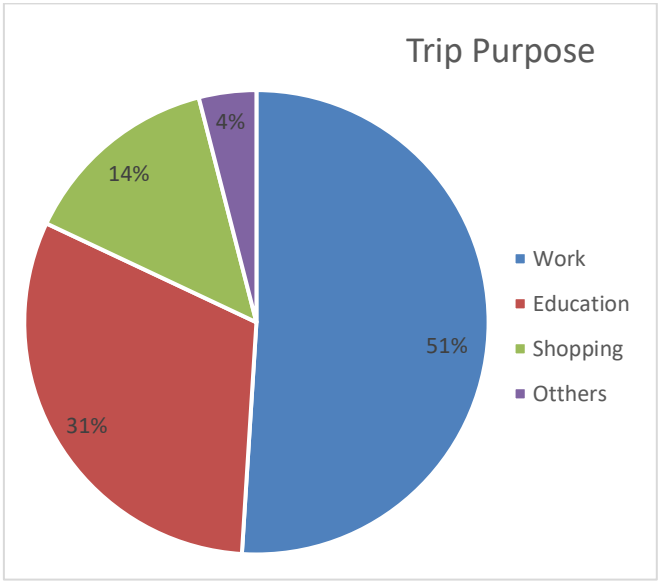


Figure 5-11 Distribution of trips by Purpose of Travel

In terms of trip length analysis, the average trip length overall at the city level is 3.1km in the study area while it varies across for different modes as shown in Table 5-9. The modal trip lengths in study area in case of public modes vary between 2.8 km for buses to 3.6 km for Auto Rickshaw while for personalized modes the average trip length vary from 3.6 km in case of two wheelers to 4.2 km in case of cars, respectively shown in Table 6-13 and Figure 6-7.

Table 5-9 Mode-wise average trip length (km)

Mode	Average Trip Length (in KM)
Car	4.2
Two-Wheeler	3.6
Auto	3.2
School/Bus/Van	2.8
Walk	0.25
Cycle	1.4

Source: Household survey

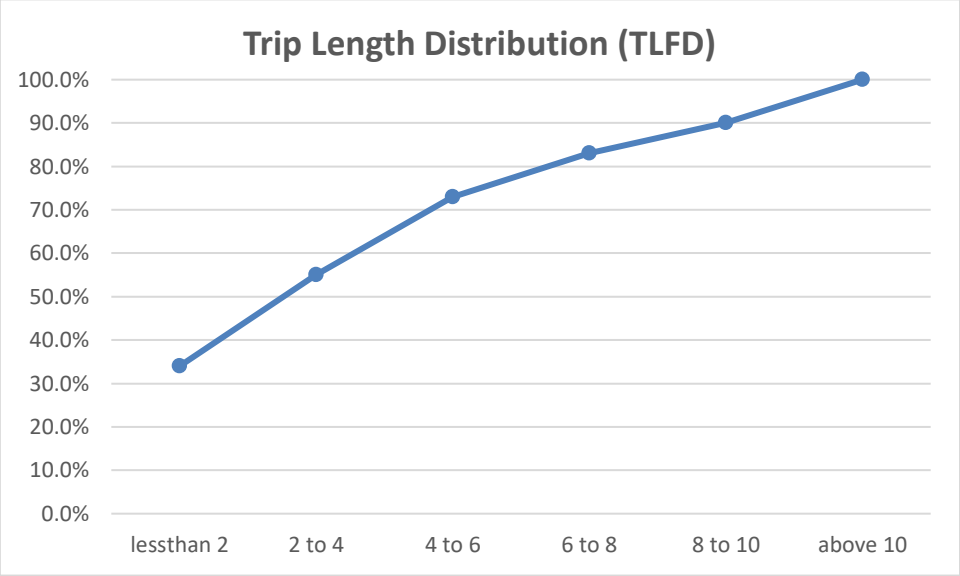


Figure 5-12 Mode-wise TLFD

5.5. Intermediate Public Transport (IPT) System Characteristics

Intermediate Public Transport in the study area plays a vital last mile connectivity providing system. In the study area, Para Transit is the backbone of the city transport. It consists of 35% of the modal share. It is flourishing in an uncontrolled manner due to lack of alternative means of public transport, easy access to vehicle registration and uncontrolled entry of vehicles into the city. Public transport had problems pertaining to intra-city transportation. The government operated the city bus services for a while, but was unable to continue due as it was not accepted by the masses due to longer waiting periods. Since then, city buses have not operated on the roads of Imphal. At present, the majority of public transport requirements are met through autos. Other modes such as Magic and Wingers are used for intercity travel.

5.5.1. Physical Characteristics

The average cost paid by the IPT users is observed that 59% of IPT users pay Rs. 20-40 followed by upto Rs. 10 (13%) and Rs. 40-60 (13%) as shown in Figure 5-13

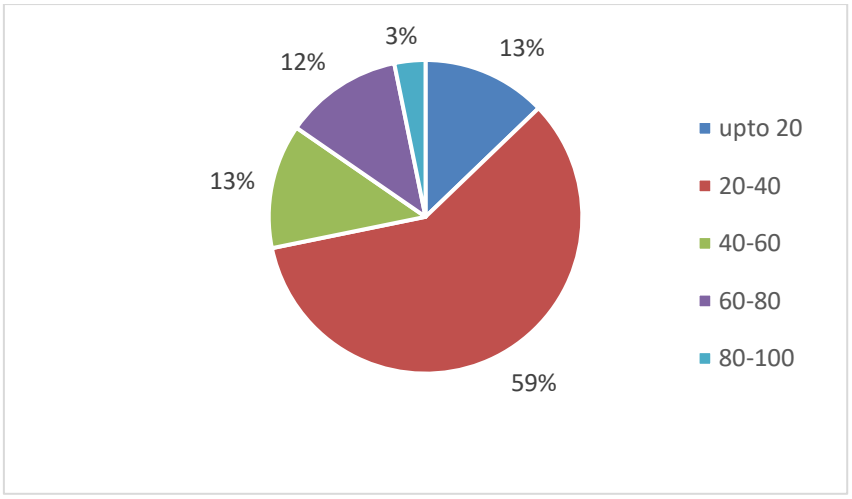


Figure 5-13 Cost paid by IPT users (in terms of Percentage Shares)

Source: Primary data from IPT Survey

IPT mode is mostly used for trip to home (34%) followed by recreational (31%), education (14%) and work (13%) purposes respectively. Table 5-10 and Figure 5-14 shows the distribution of trip purpose.

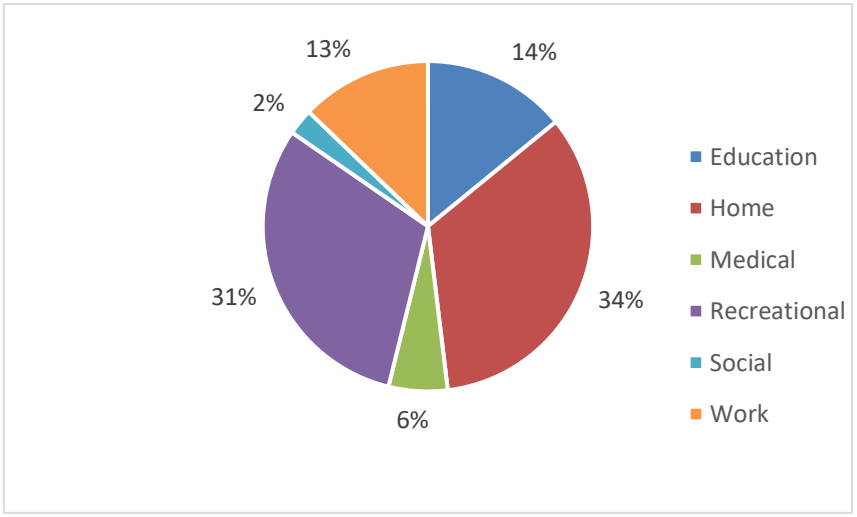


Figure 5-14 Trip Purpose Distribution of IPT Modes (in terms of Percentage Shares)

Table 5-10 Trip Purpose Distribution of IPT Modes

Trip Purpose	Percentage Share
Education	14.1%
Home	34%
Medical	5.8%
Recreational	30.8%
Social	2.6%
Work	12.8%
Total	**100%**

The access distance for the IPT mode from the home or workplace varies up to 3 km m. The maximum users of IPT mode (75.3%) reside within the radius of 0.5-2 km (Figure 5-15).

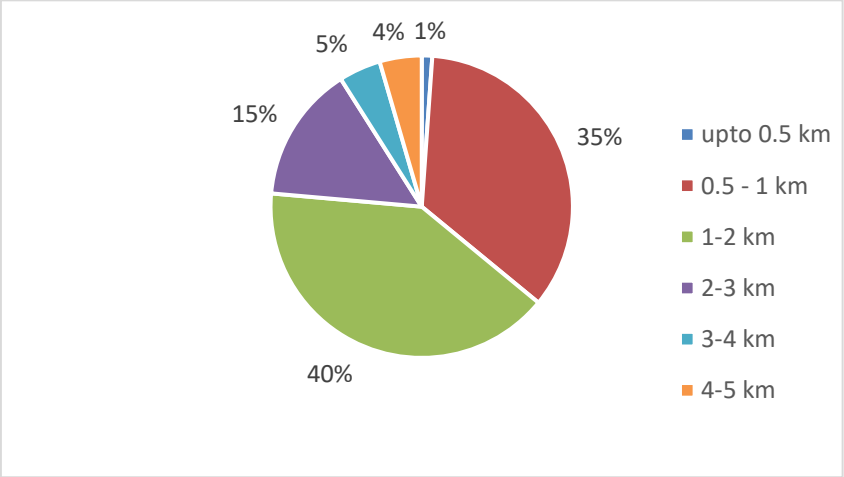


Figure 5-15 Access distance of IPT users (in terms of Percentage Shares)

The waiting time for IPT mode is 5-10 minutes (39%) followed by 10-20 minutes (30.8%) and upto 5 minutes (16.7%) respectively (Figure 5-16).

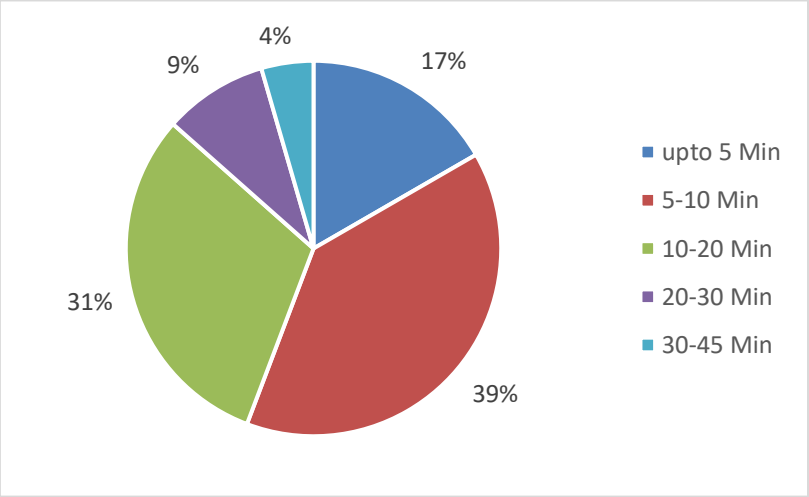


Figure 5-16 Waiting Time of IPT users (in terms of Percentage Shares)

The map below shows the IPT routes in the study area (Figure 5-15 & Figure 5-16).

Figure 5-17: IPT operational Routes in the study area

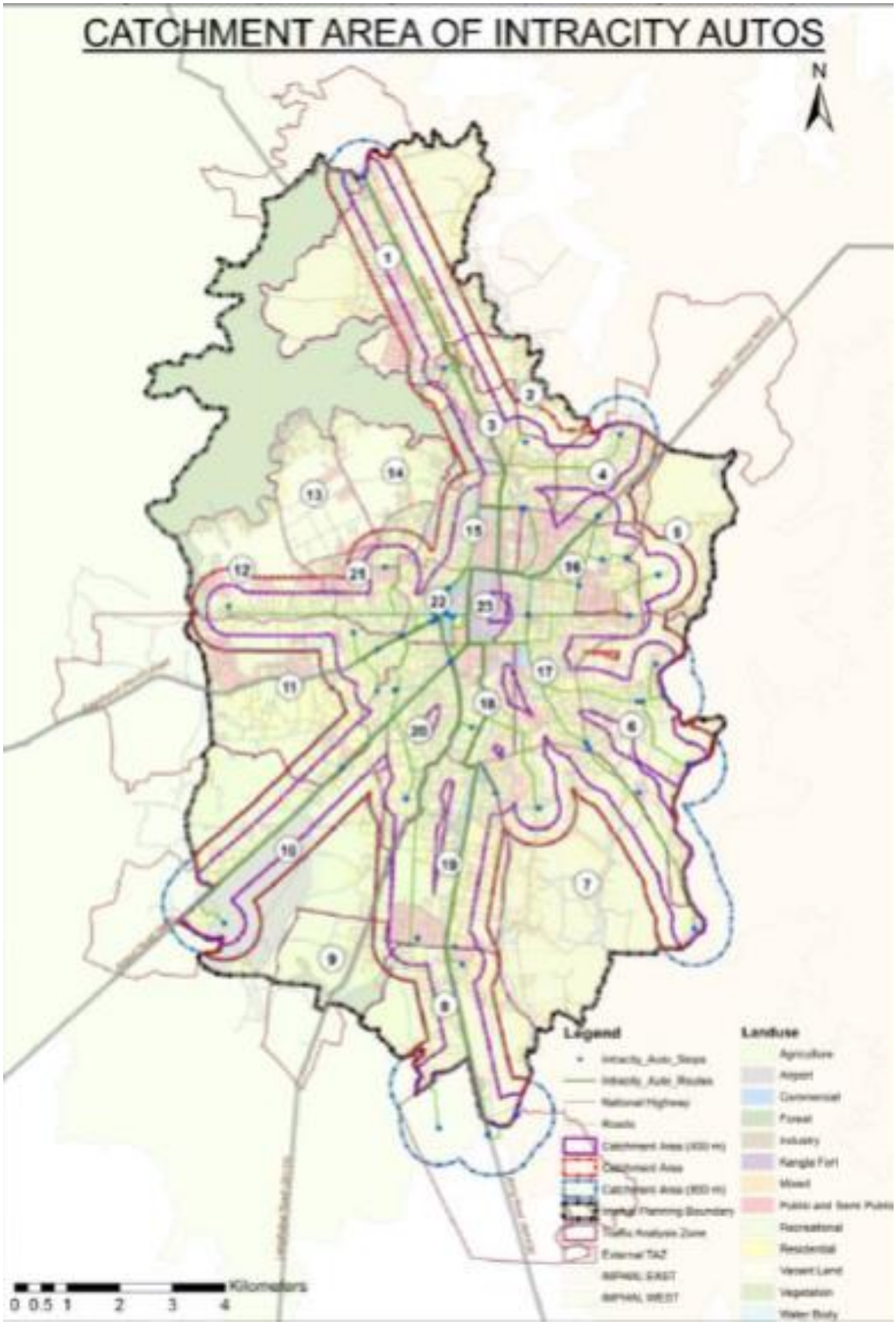


Figure 5-18: IPT Routes coverage in the study area

5.6. Parking Characteristics

Parking characteristics within Imphal area have been analyzed for two locations in the area having commercial and public and semi-public land use characteristics, which are the major attraction points of vehicle in the city (Figure 5-19 and Table 5-11).

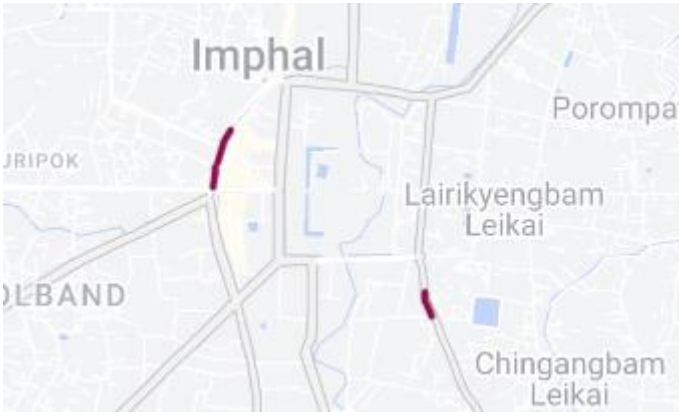


Figure 5-19 Parking Locations Surveyed

Table 5-11 Parking Locations Surveyed

S. No.	Location	Landmark
1	P1	RIMS Road
2	P2	Thangal Bazaar

Parking surveys were carried out at two locations for 10 hours. Surveys were carried out at two parking locations, namely, RIMS Road and Thangal Bazaar. At all the locations parking for two-wheelers, car, auto rickshaw, bus, Mini LCV and LCV were observed prominently.

Parking duration

The duration for which a mode has been observed to be parked across all locations have been summarized in below Table 5-12. It can be observed that parking is done mainly for short term, i.e., less than 2 hours.

Table 5-12 Location wise Parking duration

Mode	Time duration	RIMS Road	Thangal Bazaar
Two-Wheeler	Short Term (Upto 2 Hrs)	80%	94%
	Medium Term (2 to 4 Hrs)	7%	6%
	Long Term (More than 4 Hrs)	13%	-
Car	Short Term (Upto 2 Hrs)	81%	81%
	Medium Term (2 to 4 Hrs)	13%	15%
	Long Term (More than 4 Hrs)	6%	4%
Auto Rickshaw	Short Term (Upto 2 Hrs)	85%	97%
	Medium Term (2 to 4 Hrs)	11%	3%
	Long Term (More than 4 Hrs)	4%	-
Bus	Short Term (Upto 2 Hrs)	96%	100%
	Medium Term (2 to 4 Hrs)	2%	-

Mode	Time duration	RIMS Road	Thangal Bazaar
	Long Term (More than 4 Hrs)	2%	-
Mini LCV	Short Term (Upto 2 Hrs)	93%	88%
	Medium Term (2 to 4 Hrs)	-	11%
	Long Term (More than 4 Hrs)	7%	1%
LCV	Short Term (Upto 2 Hrs)	97%	100%
	Medium Term (2 to 4 Hrs)	2%	-
	Long Term (More than 4 Hrs)	1%	-

Parking Accumulation

Two wheelers, car parking, auto rickshaw, bus, Mini LCV and LCV facilities are observed at all locations. Peak parking accumulation were observed at afternoon at all locations. Parking accumulation across all locations are presented in below Figure 5-20 Figure 5-21 & Table 5-13 respectively.

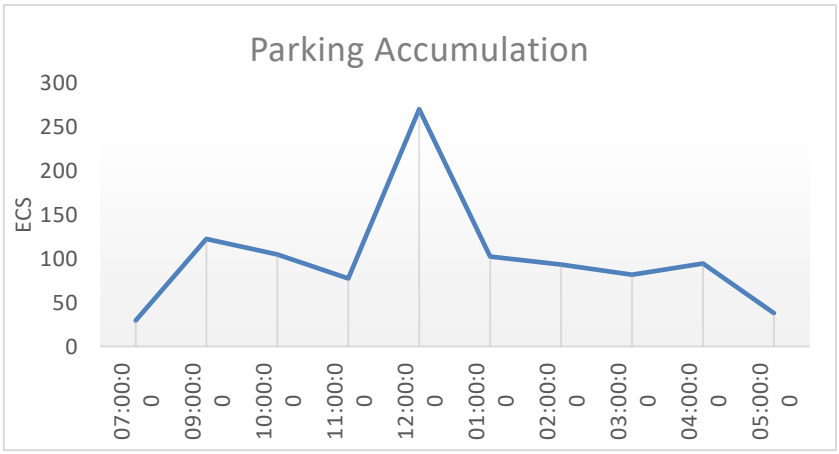


Figure 5-20 Parking Accumulation at RIMS Road Parking Location

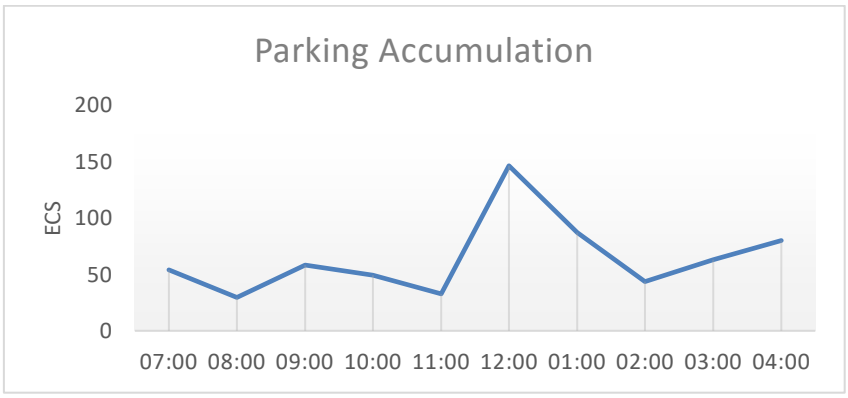


Figure 5-21 Parking Accumulation at Thangal Bazaar Parking Location

Table 5-13 Parking Accumulation at Parking locations (in ECS)

Landmark	Peak Hour	Parking Demand (ECS)
RIMS Road	1200 hours	270
Thangal Bazaar	1200 hours	146

5.7. Issues

Based on the detailed analysis of various aspects of urban mobility following issues have been identified in the Imphal city:

5.7.1 Issues with Road Network

The congestion in the core of Imphal can be attributed to the presence of significant commercial hubs such as Thangal Bazar, majorly Ima Market, and Poana Bazar. These markets act as major attractions, drawing residents and visitors alike from the surrounding areas as well. The popularity of these markets contributes significantly to the vehicular and pedestrian influx, leading to congestion and traffic bottlenecks in the core of the city. There is a need to explore alternate routes and network which could segregate the through and local traffic effectively.

- Congestion in Imphal is exacerbated by lane encroachment from parking and the presence of shops. Unauthorized parking and shop extensions onto lanes reduce road space, creating bottlenecks and hindering the smooth flow of traffic. The preponderance of permanent or temporary encroachments on the footpaths as well as carriageway is resulting in loss of capacity for traffic movement as well as pedestrian flow.
- Some of the outer roads radiating from Imphal face a decrease in lane width, contributing to traffic bottlenecks.
- Bottlenecks at culverts and bridges were also identified resulting in traffic congestion, especially during peak hours, and impact the overall flow of vehicles across crucial points in the city
- The street furniture elements majorly signages were missing

- Lack of pedestrian areas, particularly near markets in Imphal, poses a significant issue. Addressing this gap and prioritizing dedicated pedestrian zones can enhance safety of the pedestrian and reduce congestion.
- The pedestrian facilities are either absent or ill maintained along majority of the roads forcing pedestrians to walk on the carriageway and affecting their safety.
- The intermixing of local and through traffic in Imphal disrupts the smooth flow of vehicles, particularly as external trips to other areas often pass through the city. This issue emphasizes the need for strategic traffic management measures to improve overall transportation efficiency and reduce congestion in key routes.

5.7.2 Issues with Public Transport

There is a gross absence of requisite city bus fleet service coverage in the city resulting in inequities in the delivery of its services. Further the existing public transport infrastructure in terms of bus stops, depots, terminals/stands etc. too needs improvement.

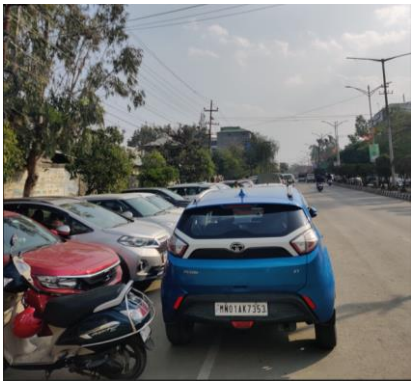
- The closure of buses to hill routes from Imphal has significantly impacted coverage, with potential repercussions even after the subsiding of riots. While a resumption is anticipated post-crisis, the persisting concern lies in the inadequate frequency of buses, highlighting the need for sustained efforts to address and improve transportation accessibility to the crucial routes.
- Absence of a dedicated bus repair service center in Imphal is a pressing issue, hindering timely and efficient maintenance for the city's transportation fleet.

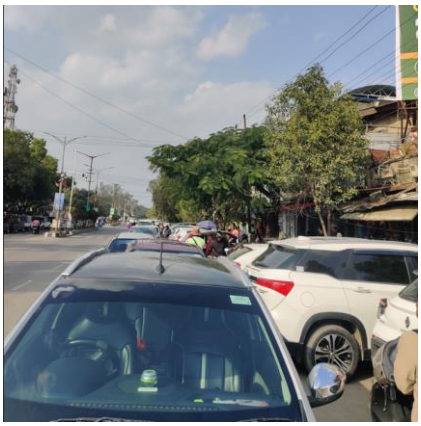
5.7.3 Issues with IPT

The extensive use of autos and Tata Magic vehicles in Imphal, coupled with inadequate parking facilities, results in on-street parking and contributes significantly to congestion. Improving parking infrastructure is crucial to mitigate the impact of these popular modes of transportation on traffic flow.

5.7.4 Issues with Parking

- The parking accumulation is high in major activity areas such as employment and shopping areas, majorly the market area resulting in spill over of parking on the carriageway.
- There is also an absence of adequate number of off-street parking facilities as a result parker are forced to park on the carriageway leading to reduction in road capacity and affecting movement of traffic
- There is a need to evolve appropriate parking spaces which could discourage long term parking and encourage short term parking in the activity areas of intense parking demand
- Loading and unloading of goods in market areas significantly contribute to congestion and parking challenges in Imphal.



5.7.5 Issues with Non-motorized Transport (NMT)

- There is an absence of good pedestrian infrastructure, both along and across, the road. Walkability index is poor in the study area forcing pedestrians to walk on the carriageway which can endanger their lives
- Presently there is an absence of cycling facilities in the study area, which is convenient, safe and appealing to the users.

5.7.6 Issues with Walkability

Although most areas in Imphal have dedicated footpath, they are not suitable for walking. Major issues include –

- The footpaths are not designed for universal accessibility and ramps and tactile pavers are missing across all sectors.
- Lack of maintenance of the footpath has resulted in broken footpath surfaces, broken drain covers and unclean footpaths in many areas.
- Footpaths are also encroached by hawkers and vendors or with obstructions such as transformers and trees.
- Parking encroachment on footpaths is observed in high intensity commercial market areas.
- Although there are streetlights, the sectors are lacking in terms of adequate lighting for pedestrian paths, as observed in a majority of sectors.

- Pedestrian crossing facilities are insufficient on outer roads in Imphal, rendering pedestrians highly vulnerable.




5.7.7 Issues with Bus Terminals

The bus terminal in Imphal serves as a docking point for goods vehicles, leading to unloading and loading activities. However, the terminal's underutilization and lack of maintenance pose challenges. Optimizing its usage and implementing proper maintenance measures are essential to enhance efficiency and fully leverage the potential of the bus terminal for goods-related activities.

6 Service Level Benchmarking

6.1 Introduction

Benchmarking is now well recognized as an important mechanism for introducing accountability in service delivery. It involves measuring and monitoring of service provider performance on a systematic and continuous basis. Regular monitoring can help to identify performance gaps and introduce improvements through the sharing of information and best practices, ultimately resulting in better services to people.

Recognizing its importance, the Ministry of Urban Development (MoUD), Government of India has launched the Service Level Benchmarking (SLB) initiative covering various sectors in urban development, such as urban transport, pedestrian facilities, etc. The parameters and technical terms are defined and standardized so that any professional across the country can comprehend and utilize them.

6.2 Benchmarking Procedure

MoHUA (erstwhile MoUD) has designed Service Level Benchmarks for the following sectors –

- Public transport facilities
- Pedestrian infrastructure facilities
- Non-Motorized Transport (NMT)facilities
- Level of usage of Intelligent Transport System (ITS) facilities
- Travel speed (Motorized) along major corridors
- Availability of parking spaces
- Road safety
- Integrated land use transport system
- Financial sustainability of public transport

The parameters to be tested in each of these sectors have been identified individually and a system of scoring is defined. The total score for each parameter is to be computed by simply adding scores for each individual aspect. The Level of Service (LoS) is assessed on the basis of the total score. The implication of the LoS is also elaborated and areas of improvement are suggested.

The primary surveys that need to be conducted to gather the requisite information have also been indicated for each of the above sectors.

Typically, four levels of service have been specified, with 1 being the highest and 4 being lowest to measure each identified performance benchmark. Therefore, the goal is to attain the service level 1. The performance evaluation is to be done by Urban Local Bodies/ Development Authority/ Parastatal Agency.

6.3 Evaluation of Present Transport Infrastructure for Imphal

The service levels of current transport infrastructure available at Imphal have been evaluated. The facilities are evaluated on a scale of 4, wherein 1 represents the best and 4 the lowest.

Based on the availability of the data, service level benchmarking has been evaluated for the following sectors:

- Public transport facilities
- Pedestrian infrastructure facilities
- Non-Motorized Transport (NMT) facilities
- Level of usage of Intelligent Transport System (ITS) facilities
- Travel speed (Motorized) along major corridors
- Availability of parking spaces
- Road Safety

The outcome of the above-mentioned sectors is shown in Table

Table 6-1 Existing Level of Services for Transport Infrastructure at Imphal

S. No.	Benchmark	Levels of Service as per SLB, MoUD	Present Level of Service
1	Availability of Public Transport	1. Presence of Organized Public Transport System in Urban Area	4
		2. Availability of Public Transport	3
		3. Service Coverage of Public Transport in the city	3
		4. Average waiting time for Public Transport users	3
		5. Level of Comfort in Public Transport	3
		6. % of Fleet as per Urban Bus Specifications	3
		Overall	**3**
2	Availability of Pedestrian Facilities	1) % of City Covered by Footpaths	4
		Overall	**4**
3	NMT Facilities	1. % network covered	4
		2. Encroachment on NMV roads by Vehicle Parking (%)	4
		3. NMT Parking facilities at Interchanges (%)	4
		Overall	**4**
4	Level of Usage of ITS Facilities	1. Availability of Traffic Surveillance	4
		2. Passenger Information System (PIS)	4
		3. Global Positioning System / GPRS	4
		4. Signal Synchronization	4
		5. Integrated Ticketing System	4
		Overall	**4**
5	Travel Speed Along Major Corridor	1. Travel speed of Personal vehicles along key corridors	2
		2. Travel speed of Public Transport along key corridors	3
		Overall	**3**
6	Availability of Parking Spaces	1. Availability of paid public parking spaces	4
		2. Ratio of Maximum and Minimum Parking Fee in the City	3
		Overall	**4**

Table below shows the overall comments on existing level of service for transport infrastructure at Imphal.

S. No.	Benchmark	Present LoS	Comments
1	Availability of Public Transport	3	The city has public transport system which may need considerable improvements in terms of supply of buses and coverage as many parts of the city are not served by it.
2	Availability of Pedestrian Facilities	4	Lack of adequate Pedestrian facilities.
3	NMT Facilities	4	Lack of adequate NMT facilities.
4	Level of Usage of ITS Facilities	4	Lack of adequate ITS facilities.
5	Travel Speed Along Major Corridor	3	Significant approach delays and average travel speed of 1/3 of free flow speed or lower. Such operations are caused by some combination or adverse progression, extensive queuing at critical intersections and inappropriate signal timing.
6	Availability of Parking Spaces	4	Paid parking spaces provided in the city need to be improved upon and to cater to the demand. The city level authorities need to initiate considerable improvements measures.

7. Base Year Travel Demand Modelling

7.1. Introduction

This section describes the travel demand model including its calibration. For the development of the base year (2024) travel demand model the household socio economic characteristics, transport systems supply and available land use parameters have been considered. The conventional Urban Transport Planning System (UTPS) process has been adopted to simulate the travel behavior pattern of residents in the study area. These macro simulation models has been calibrated and validated in the base year before using them for estimation of travel demand and testing the alternative scenarios for the horizon year. This process includes synthesizing the present day travel movement patterns using a model and adjusting it till they represent the observed conditions.

The basic inputs used (at Zonal levels) to build the models include;

- Zonal Population
- Zonal Employment
- Road network characteristics
- Speed & Delays characteristics
- Travel pattern (Internal & External)
- Traffic Volume Counts

7.2. Estimation of Base Year Travel Demand

The base year travel pattern in the form of Origin-Destination matrices has been assessed based on the Household Survey and road side OD surveys conducted at the outer cordon locations. The trips in the study area are performed by various modes including walk and bicycle. For modelling purpose, all the passenger modes of movement have been suitably grouped as follows:

Private Vehicle Trips -	Two Wheeler, Car & SUV, Taxi/Cabs, Van, Passenger Pickup
Public Vehicle Trips -	Shared Auto, Bus & Mini Bus
Active Transport Trips -	Cycle and Walk
Other Trips-	E-Rickshaw

For the better understanding of travel pattern, the study area has been divided into a zoning system of 34 traffic zones and is designated as Traffic Analysis Zones (TAZ), with total of 28 Internal traffic zones where each sector in Imphal Municipal Corporation Area has been considered as a traffic zone. Whereas, 06 traffic zones are as the external zones for Imphal Municipal Corporation Area. The internal traffic zone map is provided in the Figure 6-1.

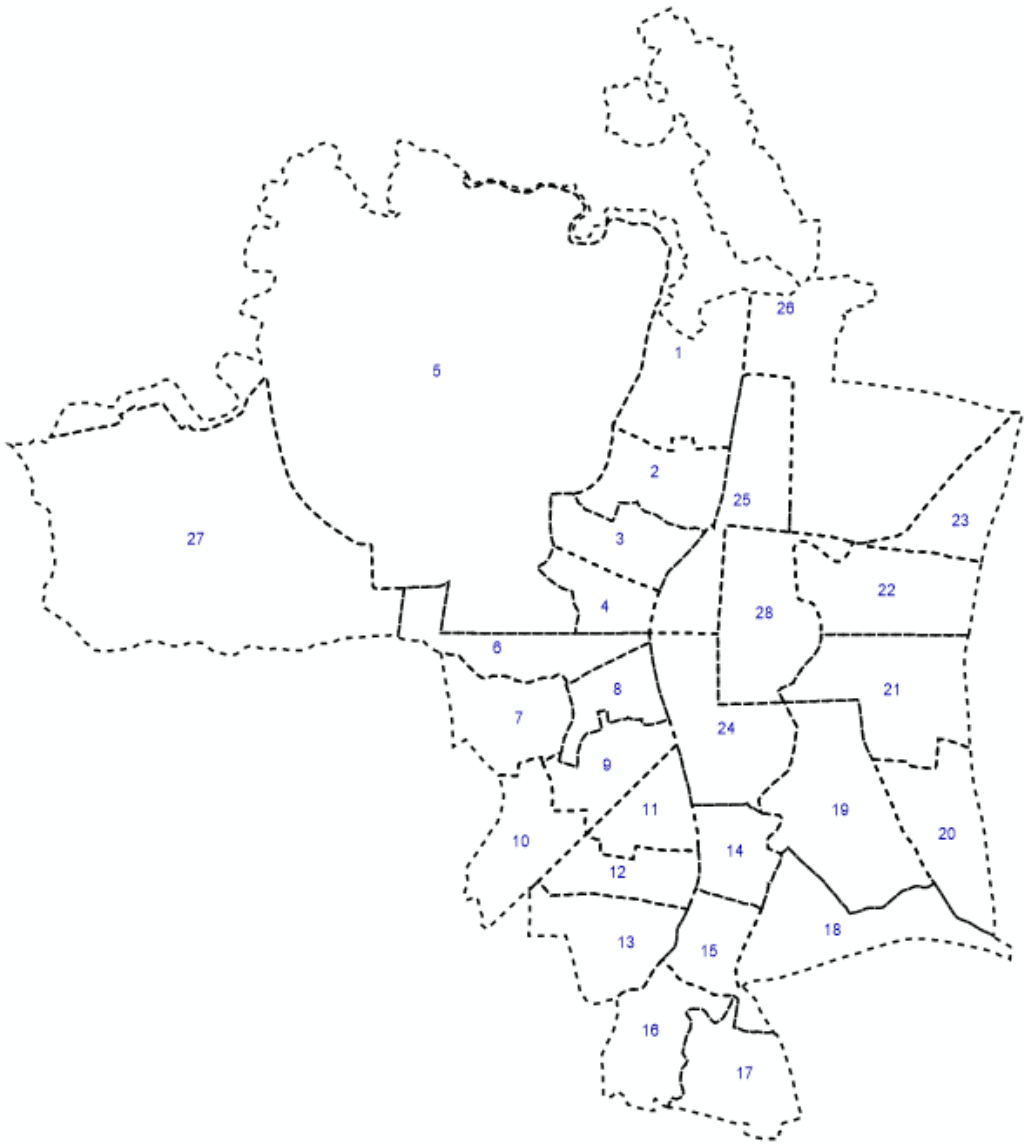


Figure 6-1 Traffic Analysis Zone system

7.3. Transport Network

The road network in Imphal Municipal Corporation area was comprehensively surveyed as part of road network inventory survey for obtaining link lengths, carriageway width, details of median, shoulder, footpath, on-street parking, etc. During the speed and delay survey, speed characteristics along the identified street network of Imphal Municipal Corporation area have been assessed.

The road network is coded in terms of a series of interconnected links with each having specific characteristics. Each link is coded in terms of start point and end point (nodes). The coded road network of the study area comprises information on road type, connections, capacities, and speeds. The network building process converts this data into a computerized format and performs certain error checks to ensure the reliability of the network.

All the primary roads in the study area are included in the model as well as significant number of minor roads that are used to provide local access to zones. The zone centroids have been connected to the nearest road node (dummy links). The network has been coded so that it is compatible to the zoning system adopted. In the highway network, primary road network included all major roads in the study area. Figure 6-2 show the network in the study area. Table 6-1 shows different types of links in the study area.

Table 6-1 : Links in Coded Network

Link Type	No. of Lanes	Type of Carriageway
1	Two Lane	Undivided
2	Three Lane	Undivided
3	Four Lane	Undivided
4	Four Lane	Divided
5	Six Lane	Divided
6	Eight Lane	Divided
Other Links		
7	Connection from road to commuter	
8	Zone centroid to road (walk)	
9	Bus network	
10	Road to bus connection	
11	Zone Centroid to bus	

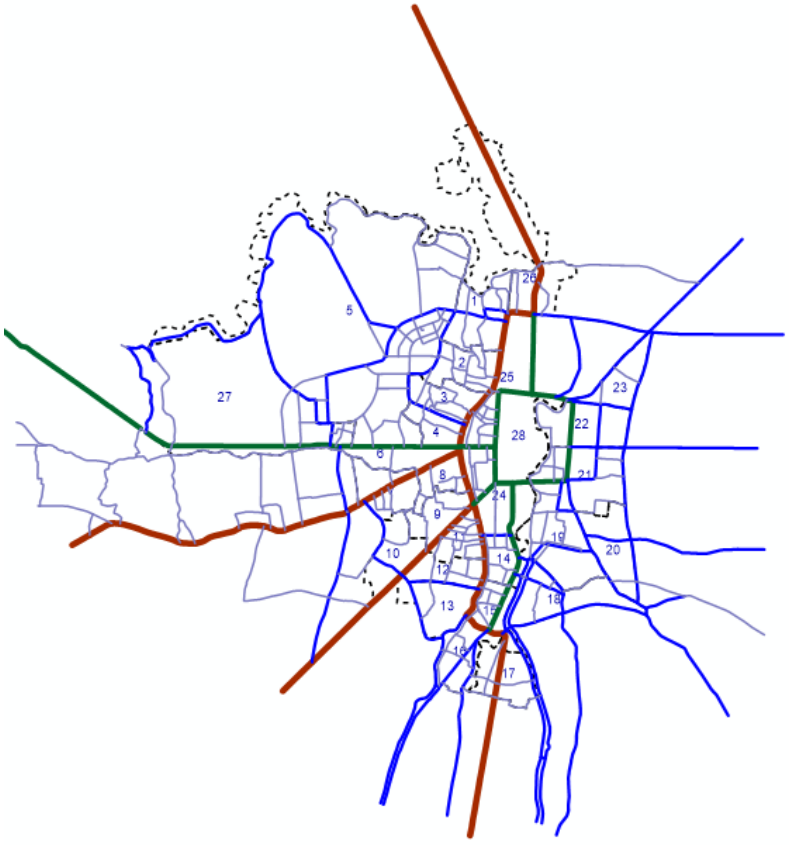


Figure 6-2 : Coded Road Network in the study area

The capacities for each link have been taken from the capacity norms specified by Indian Road Congress (IRC: 106 -1990-Guidelines for Capacity of roads in urban areas) describe the capacity of various link types identified in the study area in Table 6-2.

Table 6-2: Capacities adopted for Study Roads Network (PCU/Hour) at LOS F

Lane Configuration	Arterial	Sub arterial	Collector
2 lane (One way)	1714	1357	1000
2 lane (Two way)	1071	857	643
3 lane (One way)	2571	2071	1571
4 lane undivided (two way)	2143	1714	1286
4 lane divided (two way)	2571	2071	-
6 lane undivided (Two way)	3429	2714	-
6 lane divided (Two way)	3857	3071	-
8 lane divided (Two way)	5143	-	-
10 lane divided (Two way)	6429		

Source: IRC 106-1990

7.4. Transit Network Coding

After completing road network coding, transit coding was carried out. The transit coding included coding of route characteristics of buses and metro in terms of stop nodes, fares, time table and system characteristics such as capacity, speed, crush load capacity etc.

The objective of separate public transport coding was to represent the service level provided by each alternative public transport system. The Figure 6-3 shows the coded transit network.

Figure 6-3 Coded Transit Network in the study area

7.5. Travel Demand Modelling Approach

The classic four-stage demand model has been adopted for the present study. This model is the conventional method of Urban Transport Planning System (UTPS), where-in the distribution of land use in terms of population and employment allocation is done exogenously. This modelling approach is popularly known as sequential travel demand modelling which has four stages namely.

Trip generation, the number of trips generated at a zone

Trip Distribution, the choice of trip destination (travel desire)

Modal Split, the choice of mode for making the trip, and

Traffic Assignment, the choice of travel route on the transport network

In this approach, quantifiable relationships are being established between travel pattern, population, and opportunity (employment) distribution system and socio-economic characteristics of the population in the study area. The models have been calibrated at each stage to exhibit the observed trip making behaviour in the study area and the associated socio-economic characteristics. The calibrated model is then adopted for assessing the future travel demand for the given or estimated distribution of population, opportunities (employment) and socio-economic characteristics in the study area.

UTPS has been widely used in the past and contemporary transportation planning studies across the globe. The accuracy in calibrating this model has tremendously increased since the past, by using the latest computing tools and complex modelling software. PTV VISUM - an advance transport planning software has been used to simulate the conventional four-stage transport planning system.

The analysis of information obtained from the roadside interview surveys, household interview surveys, traffic counts and travel demand data together with socio-economic data aggregated at the zonal level forms the database to develop various components of travel demand model. Figure below shows the model flow chart that is being developed for the present study.

The Figure 6-4 shows the sequential travel demand modelling process adopted for this study.

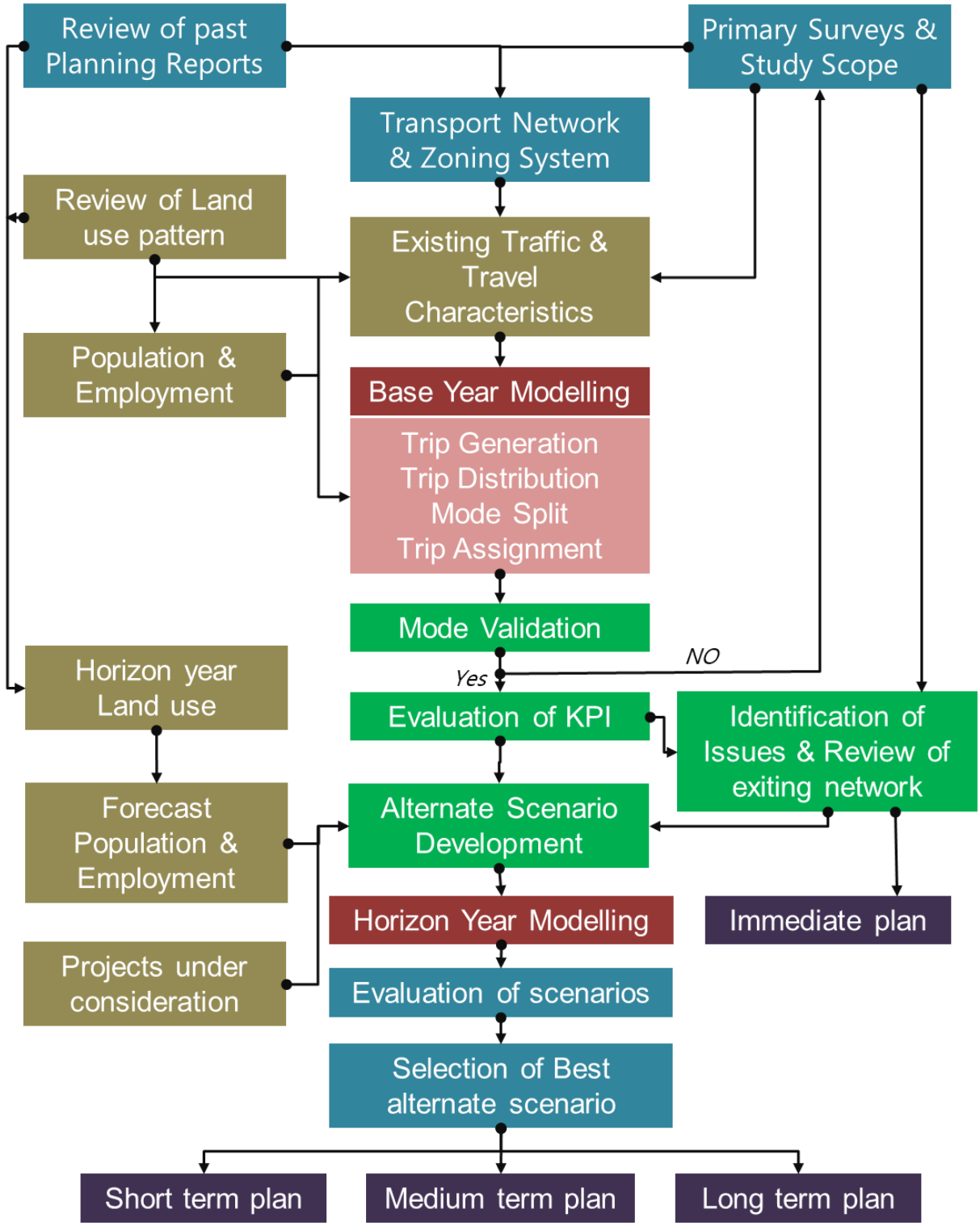


Figure 6-4 Sequential Travel Demand Modelling Process

7.6. Trip Generation

Trip generation is the first stage of the travel demand modelling process. Two types of trip generation analysis normally are carried out which are referred to as Trip Production and Trip Attraction. The developed technique utilizes the observed relationships between travel characteristics and urban environment.

Trip Generation is performed using Linear Regression Analysis technique to develop prediction equation for zonal trip ends. Typically, the functional form of single linear regression models is:

$$\boldsymbol{Y_i = M * X_i + C}$$

Given a simple one variable model:

Where:

- y_i = *dependent variable value for observation i*
- x_i = *independent variable value for observation i*
- *C = constant term*
- *M = coefficient of independent variable (Slope)*

For the purpose of this study the following variables have been considered to forecast the trip production –

- Population
- Employment

The term trip production is used for trips generated by traffic zones and is associated with trips generated at residential end. The trip production usually depends on explanatory variables like family size and composition, household income etc. In the present study, population has been considered for developing regression models for estimating future trip productions.

The estimated zonal population has been finalized as the independent variable to assess the number of trips produced in the study area.

The trip production model is given below:

Trip Production (City Level) = 1.19 x (Population of city) ***(R^2 = 0.81)***

P Value <0.05 and t- value is 7.8

The above equation is statistically significant as observed from p and t values.

The trip attraction is used for trips attracted by traffic zones. Many people travel to the non-residential areas such offices, malls, retail markets, other markets, Schools, universities, offices, factories and other industrial areas for work and other purposes. Such attraction trips are quantified using the Trip Attraction model using similar linear regression approach as used for trip production. In case of present study, zonal employment estimates has been extracted from the establishment survey data and existing land use.

Out of the variables summarized above, the calibrated equation for trip attraction with its R^2 is presented below:

Trip Attraction = 4.06 x (Employment) + 3992 (R^2 = 0.79)

P-value for constant and intercept < 0.05, t- value is 4.36

The above equation is statistically significant as observed from p and t values

Both the models are observed to be statistically acceptable for adoption for the horizon year.

7.7. Trip Distribution

Trip distribution is the second stage of Travel Demand Modelling process. The purpose of Trip Distribution is to develop a procedure that synthesizes the trip linkages between traffic zones. In other words, Trip Distribution is used for simulating the travel pattern, by distributing the production & attraction end of trips, into different traffic zones, based on some deterrence function. Several methods for synthesizing horizon year trip distribution matrices have been developed and used in Transport Planning studies. The majority of urban transport planning studies performed during the past 20 years has used Gravity Model.

The Gravity Model is a heuristically derived expression for synthesizing trip interchanges. The basic premises of Gravity Model is that the trip magnitude between two zones i and j is directly proportional to the number of trips produced in zone i.e., number of trips attracted to zone j, and inversely proportional to some function of the spatial separation of the two zones. Under the Gravity model, doubly constrained model has been used to calibrate with the friction factors.

$$t_{ij} \; \alpha \; p_i a_i \left[\frac{1}{f(d_{ij})}\right]$$

The equation can be rewritten as

$$T_{ij} = A_i B_j P_i A_j F(C_{ij})$$

Where

T_{ij} = Trips between zone i to zone j
P_i = Production from zone j
A_i = Attraction to zone j
$A_i \& B_j$ = Row/column balancing factor
$F(C_{ij})$ = Cost Deterrence from zone i to zone j

$$F(C_{ij}) = a * U^b * e^{(c*U)}$$

Where

$F(C)_{ij}$ = *Travel time / distance / generalised cost from zone i to zone j*
a, b, c = *Parameter to be calibrated.*

Calibration of Gravity Model in the present study is carried out through VISUM software which requires some basic inputs in terms of:

- Observed OD matrix by mode
- Network Parameters, speed and capacity by link, restrictions on entry of commercial vehicles, heavy vehicles etc.
- Zone-zone distance matrix is considered as friction factor

The main criteria for calibration checks are:

- Shape and position of observed and simulated trip length frequency distribution should be relatively close to one another
- The difference between the average trip lengths should be within ±3%

The Figure 6-5 shows the comparison of observed Trip Length Frequency Distribution (TLFD) form household survey and modelled Trip Length Frequency Distribution (TLFD).

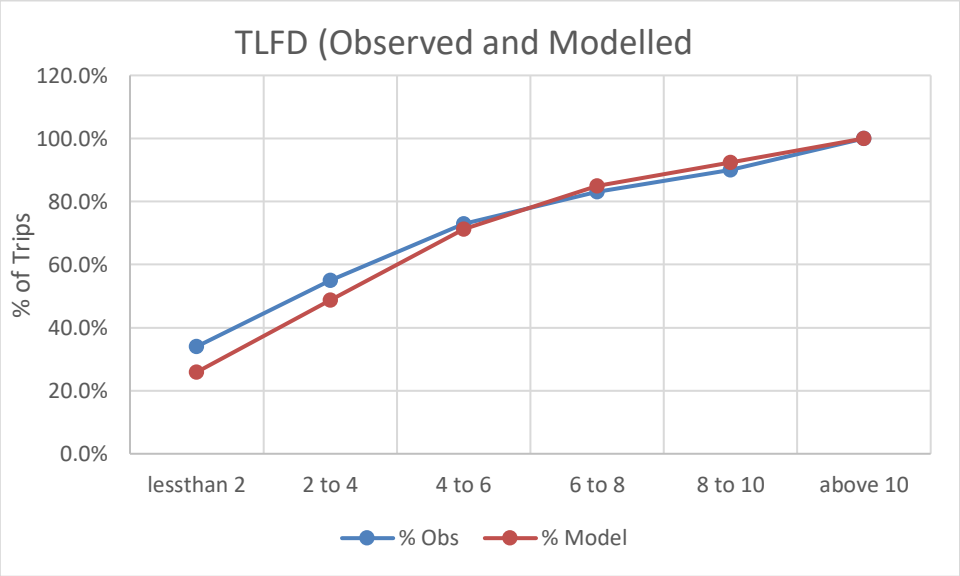


Figure 6-5 Trip Length Frequency Distribution (TLFD) in cumulative (%)

The observed Average Trip Length (ATL) and the Modelled Average Trip Length (ATL) variation should be +/- 3% and the model result for the study area is 2.94% which means the model is validated and it is showing the results within the acceptable error range. Table 6-3 shows the comparison of observed and modelled TLFD.

Table 6-3 Trip Distribution Model Validation

Details	Observed	Modelled	% Error
ATL	4.70	4.84	2.94%

The calibrated gravity model is proposed for use in distributing the horizon year travel demand for various network development scenarios.

7.8. Modal Split

Modal Split sub-modal of travel demand modelling is used to split the total travel demand in two or more mode categories for estimating the modal shares. The modal split analysis can be carried out at two stages:

- Pre-distribution stage
- Post-distribution stage

Post distribution stage has been adopted for this study. The single-step mode choice breaks down the total demand (total demand matrix) into the individual transport modes based on mode-specific impedance skims (for journey time, costs, etc.)

First of all, for each mode m the utility is calculated as a linear combination of the impedance parameters.

$$U_{ijm} = \sum_{g} \beta_g c_{ijmg}$$

Where,

- cijmg: impedance of the cost type g for the trip from zone i to zone j by mode m.
- The impedance of each mode is estimated based on the following equations Car Impedance = Time + Distance * (VOC/OCC/VOT)*60
- Tw Impedance = Time + Distance * (VOC/OCC/VOT)*60 Auto Impedance = Time + ((Distance*Fare)/OCC/VOT)*60
- PT Impedance = Time + (Fare/VOT)*60

Based on the above method, base year mode split share by various modes has been calibrated. Table 6-4 shows the variation between the observed mode wise percentage share of trips and modelled mode wise percentage share of trips as derived from the model. It is observed that the variations by modes are within the acceptable error range.

Table 6-4 Mode-wise Validation

Modes	% Observed	% Modelled	% Error
Two-wheeler	39.0%	35.7%	-8.4%
Car	16.4%	17.0%	3.8%
Auto Rickshaw	44.1%	46.7%	5.9%
Bus	0.5%	0.6%	12.7%

7.9. Traffic Assignment

Traffic Assignment is the fourth and the final stage of Four Stage Urban Transport Planning Process. The purpose of the traffic assignment is to develop a technique that simulates the way in which the trips between each origin and destination pair distribute over the links of their respective networks. The assignment model for the study has been structured into private vehicle assignment followed by public transit assignment on the coded public transit lines.

7.9.1. Private vehicles Trip Assignment – Base year

There are four traffic assignment techniques used in urban transport planning. These are –

1. All or Nothing Assignment
2. Capacity Restrained Assignment
3. Multipath Traffic Assignment
4. User Equilibrium Assignment

For this Study User Equilibrium assignment method is considered. The equilibrium assignment distributes traffic demand according to Wardrop's first principle wherein every road user selects his route in such a way that the travel time on all alternate routes is the same, and that switching to a different route would increase personal travel time. It is assumed that users are capable of correctly choosing their shortest routes, without accounting for the network level benefits. Therefore, this study assumes that actual traffic on the network is quite close to the User Equilibrium approach, as would be the case if most of the users are familiar with the road network and traffic conditions in the study area. Every driver is thus expected to minimize his/her travel time between an origin and destination pair by choosing the shortest route in terms of time.

The route search considers the impedance which results from the initial traffic volume on the network. Equilibrium assignment procedures updates travel times iteratively based upon the link performance functions. A link performance function is a mathematical description of the travel time and link volume. BPR (Bureau of Public Roads) function was used in the study as it is the most commonly used link performance function. The BPR function used for Trip Assignment is as shown below.

$$T_0 = T_C * (1 + (\propto * \left(\frac{V}{C^{\gamma}}\right)^{\beta}$$

Where;

T_0 = *Congested Travel Time*
T_c = *Free flow Travel Time*
V = *Volume (PCU/Hr)*
C = *Capacity (PCU/Hr)*
α, β, γ = *Calibrated Parameters*

Conversion of passenger trip matrix into peak hour vehicular trip matrix has been done by using the average occupancy for each passenger mode and the peak hour traffic as a percentage of totals.

The User equilibrium Assignment technique using PTV VISUM software has been adopted for the present study. The assignment is based on the generalized cost of travel between two zones. The Figure 6-6 below shows the peak hour private trip assignment for base year (2024).

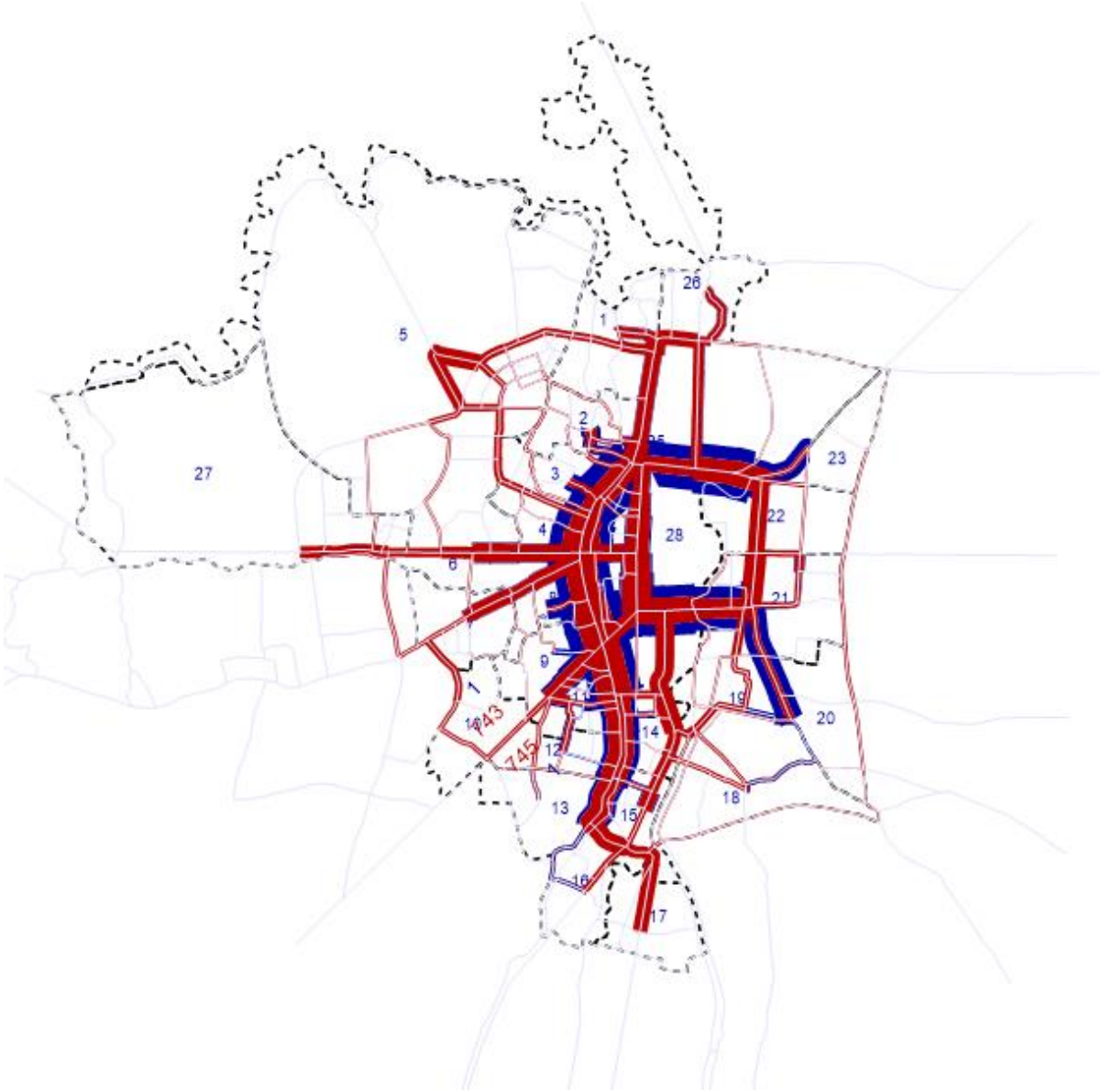


Figure 6-6 Base year Peak hour Private Transport Assignment – 2024

7.9.2. Public Transport Trip Assignment – Base year

Public transport passenger matrix was assigned on to the public transport network using time table based assignment technique. Peak hour was taken as 8.0 percent of total trips. There are two important steps in public transport assignment, viz., Route identification and evaluation and loading trips on to these paths.

- Route identification and evaluation: During this process, the Public Transport model finds “reasonable” or “attractive” multiple routes between zones, considering: number of transfers, and in vehicle costs, boarding and transfer penalty, wait time and fares. These paths were further used for loading based on probability of shift estimated by model.
- Loading: during loading, the Public Transport model loads demand, in the form of trips between zone pairs.

The Public Transport assignment was based on generalized time. The components of generalized time are In-Vehicle Travel Time (IVTT), Waiting Time (WT), Transfer Time (TR) and Fare in time units. Model also included boarding penalties. Accordingly, the generalized time (GT), is worked out as follows:

$$GT = IVTT + (WTFAC \times WT) + Acess\ \&\ Egress\ time + Walk\ time + (TRFAC \times TR) + \frac{FARE}{VOT}$$

Where,

- *GT* = Generalized time in minutes
- *WTFAC* = Wait time factor worked out as a ratio between value of Wait Time and value of IVTT
- *TRFAC* = Transfer time factor worked out as a ratio between value of TR and value of IVTT
- *VOT* = Value of travel time, in rupees per hour
- *FARE* = Fare paid for journey between origin and destination

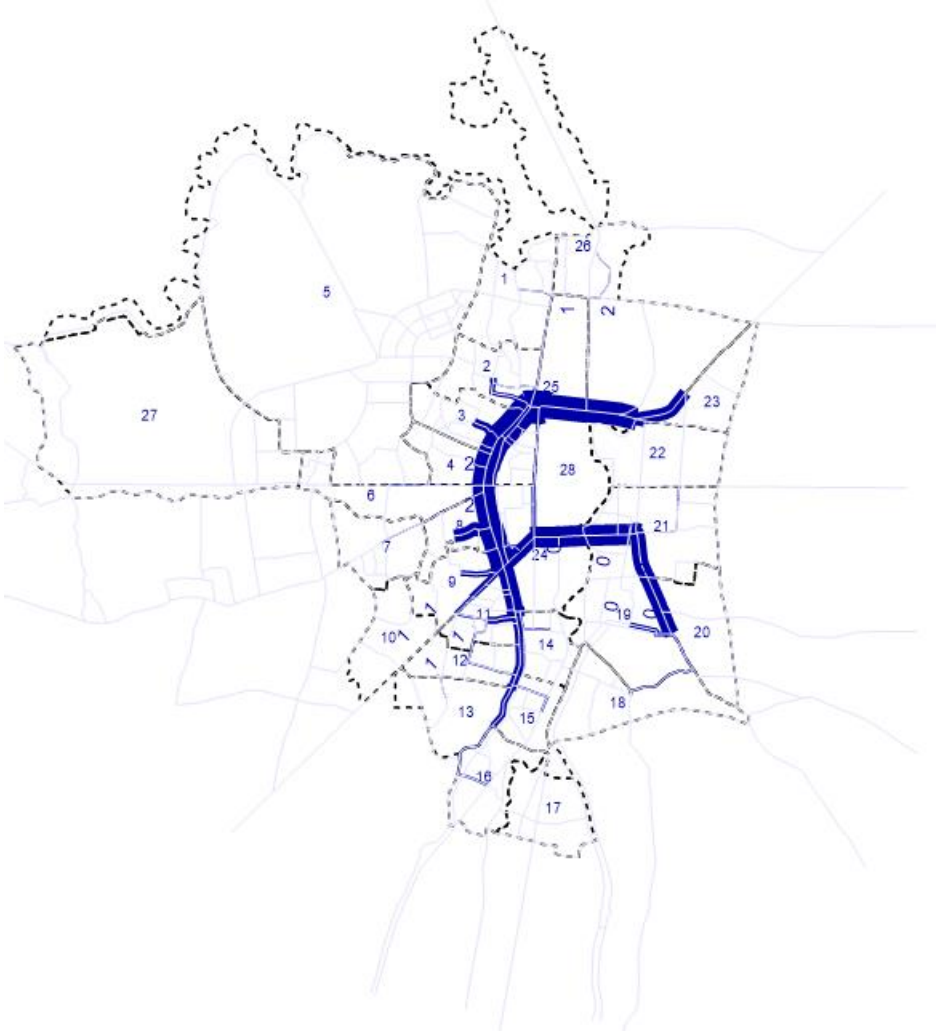


Figure 6-7 Base year Peak hour Public Transport Assignment – 2024

The model is termed as calibrated and validated model once the traffic loadings on the network are matching with the observed traffic at the selected check points termed as screen lines on the road network.

The validation has been done using the GEH statistics. The GEH statistic gets its name from Geoffrey E. Havers, who invented it in the 1970s while working as a transport planner in London, England. It is used to represent goodness-of-fit of a model. It takes into account both the absolute difference and the percentage difference between the modelled and the observed flows. Although its mathematical form is similar to a chi-squared test, is not a true statistical test. Rather, it is an empirical formula that has proven useful for a variety of traffic analysis purposes. The formula for the "GEH Statistic" is –

$$GEH = \sqrt{\frac{2(M-C)^2}{M+C}}$$

Where, M is the hourly traffic volume from the traffic model (or new count) and C is the real-world hourly traffic count (or the old count). GEH of less than 5.0 is considered a good match between the modelled and observed.

8. Alternate Development Strategies

Imphal is growing at a fast rate in 2024 and several imperatives have been identified which needs to be incorporated while devising a comprehensive strategy package to guide the development.

8.1. Planning Imperatives

Planning Period

The planning period is taken as 20 years. The horizon year for all estimates and planning Programme will be 2044.

Population Size

The study area estimated population by 2044 would be 4.20 lakhs and it is further estimated to reach 6.22 lakhs for the horizon year 2044. Such a growth presents an opportunity and poses a challenge. It needs to be organized in terms of its economic base, social structure and spatial distribution in an optimal manner. The spatial urban form must enable the city to be efficient, productive, and competitive. Table 8-1 below shows the population projection for 2044.

Table 8-1 Projected Population for Imphal– 2044

Year	Estimated Population
Base Year 2024	4.20 lakhs
Horizon Year 2044	6.22 lakhs

Work Force Participation Rate (WFPR)

The workforce participation rate (WFPR) is estimated as 24.0% in 2024. The WFPR during the horizon year (2044) is expected to be 24.53%.

Modal Share

The modal share in favour of public transport (bus and mini bus) is very low (around 0.6%). In the context of sustained development and enhanced environmental quality to be achieved through promotion of low carbon modes besides the need to reduce congestion and parking demand, it is necessary to improve the public transport share to a level of around 15%. This is adopted as a target for the purpose of public transport technology selection and planning.

8.2. Population Distribution Strategy

The population strategies have been prepared based on the Master Plan. As per the Master Plan 2043, distribution of total population within the study area zones been carried out based on proposed land use, development controls and population growth potential. Growth of population in certain sectors due to committed developments, policy interventions etc., has been appropriately considered.

Population distribution strategies have been evolved. These comprise –

Master Plan Development Strategy (MP) (P1)

In this scenario, population has been distributed based on the Master Plan 2043. It is estimated that, in Imphal population would be 6.22 lacs in the horizon year 2044 including proposed developments.

8.3. Employment Distribution Strategy

As per Master Plan 2043 additional area has been allocated for residential and PSP development. No new heavy industries are to be located within study area. The present central commercial areas such as Ima Market would continue to function as Central Business District.

For employment level assessment it is assumed that that ratio of employment in formal and informal sectors in the horizon years may follow the same trend as observed in the present scenario. New activity developments resulting in additional employment opportunities in certain areas due to proposed land use and committed projects have been included in horizon year employment assessment.

8.4. Transport Structure Strategies

In order to develop an integrated mass transit system for the study area, it is necessary to assess the future travel demand, which would decide the type of system necessary to cater the forecasted demand. Alternative transport network options have been evolved. Scenarios has been be created based on network development options. The identified scenario has been be tested and evaluated based on scenario evaluation parameters.

8.4.1. Master Plan Road Network along with committed project under considerations

This network comprises of the road network as proposed in the Master Plan-2043. The network form is largely an extension of existing road network identified by the road inventory survey and other additional links proposed in the Master Plan - 2043. The proposed road network system in the Master Plan comprises of roads with RoW of 60m, 45m respectively. The ring road is proposed for better connectivity and reduced congestion levels. The hierarchy of new roads is decided based on the RoW assigned and their functional character. The through roads are designated as arterials and the roads providing access to arterial are designated as sub arterial while the roads collecting and distributing traffic from and to sub arterial roads designated as collector roads. Based on the base data analysis possible road widening sections are also been considered in this scenario.

8.5. Identification of Appropriate Scenarios of Urban Development

Based on the various alternative strategies of population and employment distribution besides network developments in all two scenarios of urban development are evolved by combining all possible alternate strategies. From these, two scenarios of urban development were found appropriate and selected for testing and evaluation. These are briefly described as under:

8.5.1. Master Plan Scenario (BAU)

In the Master Plan development scenario, the proposed Development Plan for the year 2043 and Vision Plan of Imphal are considered. This is a Business as Usual (BAU) case in which most of the future growth will be accommodated in the Greenfield areas identified in the southern and south-west part of the sub city. For the estimated Master Plan population of 6.22 lakhs, an employment of 1.52 lakhs is estimated.

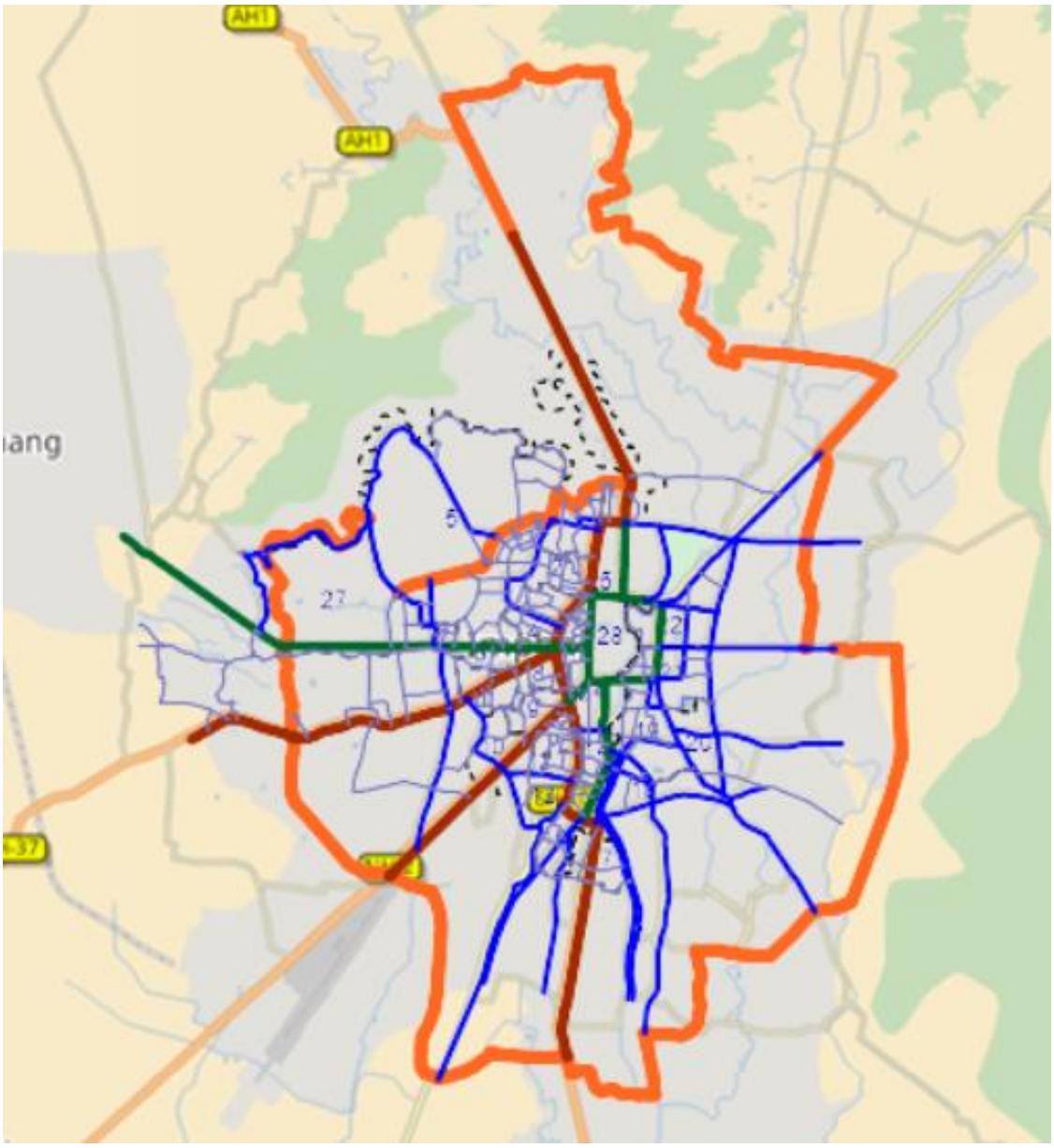


Figure 8-1 Master Plan Network and committed projects under N1 strategy

9. Horizon year Travel demand forecast - 2043

9.1. Background

The forecasted travel demand for the year 2043 has been assigned on the road network based on each scenario. The Level of Service of the road network is determined by comparing the volumes on the road links to their respective capacities. The intra – city travel demand for horizon year have been forecasted using the base year calibrated travel demand models while for regional (Inter -city) travel demand the forecast is based on elasticity demand using econometric model.

9.2. External Trips Forecast

The Regional (inter -city) trips were forecasted for the horizon year adopting using the trip rate method while fratar method has been considered for distribution of trips. The outer cordon roadside interviews of the present study in the base year have been utilized for the purpose of modelling external trips. The typical external trip forecast method is used in the current study as the requisite economic data at the traffic zone level. The external trips generally depend on the economic and vehicle registration of that particular zone to estimate the trip rate of the external zones for the base year. In order to project the external trips for horizon year in the study area, growth factors of trips were established for each of the external zones based on estimated base year external trip. The following section briefly explains the population forecast of external areas.

9.3. Horizon Year Travel Demand Model

The base year calibrated model has been adopted in the horizon year to evaluate the alternate scenarios taking into account estimated population, employment, transport network and external trips. It is assumed that the travel behaviour will remain same in the horizon year. For the horizon year, three scenarios were developed as follows:

- Scenario 1: BAU : Master Plan + committed development projects

9.4. Scenario 1: BAU: Master Plan with Committed development projects scenario

In this scenario the modal split in favour of public transport excluding NMT is estimated to increase to 15% in the year 2044 from present value of 0.6% in 2024. From the trip assignment it is observed that the V/C ratio in 2044 would be 0.78. Figure 9-1 shows the peak hour PCU for HY 2044.

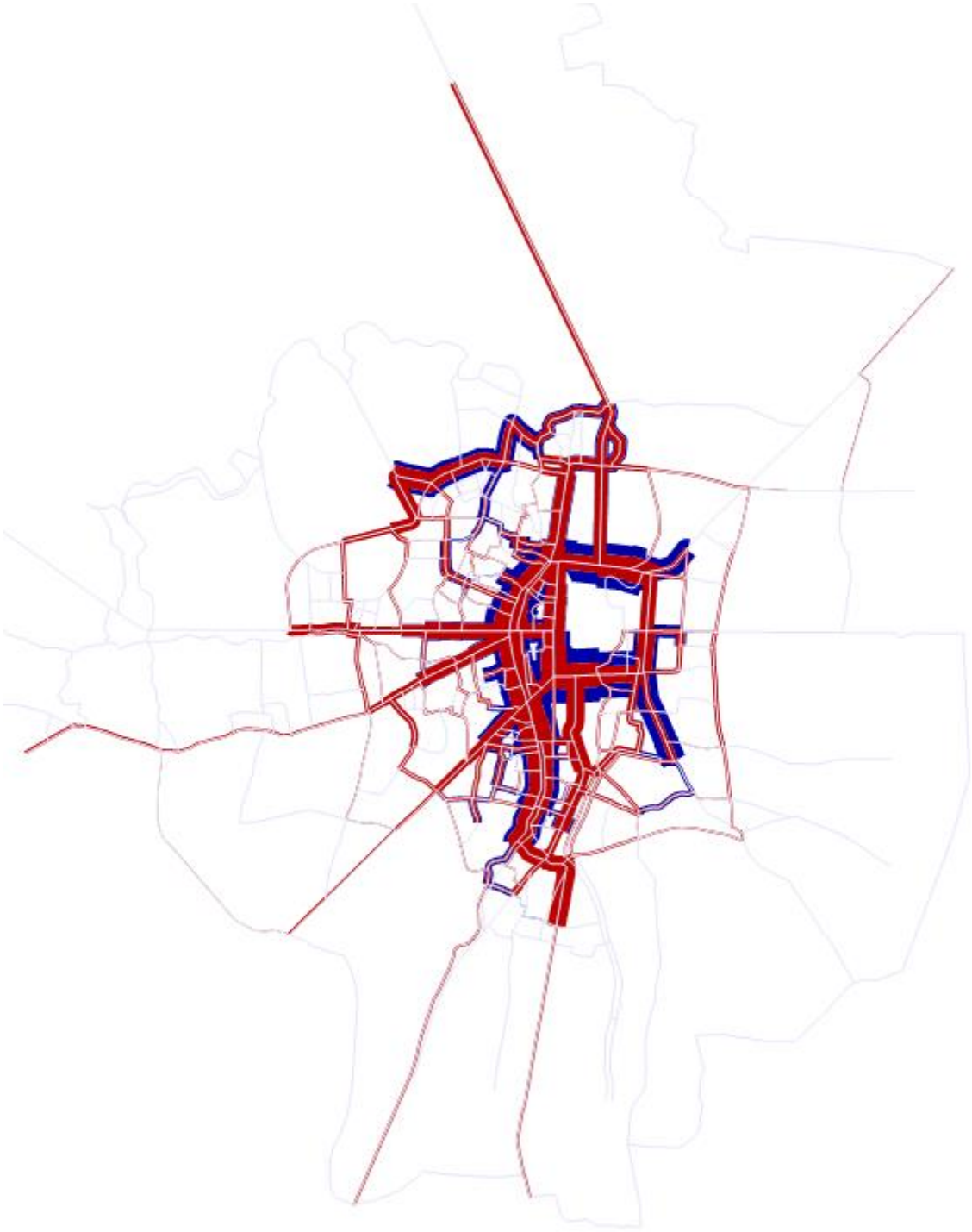


Figure 9-1 Peak Hour PCU assignment of BAU Scenario (Peak Hour – HY2044)

10 Vision and Goals

A Comprehensive Mobility Plan is a plan to guide the decision and policy makers regarding urban transport infrastructure requirements in the study area. Vision is a key element of CMP preparation. In this context clear vision along with goals and objectives need to be developed for CMP that are guided by general objectives of NUTP and consider the contextual situation of Imphal. In order to evolve appropriate vision and goals, a review of NUTP (2006) has been undertaken to identify key objectives which would provide basis for vision formulation.

10.1 National Urban Transport Policy

The Government of India formulated a National Urban Transport Policy (NUTP) in 2006 to transform the current situation into a safe convenient and efficient transportation system across all urban areas in India.

The vision of NUTP is –

- To recognize that people occupy center-stage in our cities and all plans would be for their common benefit and well being
- To make our cities the most livable in the world and enable them to become the “engines of economic growth” that power India’s development in the 21st century
- To allow our cities to evolve into an urban form that is best suited for the unique geography of their locations and is best placed to support the main social and economic activities that take place in the study area.

The objective of this policy is to ensure safe, affordable, quick, comfortable, reliable and sustainable access for the growing number of residents to jobs, education, recreation and such other needs within our cities. This is sought to be achieved by –

- Encouraging integrated land use and transport planning
- Ensure equitable allocation of road space with people, rather than vehicles, as its focus
- Encourage greater use of public transport and non- motorized modes
- Enabling the establishment of quality focused multi-modal public transport with seamless travel across all modes
- Establish effective regulatory and enforcement mechanism for different transport service operators
- Ensure effective parking and freight management
- Establishing institutional mechanisms for enhanced coordination in urban transport
- Reducing pollution levels through planning and technological intervention
- Ensure adequate capacity in urban transport

Drawing upon the merits of various recommendations in the NUTP (2006) and also the contextual situation of Imphal, the vision and goals have been identified for the CMP based on existing socio-economic and travel characteristics of the resident population in Imphal. These are described in following sections.

10.2 Vision for Imphal

The CMP of Imphal seeks to "Move People, Not Vehicles". By emphasizing the pre-eminence of public and integrating the land use with transport networks, while encouraging non-motorized transport (NMT) and travel demand management, the vision seeks to emphasize the objectives of the National Urban Transport Policy (NUTP) in the Imphal Area. The statement for the vision is –

"To provide for a people centric, environment friendly, safe, efficient and integrated transport system compatible with proposed development in Imphal"

The stated vision of CMP, which is based on contextual situation and consultation with stakeholder organizations, focuses on developing Imphal a healthy and loveable city which is able to provide its inhabitants with safe, accessible, affordable and environment friendly transport ecosystem for catering to their social, economic and resource needs.

10.3 Mission

The mission of CMP is to develop and operate a transport system that will have –

- Pedestrian and Non-Motorized Transport facilities which are extensive, adequate, attractive and safe.
- Public Transport System, which is extensive in coverage, appropriate in technology mix for the size of the city, equitable and inclusive in access to service, affordable and which caters a large share of the travel demand.
- Transit supportive land use structure with provisions for adequate last mile connectivity to transit stations and stops
- Road Network system, which is adequate in capacity, appropriate in pattern and hierarchical in structure.
- Terminals to provide a place of convenient access to the services, a place of easy transfer amongst modes and services
- Parking policy and parking areas which, provide for orderly parking of modes and support traffic management objectives
- Institutional frameworks with a technical and financial capacity to plan, develop, operate and manage the proposed transit system and transport infrastructure.

10.4 Goals

The goals of the CMP are –

- Improve the modal share in favor of public transport system from existing 6% to 25% with respect to motorized trips.
- Ensure 80% of the population is served by public transport within influence area of 500 meters through improved coverage of public transport services.
- Promotion of an integrated land use and transport system to encourage compact development and reduce the average trip length.
- Ensure minimum 20% of the total trips to be performed using bicycle modes in the future from a present low share of 16%
- Develop seamless multi-modal transport network which can facilitate convenient mobility and cost – effective access to places of activities in the next 20 years

- Provide safe and convenient pedestrian and Bicycle facilities in major residential, educational, and commercial areas.

10.5 Strategies

The selected strategies to achieve the mission and objective of CMP are:

- Provide well designed pedestrian footpaths and Bicycle lanes along all corridors of the city
- Provide exclusive pedestrian phase at all signalized intersections
- Provide pedestrian grade separation facility, at mid-block, along major arterial corridors where the inter-section spacing is 1 km or more
- Provide pedestrian refuge islands, of adequate size, at all intersections
- Preparation of Traffic Management Plans, for critical locations, corridors and areas with emphasis on priority of access and movement for public transport, pedestrians and bicyclists
- Enlarge coverage of city bus service to all parts of the city
- Provide intra and inter bus terminals with all requisite facilities
- Develop integrated freight complex (IFC) for facilitating urban freight movements and adopt city logistics facilities for sustainable urban freight deliveries
- Prepare and adopt a comprehensive Parking Policy
- Adopt ‘Zero Fatal Accident” policy and promote high degree of safety in the planning, design and construction of transport facilities and operation of transport service
- Conduct safety audit at all stages – planning, design, construction, post construction and operation – of transport facilities and services
- Strengthen capacity of institutional set up in the area of mobility planning and traffic engineering.
- Explore innovative mechanism to finance urban transport
- Undertake capacity building programs in the field of urban transport for senior and junior level staff of ULB.

11. Comprehensive Mobility Plan Proposals

Several traffic & transportation surveys were conducted Imphal as a part of the present study in order to assess the passenger and goods movement pattern, travel characteristics, pedestrian & parking characteristics and the available infrastructure facilities within the study area. Based on the data analysis carried out various issues were identified which required immediate to short-term, medium- and long-term measures to mitigate the transport problems.

The improvement measures for a city traffic and transport system can normally be grouped under two broad categories:

- Immediate and Short-term improvement Proposals (Phase 1 2024 -2029).
- Medium improvement proposals (Phase 2 for HY 2029 to 2034).
- Long term improvement proposals (Phase 3 for HY 2034 to 2039) and (Phase 4 for HY 2039 to 2044).

The following sections describe various improvement plans in transport sector for Imphal based on extensive data analysis and travel demand modelling efforts carried out.

11.1. Regional Connectivity Enhancement

Analysis of the OD data indicates that Imphal is having daily interaction with its regional growth centres such as Dimapur, Kohima, Aizawl and Monirang. It is necessary to develop strong regional linkages to enhance the regional connectivity for freight and passenger movement. From the data analysis it is observed that, almost 38% of traffic is external to external freight and passenger traffic which reflects the importance regional connectivity. The radial road network converging in and around city core (Ima market area) is largely responsible for regional traffic entering and thereafter congesting the already saturated urban road network. To counter this challenge, multiple agencies and documents have suggested a ring road alignment around the Imphal city.

Figure 11-1 shows the proposed regional road network connectivity

Figure 11-1 : Proposed Regional Road Network

The project road has been proposed to be improved to 4 lane with service lane, 4 lane without service lane and 2 lane standards in different sections. The alignment of the project road has been designed to design speed of 80kmph in green field and improved to 50/40/30 kmph in existing road section depending upon the ROW, existing geometrics and impact on habitation along existing road.

11.2. Road Network Improvement

The road network improvement plan has been prepared based on the analysis of primary surveys such as traffic volume count and various inputs like the population and employment. For each TAZ, external matrices for each vehicle type and future year proposed networks have been prepared for the horizon year 2044. These inputs were used to run the Travel Demand Model of Imphal city for the horizon year assuming that the transport infrastructure would not be improved. This scenario is referred to as “BAU Scenario”. Links with lower V/C were identified and have been recommended for improvement. In areas with Greenfield development, it was observed that new roads would be needed to facilitate travel in those areas. The same have also been recommended.

The Study is proposing a transition from a radial network to a ring radial network involves enhancing the existing network infrastructure to improve efficiency, reliability, and fault tolerance. The move from a traditional radial network, where all radial network is connected to central fort area. The ring radial network offers several advantages. The figure below shows the proposed ring and radial network for Imphal city.

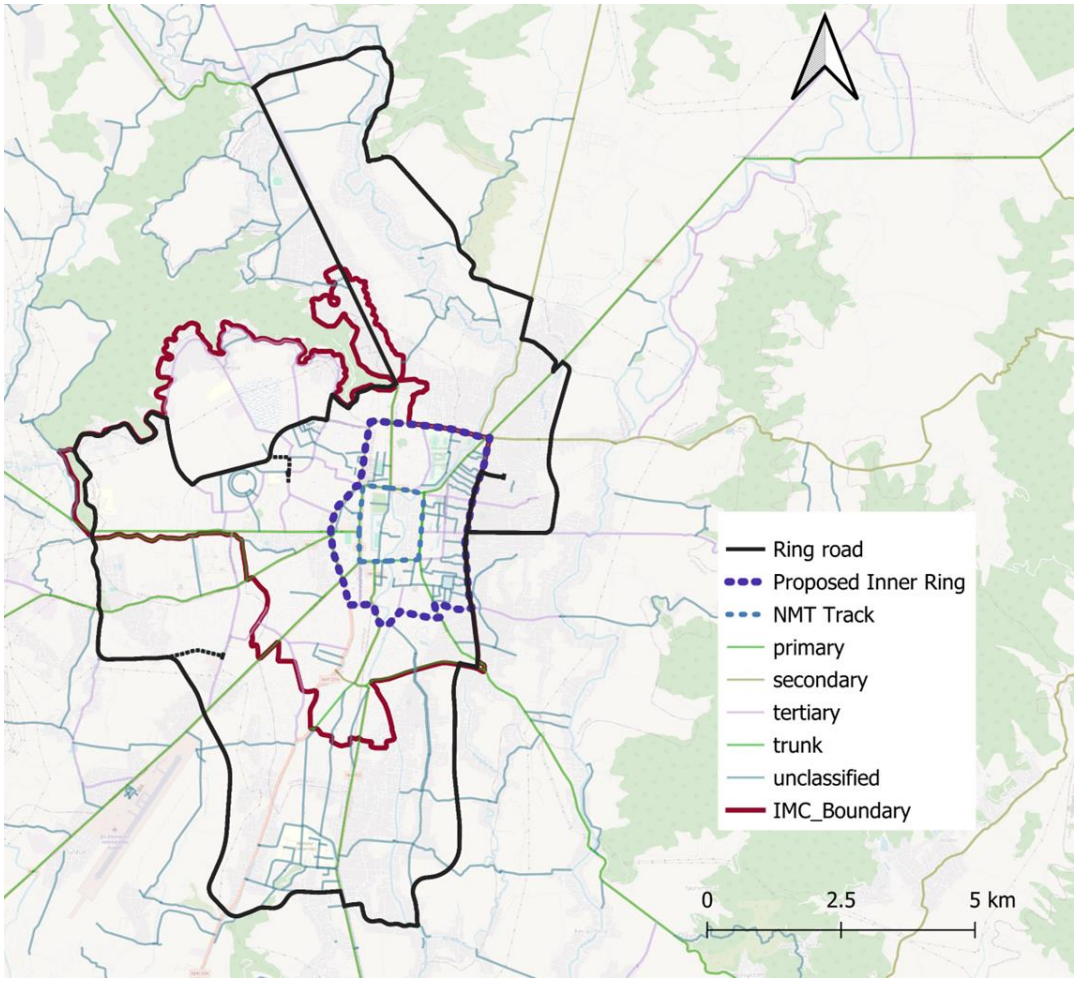


Figure 11-2: Proposed Inner ring Road Network

As part of the study, Volume by Capacity analysis has been carried out to identify the roads with more than 70% of V/C for widening. The figure below shows the roads for widening in the study area.

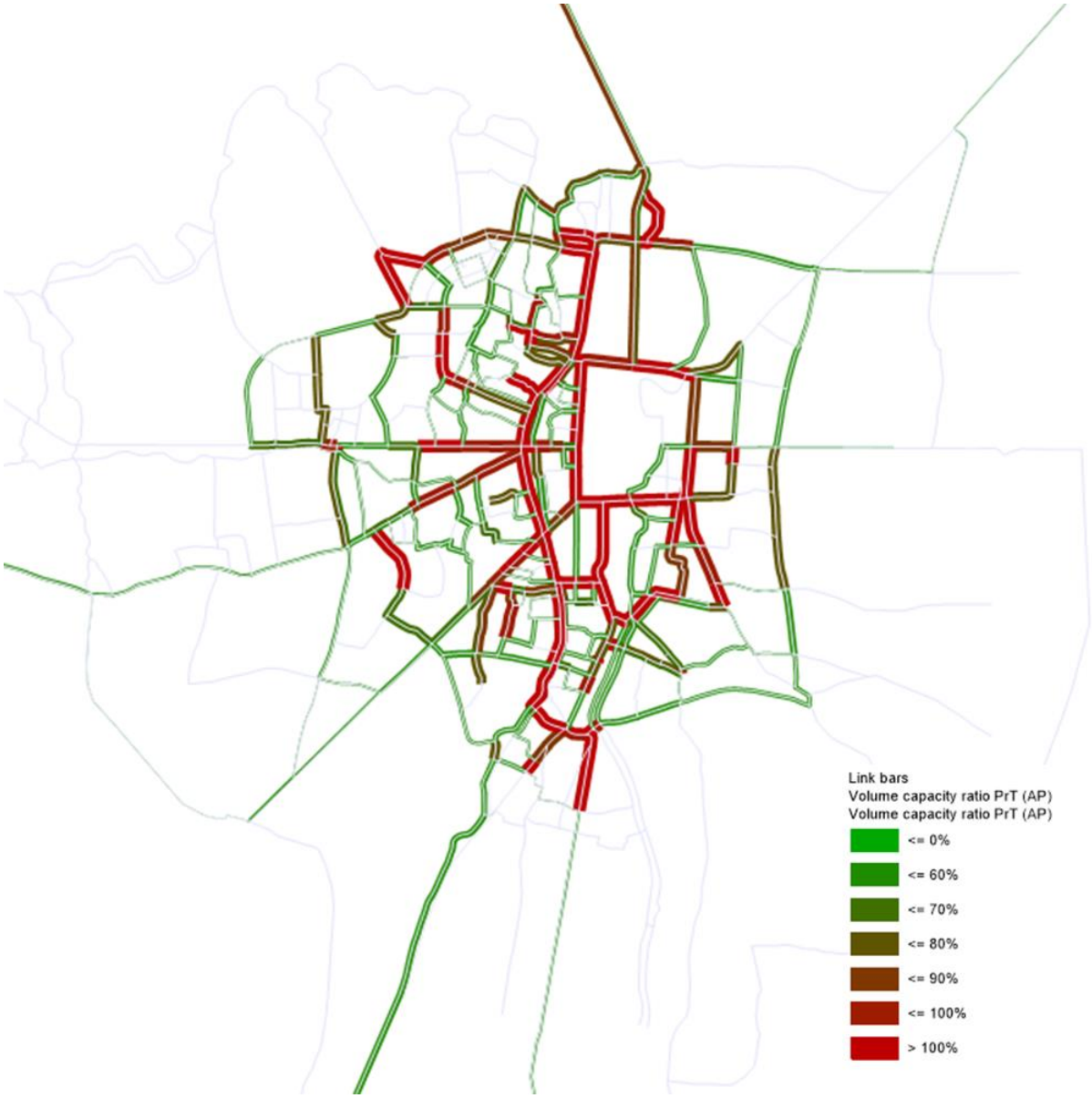


Figure 11-3: Proposed Roads for Road widening

11.3. Proposal of Bicycle Infrastructure

It is observed that 3% of the total trips in the city are cycle trips. Considering this low pattern of bicycle usage, the challenge is to shift the large proportion of motorized two-wheeler trips (30%) and the Car trips (30%) to bicycle mode or bicycle + public transport, or intermediate transport + public transport system. It has been observed that more than 75% of the overall total trips in Imphal are within 5 km which can potentially be either undertaken by walk or by non-motorized modes.

The city-wide bicycle infrastructure, 9 kilometers of network has been proposed as exclusive cycle tracks to connecting various activity nodes such as fort, transit nodes, commercial areas and residential areas in order to provide direct connectivity between various land uses and activity nodes. Dedicated cycle tracks for ROW above 24m will have minimum 2.5 meter on the both side of the network and where every there is a low traffic volume and road width is available there 5.0-meter dedicated cycle lanes can be provided. For Less than 24m ROW minimum 2.0 meter can be provided. Most of the places it will be protected, and special treatment will be given at the junction and wherever it is required cycle phase will be added to the signal system. More cycle network will be added based on the available of network.

Proposal of Public Bicycle Sharing Scheme

Public Bicycle Sharing (PBS) is a high-quality bicycle-based transit system in which bicycles, stored in a closely spaced network of stations, are made available for short-term shared use. Apart from short trips PBS could serve as an important sustainable mode of transportation for

- Daily commuters using PBS as a feeder public transportation.
- Shoppers, Tourist, Residents and office employees for short daily errands.
- Tourists who need flexibility and independence in experiencing the city at their own convenience.
- School and college going students on a budget.
- Women, especially those who are dependent on IPT modes for commuting short distances.
- PBS is likely to encourage the use of cycling, governmental agencies and civic groups have come together to execute Raahgiri day and Car-free days in the city.
- PBS may result in bringing down the use of personalized mode of transport in the city.

The Figure 9.4 below shows the Proposed PBS in Imphal City.

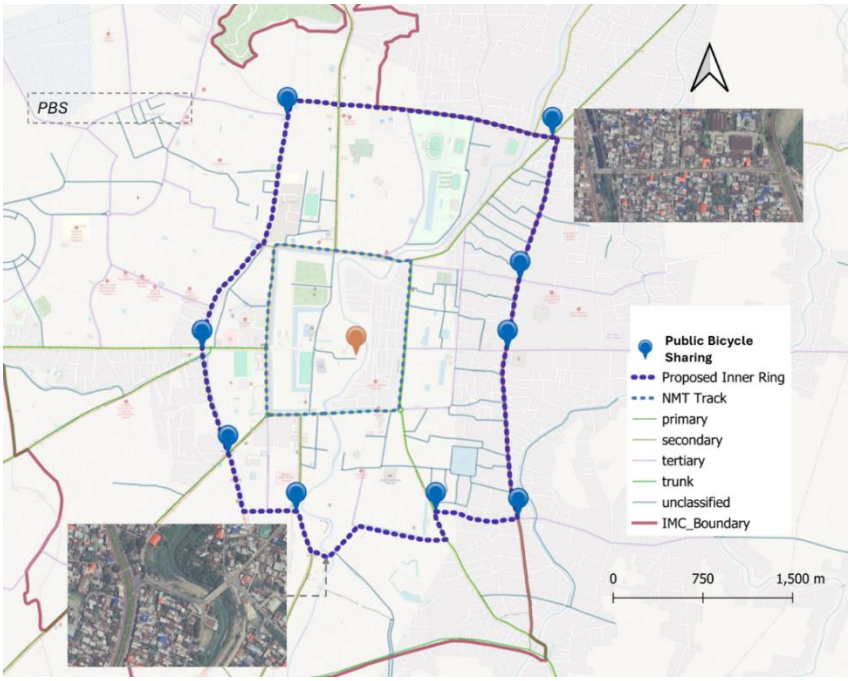


Figure 11-4: Proposed PBS and Cycle track

11.4. Footpath Proposal

From the data analysis it is observed that presently only 9% of the total network is covered by footpath resulting in footpath length of 29km. Major areas that have footpath include the inner core area. Most of the locations in central core area have footpath, unfortunately there are either encroached or occupied by vehicles and forcing pedestrians to walk on carriage way. This leads to the reduction in carriageway capacity besides Pedestrians' walking experience on carriageway is neither safe nor convenient. Based on walkability analysis about 281km of road network has been identified for which footpath needs to be developed as shown in below Figure. It is recommended to have footpath on various roads to segregate motorized and pedestrian traffic. A minimum of 1.8 meter footpath is suggested on either side of the road especially in pedestrian intensive areas.

Figure 11-5: Proposed Footpaths

Extending the existing complete pedestrian network till DM College Road (entire Khoyathong Road) of Ima Market in Imphal city presents an opportunity to enhance accessibility, safety, and connectivity for pedestrians. The completion of this network would ensure a seamless pathway for people in Ima Market. By extending the pedestrian network, it can create a

pedestrian-friendly environment that encourages walking, reduces traffic congestion, and promotes a healthier lifestyle. This extension would not only benefit locals but also tourists who visit Ima Market, known for its vibrant atmosphere and cultural significance. It would offer a safe and convenient pathway for visitors to explore the market and its surroundings on foot, encouraging tourism and boosting the local economy. Additionally, a well-designed pedestrian network can contribute to the beautification of the city, with opportunities for public art installations along the route. Safety features such as proper lighting, crosswalks, and signage can also be incorporated to enhance the overall pedestrian experience. The figure below shows the proposed complete pedestrianization network.

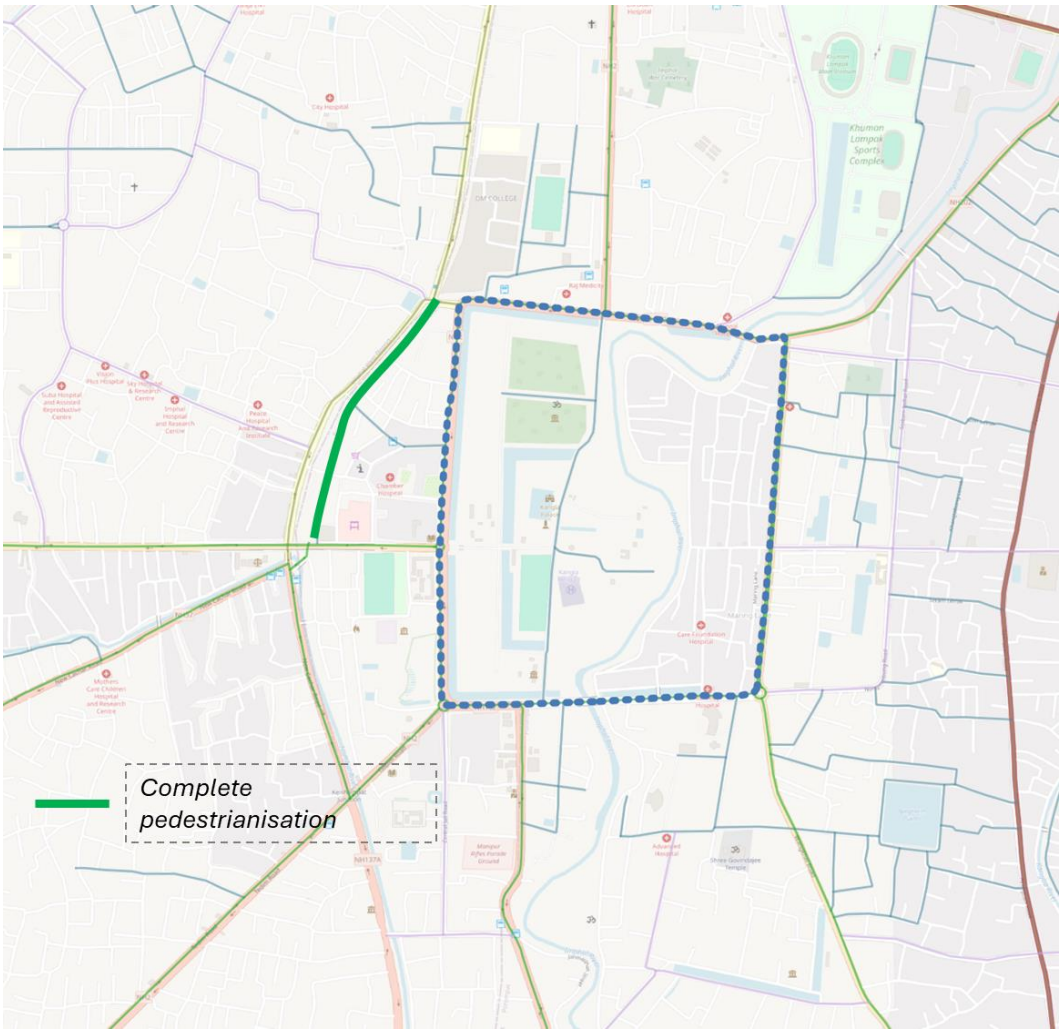


Figure 11-6: Proposed Pedestrianization network

11.5. Proposed Public Transport

Before to the riots in Manipur, there were almost 25 routes which are providing service to the Imphal and towns of Manipur. The study is proposed to re-initiate the same routes after the riots and get back the riders on public transport. The figure below shows the short term bus operational routes. For the medium and long term plan, the study is targeted to increase the public transport share from present 0.6% to 15% for the horizon year 2044. In this context , Imphal city level bus routes has been proposed which will be operated by electrical mini

bus/cab with 24 seater capacity. Intensification of public transport by buses shall increase the emission levels of the city and may deteriorate the urban environment. Hence, the buses on the proposed routes shall be replaced with electrical buses as a possible option to reduce emissions. Depending on the funding available and ease of provision of infrastructure electrical bus shall be selected.

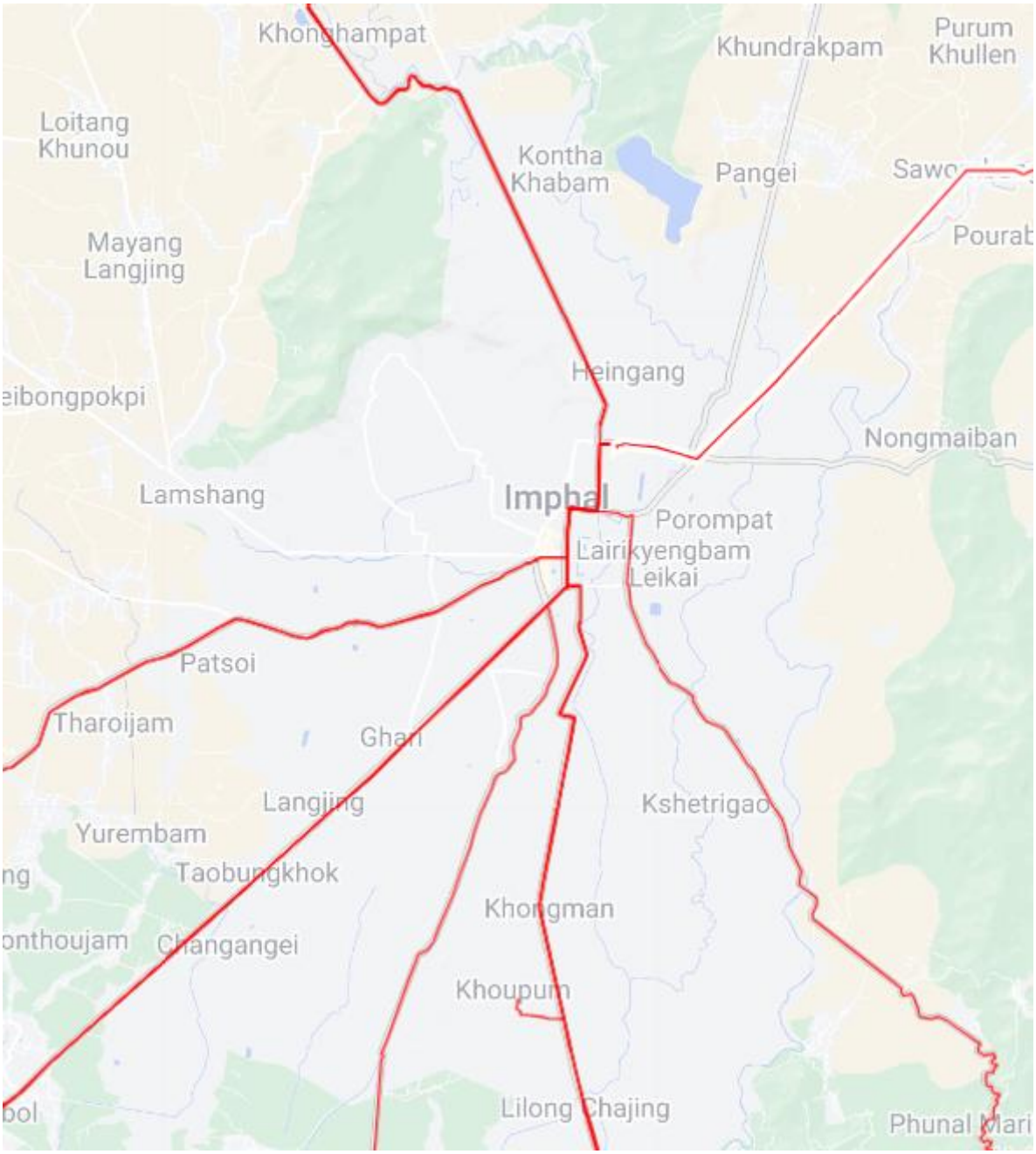


Figure 11-7: Short term - proposed Bus routes

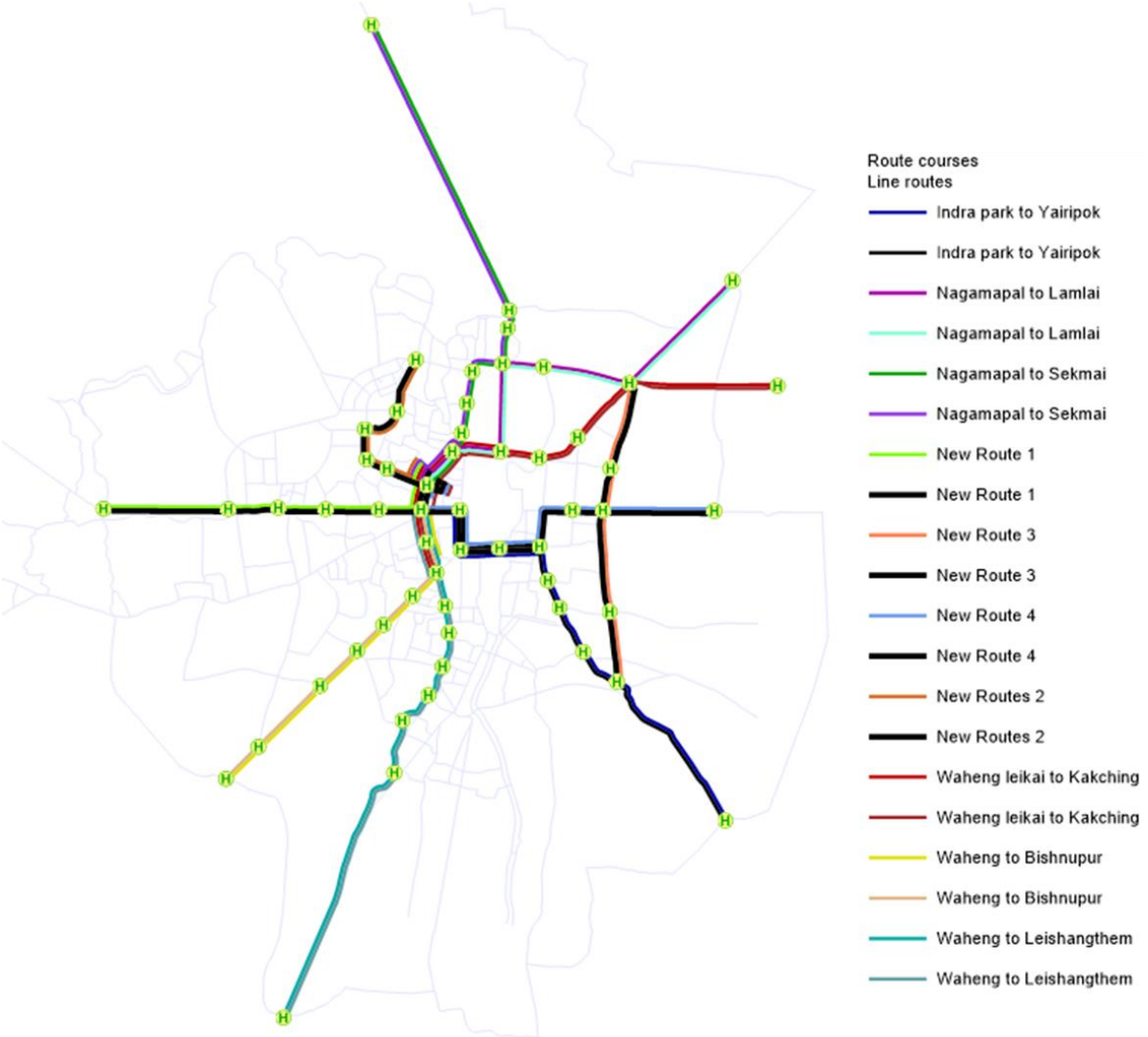


Figure 11-8: Medium and Long Term - Proposed Bus routes

11.6. Proposed Parking Facilities

The rapid growth in the use of cars and two wheelers in Imphal have exacerbated the problems of parking of vehicles in the core area. Four MLC parking areas are proposed (Nagamapal (Near Kasturi Bridge), Ima Keithel (Irabot Road), Near Sanjenthong Bridge and ecure Building (North AOC)) to full fill the needs of parking in next few years. Also, the present study recommends to formulate a parking policy as a solution to the increasing parking problems and road congestion in Imphal. The components of the Parking Policy for Imphal are –

- 'Discouraging the use of private vehicles and encouraging walking/cycling/public transport' should be the prime objective of the parking policy
- Preparing a city-wide street wise parking plan
- No Parking on arterial/ring and radial roads and other important roads where the parking affects the movement of traffic
- Removing obstacles from carriageways thereby improving the steady flow of traffic and increasing carriageway capacity

- Implementation of duration-based parking which will discourage long term parking
- Implementation of steep parking charges in order to discourage use of private vehicles and encourage use of walking/cycling/mass transport modes
- Higher parking charges for on-street parking as compared to off-street parking
- Present norms for provision of parking spaces to be maintained
- Developing parking lots on PPP based models

The Figure 11-9 shows the proposed MLCP parking locations

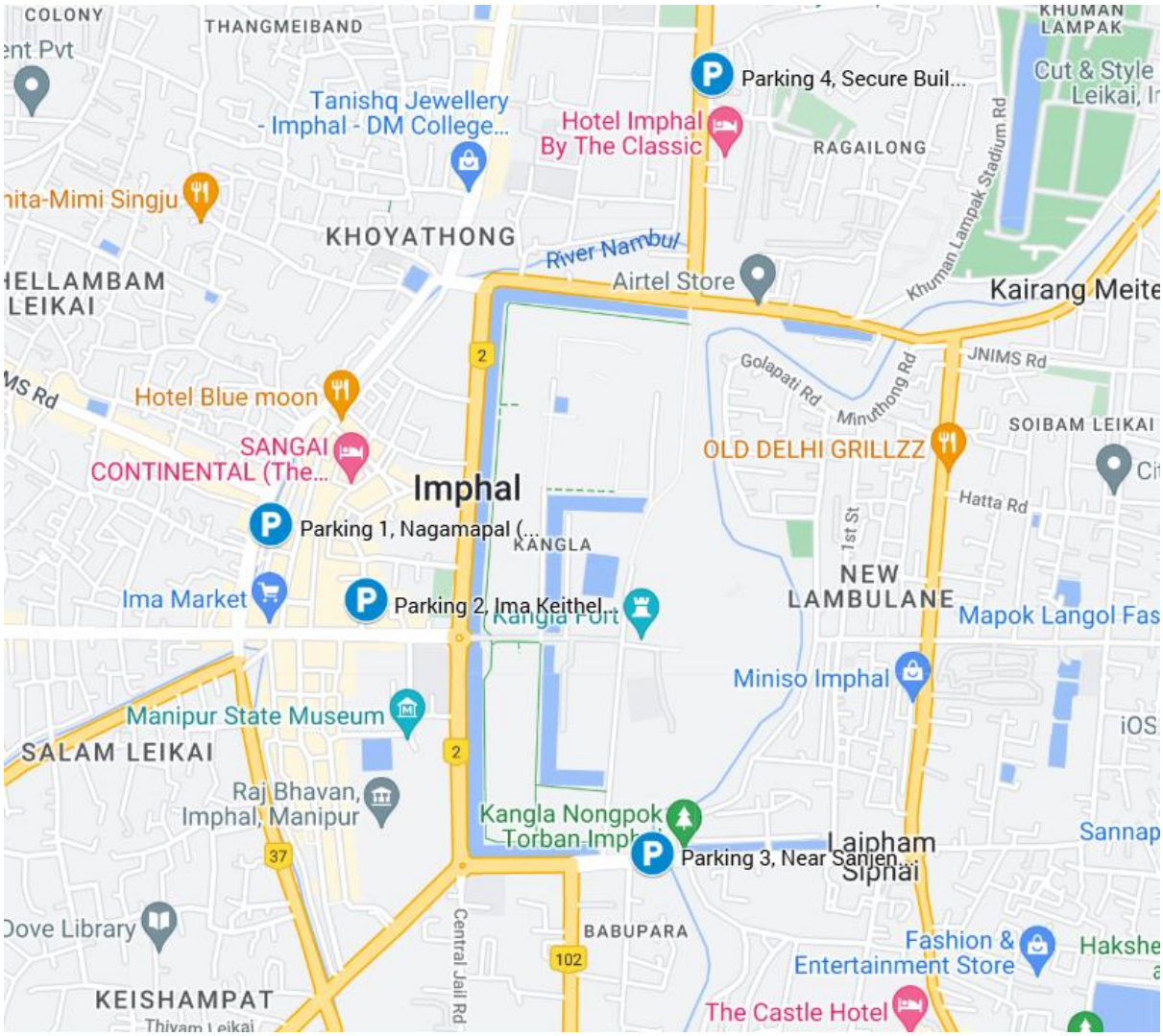


Figure 11-9 Location of proposed MLCP areas

The estimated space requirement for each parking location is based on the total space required for the parking of vehicles and the space requirement of multi-level parking by stack the vehicles one above the other.

Apart from above, a parking space management application is proposed to manage and share the information with the residents on how many parking slots are available and parking price. The proposed parking space management typical application layout has been shown below

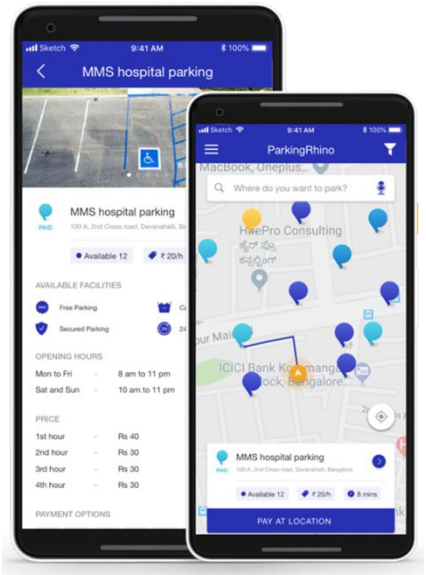


Figure 11-10: Application for parking space management

12 Costing and Implementation Plan

12.1 Project Phasing

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 & which 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 implementation.

12.2 Project Prioritization

As given in the above section, based on the detailed analysis, all the projects identified have been prioritized. The criteria for the prioritization of the project are as shown in below.

Table 12-1 Criteria for Selection of Priority Measures

Criteria		Description
Project Importance		
Mobility	Promotion of Public Transport	Projects that Increase the usage of public transport should be given high priority. Not only public transport projects, but also some road infrastructure projects can promote
	Impact on Reducing Traffic Congestion	This impact should be considered from the viewpoint of the whole road network. Therefore, a locally limited impact, such as congestion
		Providing NMT tracks and pedestrian facilities
Accessibility	Consistency with Strategic Framework for Transport Network:	Assessment of the level of consistency with the strategic framework
Safety	Enhancement of Traffic Safety	Projects that enhance traffic safety should be given high priority. Traffic safety includes not only road traffic safety, but also urban railway safety.
Energy	Promotion of CNG Vehicles	Projects that saves the fuel energy resources should be given the high priority
	Promotion of E-Rickshaws	
	Promotion of NMT vehicles	
Environment	Promotion of Public Transport	Projects that give better environmental conditions in the city by enhancing the share of public transport and NMT trips should gave high priority
	Pedestrian and NMT tracks	
Co2 Mitigation	Promotion of Public transport & NMT	Projects that give better healthy living condition for the users should gave high priority
	Road cost Pricing	
	Reducing the impact of Traffic congestion	

Criteria		Description
Project Importance		
Cost	Infrastructure cost	Projects that give better infrastructure facilities to the users. If the infrastructure cost is less, then high priority

The list of projects has been be prioritized below –

The above phasing is an indicative phasing and can be changed based on travel pattern and demand characteristics. Phasing of the project is split into 4 phases viz., Phase I, II, III and IV based on the time span of the implementation of the projects. The time span proposed is as presented below.

Phase	Period	Description
Phase I	2024 - 2029	Immediate & Short term
Phase II	2029 - 2034	Medium Term Plan
Phase III	2034 - 2039	Long Term Plan
Phase IV	2039 - 2044	

12.3 Costing

The Mobility Plan components discussed in the previous sections were considered in the estimation of block cost (FY2024) estimate for implementing the elements in the future. The approximate capital cost, excluding land acquisition, for implementing the mobility plan is about **Rs. 1799.2 crores**. The breakup of the project cost along with the priority of the respective projects within the phase in the respective phases is provided Table 12-2.

Table 12-2 Project Cost Based on Phasing (in Crores)

S.no	Poposal	length (in KM)	Units	Unit rate (in Cr.)	Phase I	Phase II	Phase III & IV	Total (in Cr.)
1	New Road	47.8	in Km	10.0		478.0		478.0
2	Road Widening	43.4	in Km	5.0	54.3	54.3	108.5	217.0
3	Dedicated Cycle track	10	in Km	0.7	7.0			7.0
4	PBS	10	in No's	0.0	0.1			0.1
5	Footpath	281	in Km	0.6	157.4			157.4
6	Pelican Signal	10	in No's	0.1		1.3		1.3
7	Grade seperated for safe pedestrain crossing	10	in No's	3.9		38.6		38.6
8	Pedestrianized zones	9	in Km	6.3		56.3		56.3
9	Augmentation of Buses	300	in No's	0.8	60.0	60.0	120.0	240.0
10	Buses quee shelters (Bus Stops)	100	in No's	0.2	3.8	3.8	7.5	15.0
11	Multi Modal Transit Center (MMTC)	1	in No's	20.6			20.6	20.6
12	Ropeway	7.4	in Km	60.0			444.0	444.0
13	Off street Parking	2	in No's	7.0			14.0	14.0
14	Multi Level Car Parking (MLCP)	2	in No's	25.0			50.0	50.0
15	Intelligent Transport Systems (ITS)				5.0	5.0	10.0	20.0
16	Junction Improvement	20	in No's	2.0	10.0	10.0	20.0	40.0
Total Project Cost (in Cr.)					**297.5**	**707.2**	**794.6**	**1799.2**

The above-mentioned cost is excluding land acquisition costs.

12.4 Funding Options for Urban Transport

Resource mobilization is a key to successfully implement various plans and proposals of CMP. Given the severe pressure on government resources, the budgetary support for transport projects is usually inadequate relative to the scale of an investment required. The mechanisms for resource mobilization for implementation, operation and maintenance of transport services and infrastructure have been discussed.

12.4.1.1 Innovative Sources of Resource Mobilization

Innovative methods, due to their ease of implementation and high usage, are helpful in funding the imposing needs of urban infrastructure in general and transport in particular. Some of the effective methods are described below

Formation of Dedicated Urban Transport Fund (DUTF)

Huge capital investments are required in addressing issues in the urban transport sector and building of requisite infrastructure. Be it be for constructing capital intensive mass transit systems or segregated rights of-way for cycles and pedestrians, a substantial financial burden would have to be borne by the government. Alternative methods of financing should be explored, due to limited resources available with the Municipalities.

The main rationale behind a fund dedicated for urban transport is to ensure transparency and accountability for money collected or allocated for urban transport. A stable flow of funds allows consistent planning and efficient execution of urban transport development, maintenance, and operations. So, city specific UTF is required for Imphal, which shall make funds available for development of urban transport in the city. The following points illustrate the necessity of setting up a dedicated financing mechanism in the form of UTF at the city level–

- Requirement of a dedicated fund where revenues intended for urban transport are deposited
- Raising funds from the market and institutions
- Requirement of a revolving fund
- Requirement of a fund to provide targeted subsidies for public transport
- Providing financial strength to transport authority
- Fund mobilization in urban mobility area for financing urban transport needs

For collection of funds from the specified sources, following requisite processes shall be followed for ensuring that all funds are collected, and the funds collected correspond to the stipulated amounts. User charges/taxes suggested to be collected at the State level shall be collected by the respective government departments and the proceeds shall be paid into the State consolidated fund and a portion shall then be transferred to UTF. Allocation of funds through the Central government schemes may directly go to UTF or be channelized through urban local bodies or the State Government. For example, under the AMRUT scheme of the GoI, funds are proposed to be allocated from the states to ULBs. Borrowings made by Fund Management Division (FMD) can directly be deposited into the UTF account. The receipts from the suggested sources of funds for UTF shall be regularly transferred to the UTF account on a monthly basis or more frequently.

Figure 12-1 describes broadly the sources for UTF, segregated as Central-level, State-level, local-level and other allocations.

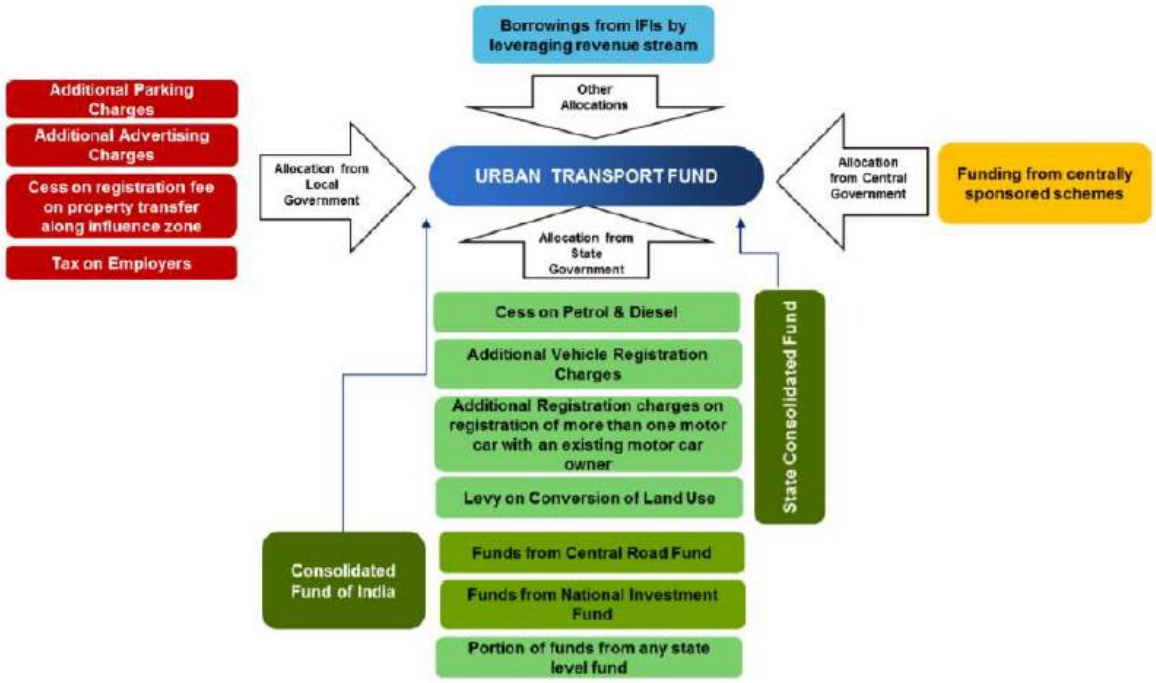


Figure 12-1 Collection of funds from Central, State and Local Governments

Source: SUTP Toolkit

With reference to the sources of funds, the fund flow mechanism shown in Figure 12-2 below can be adopted for collection and disbursement of funds.

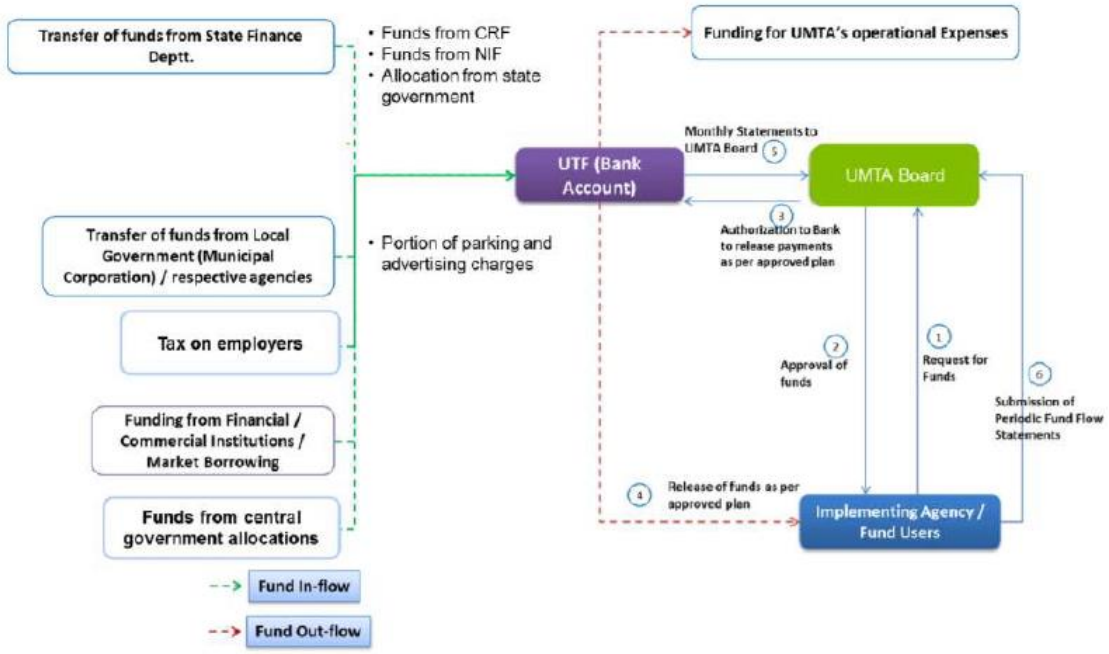


Figure 12-2 Fund flow mechanism to and from UTF

Source: SUTP Toolkit

Table 12-3 Urban Transport Fund practice in Pimpri Chinchwad & Jaipur

State / City:	Pimpri Chinchwad	Jaipur
Fund Name	• Urban Transport Fund (UTF)	• Dedicated Jaipur Metro Rail Fund (DJMF)
State Nodal Agency	• Managed by a SPV wholly owned Pimpri – Chinchwad Municipal Corporation (PCMC)	
Start Date/Year	• FY 2009-10	• 21st July 2010
Rationale Behind	• Fund has been created to capture the benefits of the BRTS projects for long term sustainability and as a means of self-financing for the future. • Identified 100 m on either side of the BRTS corridors as BRTS influence zone which will be densified as per Ministry of Urban Development's policy of corridor densification. • Approved grant of higher FSI on all BRTS corridors.	
Objectives of the fund		• To service the debt obligations • To fund the viability gap funding • To meet the gap resulting in operating losses • To provide equity/debt for Jaipur Metro Rail
Sources of Funding	Financed through resources generated from capturing value from beneficiaries in project influence zone. (A zone of 100m on either side of the corridor designated as BRT influence zone): • Loading of Transferable Development Rights (TDR) • Building permission charges in the zone (Development Charges) – Ceiling FSI raised to 1.80 from existing 1.0, 0.80 loading is through TDR with payment of a premium • Incremental property Taxes • Advertisements	• 25% of the total revenue accrued to RTIDF from Green Tax/ Surcharge on taxes on registration of vehicles will accrue to proposed Dedicated Jaipur Metro Fund. • 25% of the total revenue accrued to RTIDF from surcharge/ stamp duty on registration/ transfer of land, buildings etc. will accrue to proposed Dedicated Jaipur Metro Fund. • Premium FAR on properties along the Metro Corridors • Proceeds from sale of land/property development on land as may be allotted by the State Govt. (50 Hectares of land approved for the purpose) • Revenues from advertisements, parking and other related sources • Share from auction proceeds of Jaipur Development Authority.

Source: SPA in-house research study (2019)

Transferable Development Rights

Transfer of Development Rights (TDR) means making available certain amount of additional built up area in lieu of the area relinquished or surrendered by the owner of the land, so that he can use extra built up area either himself or transfer it to another in need of the extra built up area for an agreed sum of money.

Public investments, transfer of development right increase adjacent land values, generating an unearned profit for private landowners. The unearned value (increases in land value which otherwise profit private landowners cost-free) may be "captured" directly by converting them into public revenue. Thus, value capture internalizes the positive externalities of public investments, allowing public agencies to tax the direct beneficiaries of their investments. These are the major alternative methods of financing, which should be explored.

Cess on Turnover

Turnover, particularly in cities based on industry, trade and commerce activities, generates substantial amount of revenue. Such cess has already been levied on Bangalore MRTS Project.

Betterment Levy through Value Capture Mechanism

The method aims at recovering the project cost from beneficiaries of the Project. It is fiscal instrument to generate funds be recouping the land value increment. The method has been experimented in the case of Bangalore for project in the form of metro tax. Few Municipal Corporations are authorized to levy such a tax under relevant acts. In Mumbai, resource mobilization 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 works well for a city where predominant economic base is trade and commerce. If applied well, the method has high potential to be one of the large revenue earnings.

Tax on Employment

This method is successfully adopted in cities of developed countries like Paris, an additional revenue is generated by adding levy on the employer.

Surcharge Levy on Octroi Rates

Levying a surcharge on Octroi can be introduced. 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.

Other Levies

Levies on use of Private Transport:

- Surcharge on Motor Vehicle Tax
- Surcharge on Fuel (Fuel Levy)
- Surcharge on driving license fee
- Surcharge on sales tax on tyres, tubes, motor parts
- Vehicle ownership charge on first time registration

Levies on Direct use of Transport Facilities

- Terminal Taxes for Passengers

- Cess on Permit fees for buses
- Goods Vehicle tax
- Surcharge on freight carried
- Surcharge on fee for parking
- Surcharge on passenger fares

Others

- Surcharge on Property tax
- Surcharge on Conversion charge for allowing commercial use of land
- Cess on Liquor
- Levy on wages bill of industrial and commercial establishments.

Municipal Bonds

This is emerging as an important tool for mobilizing private resources for funding urban infrastructure projects. In USA, 70% of the infrastructure finance is through municipal bonds. In India, Ahmedabad Municipal Corporation became the first in Asia to float Municipal Bonds to upgrade its city's infrastructure. It was followed by Bangalore City Corporation which collected INR 125 crore through the bond issue. In the past, Indore Municipal Corporation has contemplated to float bonds worth INR 250 crore for subscription by the public. With the issuance of guidelines for floating Municipal Bonds by the Ministry of Urban Development, Government of India.

Real Estate Development

Property developers are invited to develop the land along the transport corridors and share the profit with transport organization arising out of such sale of property. This is one of the most widely used practice for raising funds particularly for projects like metro construction, flyovers etc. Hong Kong Mass Transit System was financed to the tune of 15% of the metro construction cost adopting this approach. This model has been implemented in Navi Mumbai by CIDCO, where the cost of funding the railway line has been jointly financed by CIDCO and IL & FS. CIDCO has exploited the air space above the stations for building commercial complexes and recovered its investment through the sale of property in these commercial complexes. Similarly, Maharashtra State Road Development Corporation (MSRDC) is planning to use the space under the Andheri and Satna Cruz flyovers for commercial exploitation.

Funds may be raised through sale of unused government land and other property.

In the study area real estate development at terminals shall be considered. In addition, government could create land bank near potential transit stations to do value capture along western direction.

Advertising Revenue

Billboards at Terminals and other places can help in generating this revenue. At bus shelters and at strategic locations in the city, advertisement could be a good source of revenue generation. The advertisement master plan for city to explore this potential comprehensively

is to be prepared by the Town planning department of Manipur for proper execution of the project and revenue enhancement.

Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

A centrally sponsored scheme providing basic services (e.g. water supply, sewerage, urban transport) to households and build amenities in cities which will improve the quality of life for all, especially the poor and the disadvantaged is a national priority. The mission focuses mainly on the following Thrust areas:

- Water supply,
- Sewerage facilities and seepage management,
- Storm water drains to reduce flooding,
- Pedestrian, non-motorized and public transport facilities, parking spaces, and
- Enhancing amenity value of cities by creating and upgrading green spaces, parks and recreation centres, especially for children.

The project fund will be divided among States/UTs at the beginning of each year. An equitable formula will be used to distribute the annual budgetary allocation in which equal (50:50) weightage is given to the urban population of each State/UT (Census 2011) and the number of statutory towns in the State/UT. The amount of project fund allocated will be informed to the States/UTs at the appropriate time. The Central Assistance (CA) for the projects will be in three instalments of 20:40:40 of the approved cost.

Funding Component

Urban transport being a trust area, funding will be providing to various urban transport components like

- Sidewalk
- Foot over bridges
- Non-motorized transport
- Buses
- BRTS
- Mutli-level parking
- Waterways and ferry vessels

Viability Gap Funding

Viability Gap Funding (VGF) established under the Department of Economic Affairs, Ministry of Finance, to provide support to PPP Infrastructure project 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 level guidelines, issued in August 2004. The Funding can be in the form of capital grants, subordinated loans, O & M support grants and interest subsidies. It will be provided in instalments, preferably in the form of annuities. Ministry of Finance guidelines requires 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:

- Roads and bridges, railways, seaports, airports, inland waterways
- Power
- Urban Transport, water supply, sewerage, solid waste management and other physical infrastructure in urban areas.
- International Convention Centres and other tourism infrastructure projects.

Private Sector Participation

Participation of Private sector is essential to assist the local bodies in development and provision of infrastructure to contribute to growth in economy. Some of the widely used forms of such participation in urban infrastructure financing are listed below:

- Service contracts for short duration to perform specific tasks
- Management contracts for operation and maintenance of government owned business
- Leasing where a lease agreement is signed whereby public facility's assets are transferred to a private firm for a fixed time period for which it pays for the right to use the facility in providing service.
- Concession where in the contractor besides the operations and maintenance also assumes additional responsibility of investments
- BOOT/ BOT/ DBFO/ DBFOT

Some examples of private sector participation in transport projects in India are given in the Table 12-4.

Table 12-4 PPP Projects in India

Sectors	Projects	City	Authority	Form of Partnership	Concession Period
Public Transport	Cluster Bus Scheme	New Delhi	Transport Department, GNCTD	Gross Cost Contract	10
	BRTs in Jaipur	Jaipur	JCTSL	Cost plus contract (BOOM)	10
	Bus Operations is Indore	Indore	AICTSL	Net Cost Contract	10
	Bus Operations is Bhopal	Bhopal	BCLL	Net Cost Contract	10
	Bus Operations is Jabalpur	Jabalpur	JCTSL	Net Cost Contract	10
	Hyderabad Metro	Hyderabad	Govt. of AP	BOT	35
	Mumbai Monorail	Mumbai	MMRDA	BOOT	35
Inter State Bus Terminal	Bus terminal cum Commercial Complex	Mohali	GMADA & PIDB	DBOT	Bus terminal - 20 Yrs. Commercial Complex - 90 Years
	Amritsar Inter-city Bus Terminal	Amritsar	DoT, Punjab	BOT	11 years 5 months

Sectors	Projects	City	Authority	Form of Partnership	Concession Period
	ISBT - Dehradun	Dehradun	Mussoorrie Dehradun Development Authority	DBFOT	20
	Hyderabad International Airport	Hyderabad	Govt. of AP	BOT	30 + 30
Parking	MLCP - Kamla Nagar	New Delhi	NDMC	BOT	30
	MLCP - BKS Marg	New Delhi	NDMC	BOT	30
	MLCP - Sarojini Nagar	New Delhi	NDMC	BOT	30
Bus-Q-Shelter	197 BQS for NDMC area	New Delhi	NDMC	BOT	15
	Bridge over river Amravati	Karur	PWD	BOT	20
Outer Ring Roads / New links	Chennai ORR - Phase 1	Chennai	TNRDC	DBFOT	20
	Chennai ORR - Phase 2	Chennai	TNRDC	BOT Annuity	20
	DND Flyover	Delhi - Noida	SPV	BOOT	30
	Bypass	Coimbatore	NHAI	BOT	20
	Bypass	Udaipur	NHAI	BOT	20

Source: SPA in-house research studies

Private sector participation should be encouraged in execution of various projects, such as those listed below:

- Bus Service Operations
- Provision of Bus Queue Shelters
- Provision of Street Furniture against advertisement
- Cycle Sharing schemes
- Renovation and Maintenance of existing terminals with real estate development
- Construction and Maintenance of Parking Facilities with real estate development

PPP possibilities for Imphal

PPP in Parking

A public-private partnership model on BOOT basis may be adopted to operate parking in Imphal. Over a long concession period, both the BOOT operator and the Town Planning Department are bound to earn revenues and even profits.

- PPP models of partnership in infrastructure development form the most sustainable approach for a city government that most often has a resource crunch both, in terms of finance and in terms of engineering staff.

- Public service provided by a local government can also become an alternative source of additional revenue.
- Underground development can be an alternative where ground level space is scarce, especially in mega cities.
- Financial sustainability of the partnership project has been ensured in terms of Parking fees, advertisement rights and premium on shops – gives returns on investment for the concessionaire because of the very nature of the BOOT contract.

PPP in Development on Bus Terminals and Intermodal Facilities

Proposed bus terminal and intermodal facilities may be developed on DBFOT basis with land to be provided by Town Planning Department or other concerned agency and concessionaire shall develop the structure and operates it. The state agency can generate revenue by the annual payments done by concessionaire for lease of land and private party can generate revenue from the commercial, advertisement rights and parking developments. In this scenario, the risk is mostly with the private player.

12.5 Institutional Framework

Urban Transport Responsibilities are those functions relating to the planning and management of circulation of vehicles, passengers and pedestrians on the road system and where relevant other transport networks such as rail. They generally include –

- Planning and development of transport infrastructure
- Management of roads and road use, including the licensing of vehicles and drivers
- Public transport organization, development, and regulation
- Financing and investment
- An interface with land use and urban planning

Government's transport responsibilities may extend to operations where there is state – owned rail, bus, toll roads, bridges, and tunnel.

Generally, it has been observed that Indian cities are not equipped with appropriate institutional capacity and needed financial resources. The following institutional weaknesses prevent authorities from translating knowledge into action –

- Fragmented functional responsibilities for urban transport among central, state, and local authorities, without one in charge of overall coordination and outcomes
- Lack of technical capacity for urban transport management, especially at the local level
- Lack of financial resources at state and local level for funding urban transport infrastructure investments and maintenance, combined with insufficient attention to cost recovery and user charges.
- Absence of enabling policy, regulatory and financial frameworks for private sector participation in a range of urban transport operations and infrastructure financing.

There exists a functional fragmentation of responsibilities among central, state, and local authorities for policy, planning, investment, operation and maintenance and management of urban transport related infrastructure and services which are generally observed in large cities. It is observed that central government not only is involved in policy aspect but also directly involved in provision of suburban rail service through Indian Railways in few cities such as Mumbai, Kolkata, Delhi, and Chennai. In most countries however, urban transport

responsibilities are vested in city (municipal or metropolitan) governments. The issue is, how urban transport responsibilities may be divided both vertically (for example, between high level strategic planning and policy make functions and lower-level implementation and regulatory functions) and horizontally (between different functional areas and professional disciplines). The existing institutional set up in Imphal has been studied to appreciate prevalent governance framework. Certain interventions have been suggested in this chapter for smooth functioning of these bodies in the future.

12.6 Existing Institutional Setup at Centre

Under Constitution of India, responsibility for urban development, and therefore, urban transport, rests with the respective state/union territory government and as per the revised policy of MoUD, the Urban Transport is to be included under the Urban Development Department of the Government. The Central government also plays an important role in many respects. The main legislation that regulates road transport, namely the Motor Vehicles Act, is administered by the Central Government, whose other responsibilities include production and quality specification of petroleum fuels, railways, etc. The Central Government also supports investments in mass transit infrastructure.

Ministry of Road Transport and highway an apex organization under Central Government, in consultation with Central Ministries/Government and State Government/UT Administration is entrusted with the task of formulating and administrating policies for Road Transport, National Highways and transport research with a view to increase the mobility and efficiency of the road transport system. The National highway sector is primarily responsible for planning, development, and maintenance of National highways in the country. It also extends technical and financial support to State Governments for development of state roads and the roads of inner-state connectivity and economic importance.

12.7 Existing Institutional Setup in Imphal

12.7.1. Transport Department

The Transport Department in Imphal, likely operating under the Manipur State Transport Authority (STA), oversees various transport-related functions, including issuing driving licenses, registering vehicles, granting permits for commercial vehicles, enforcing traffic rules, and promoting road safety.

12.7.2. Planning and Development Authority (PDA)

The Planning & Development Authority (PDA), Manipur was established in the year 1975 under the provision of the Manipur Town & Country Planning (MTCP) Act, 1975. The primary function of PDA as defined under Section 18 (1) of the MTCP Act, 1975 is reproduced hereunder:

“The functions & power of the Authority shall be to promote and secure development of the area according to the Master Plan or the development scheme and to carry out building, engineering, mining and other operations, to execute works in connection with supply of water and electricity, disposal of sewage, looking after drainage system and other services and generally to do anything necessary or expedient for purposes of such development and for purposes of incidental thereto”

In addition to the above, PDA has also the power to execute public housing projects and to dispose off of the houses so constructed on terms and conditions approved by the Government.

Legal Status: The Planning & Development Authority, Manipur known as Authority was constituted in 1976 under the Manipur Town & Country Planning (MTCP)Act, 1975. As per sub-section 2 of section 13 of MTCP Act legal status of PDA is defined as " –The Authority shall be a corporate having perpetual succession and a common shield with power to acquire, hold and dispose of properties, both moveable and immovable, and to enter into any agreement, and shall, its name, sue and be sued.

There is an Authority constituted by the State Government under Section 13 (1) of the MTCP Act, 1975 whose members are all senior Government officials.

PDA consists of different Divisions as shown below:
i. 3 (three) Nos. of Engineering Division headed by Superintending Engineer
ii. Accounts Division headed by Assistant Secretary
iii. Land Section headed by Assistant Secretary
iv. Secretary is the Administrative Head
v. Chairman is the overall head of the Planning & Development Authority, Manipur.

12.7.3. Strengthening of other Organizations Capacity Building

Report of the Working Group on capacity building for urban development management for the formulation of the Twelfth Five Year Plan (2012-17) emphasizes the need for capacity building to strengthen skills and transfer of knowledge. The quote from the report for the capacity building is reiterated below:

'Capacity Building for better cities is the effort to strengthen and improve the abilities of personnel and organizations to be able to perform their tasks in a more effective, efficient and sustainable manner. It needs to be appreciated that capacity building is a long term and ongoing effort which needs to be institutionalized in the planning and implementation process starting from the ULB to state to the central level programs. Capacity Building needs to be a continuous and ongoing initiative whose aim is to improve and facilitate the skill sets and processes involving human and other perceivable inputs. There is a need to calibrate and benchmark continuously against measurable indicators over a period in order to make course corrections to achieve the desired results'

The Working Group on capacity building for the Twelfth Plan believes that while formulating a strategy, it is important to factor in the following considerations:

- Capacity Building should precede project / programme implementation so that there is marked improvement in implementation of the projects on the ground.
- Capacity Building should result in measurable outcomes (results-based approach)
- Capacity Building should be an integral part of urban infrastructure development.
- Creation of enabling environment for capacity building including stakeholder consultations and communication and preparatory action.

- Capacity building should be demand responsive and based on the formal articulation of comprehensive state strategy deriving from state level urban sector policy and investments.
- Financing of capacity building activities should be predictable.
- Capacity building activities should focus both on human resource development (individual capacities, norms) on the one hand and organization development (results-based performance) on the other.
- Capacity building activities should promote the use of Information Communication
- Technologies and robust information systems.
- Any capacity building effort should prioritize Innovation, Incubation and Implementation. Innovation is required in selecting the appropriate mode of training delivery. Incubation would imply encouragement of ideas, systems and processes towards change management, knowledge management through the creation of networks of sector managers for sharing of emerging trends, ideas and best practices.
- Implementation of capacity building programs needs to be customer focused and geared towards result oriented process and project Implementation. There is a need for an incremental approach to building capacities of cities in the next 5 years to prepare the ground for bridging the infrastructure and governance gap over the next 20 years.

Based on above recommendations, some of the suggestions are made for study area.

12.7.4. Education and Training

It is necessary to select professionals with necessary qualification from various departments in the study area and depute them for higher levels of education to reputed institutions within the country. The education program should cover all aspects of planning, development, operation, and management of urban and regional transport system. Upgrading the skills of existing personnel and new entrees on a regular basis would be needed through various short-term training programs.

The following programmes in Table are suggested –

Table 12-3 Suggested Capacity Building Programmes

Department	Training and Development	
	Senior Level	Junior Level
PDA, Imphal Police, Municipal Corporations etc.	• Conferences • Case Study Tours (within India and outside of India) • Soft skill development • New technologies • New methods of financing	• Training in new software • Innovative designs • Modern operations • Documentation and information retrieval as per ISO standards

Department	Training and Development	
	Senior Level	Junior Level
		• Technological advancement such as ITS, Modelling, simulation

12.8. Proposed Regulatory Measures

12.8.1. Changes for Transport Demand Management (TDM) measures

Due to constraints on the augmentation of the urban transport facilities for improving the traffic flow, there is a need to introduce a Transport Demand Management (TDM) program as a part of overall planning. TDM is a wide range of policies, programs, services and products that influence why, when, where and how people travel to make more sustainable. TDM has four main components that people an integrated approach to transport demand management.

- Education, promotion, and outreach
- Travel incentives and disincentives
- Sustainable travel options
- Supportive land use practices

Travel incentives and disincentives: Measures often individuals a tangible benefit or dis-benefit related to the use of one or more travel modes such as congestion pricing, parking fee and transit tariff.

Sustainable travel options complement TDM by strengthening the supply of sustainable travel options (e.g., walking, cycling and public transit). They can make travel by those modes faster and more comfortable, secure, and enjoyable.

Supportive land use practices need to be promoted which minimizes need to travel.

12.8.2. Traffic Safety Regulations

The CMP should consider both the safety of passengers, vehicles, and infrastructure facilities. The Traffic police/ Traffic Engineering cell should identify the reasons for the accidents and mitigation measures through a special questionnaire design so that preventive measures could be taken.

- Driving license for the beginner should be through a theory and practical test through an independent agency
- Ban/Cancellation of Driving license for a certain time

- Certificate of fitness test for old vehicles
- Provision of Traffic Signs as per IRC
- Seat belts for cars to be made mandatory to avoid causalities
- Helmet for two-wheelers mandatory and enforced
- Traffic calming measures on all important roads

12.8.3. Road Safety Policy

Based on the globally accepted multi-pronged strategy and the safe-system approach for improving road safety, the National Road Safety Policy outlines the initiatives to be taken by the Government at all levels.