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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 (2): 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 Thoubal. 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 Thoubal.

- 2. And, Whereas, the study conducted traffic and transportation study in detail for Thoubal 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 Thoubal.
- 6. Now, Therefore, the State Government hereby publishes the City Comprehensive Mobility Plan (CCMP) for Thoubal 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



City Comprehensive Mobility Plan for Thoubal

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 Thoubal 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 Thoubal, 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. Intermediate Public Transport (IPT) Survey
- 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 Thoubal Municipal area.

2 Profile of Study Area

2.1 Introduction to Thoubal 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. Thoubal stands as a prominent town and district headquarters in the Thoubal district of Manipur, India. As a municipal council, it is organized into 18 municipal wards, reflecting a structured administrative setup to cater to the needs of its residents.

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.

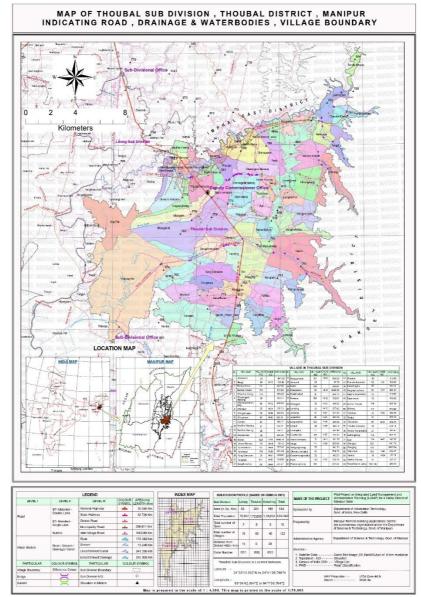


Figure 2-1: Location and Administrative Boundary of Thoubal

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

District	Total Population	Rural Population	Urban Population	Urbanization (%)
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

District	Total Population	Rural Population	Urban Population	Urbanization (%)
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 in 2001 Census. Analyzing 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 urbanization (Figure 2-2)

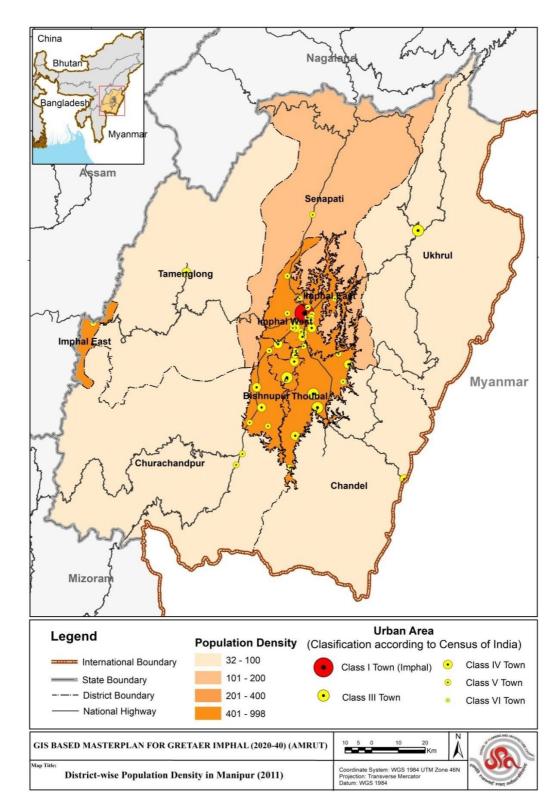


Figure 2-2: District wise Population Density of Manipur (2011)

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 analyzing the distribution, it is observed that there is not much deviation among hill districts and valley districts regarding workforce participation rate (Figure 2-3). Thoubal district has a moderate workforce participation rate because of the prevailing urban economy in most part the district.

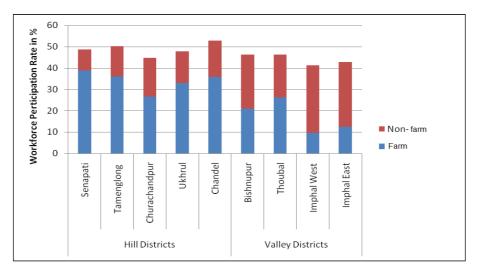


Figure 2-3: District-wise Workforce Participation in Manipur, 2011

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 towns and cities area more. Thoubal, the city of Manipur and located in the northern portion of the valley area, contributes highly to increase of the farm workforce. Hence this district have above average share of the farm workforce.

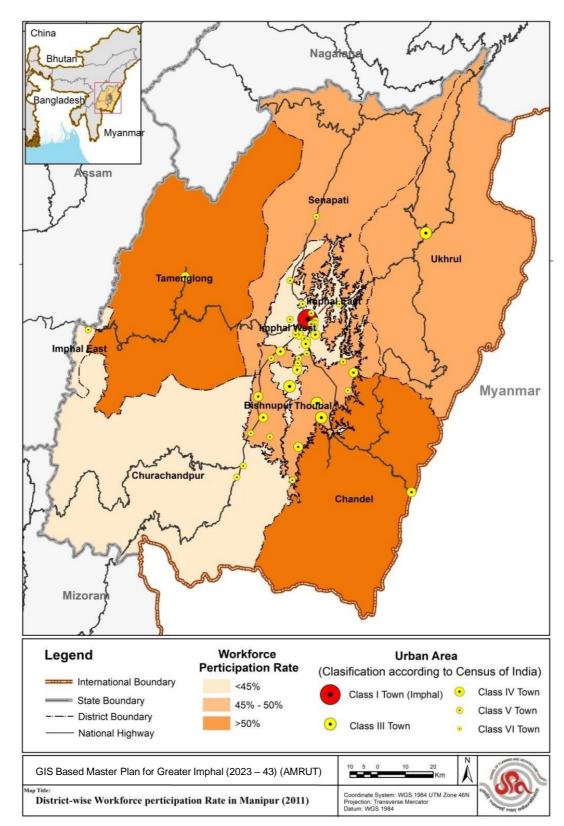


Figure 2-4: District-wise Workforce Participation Rate in Manipur(2011)

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

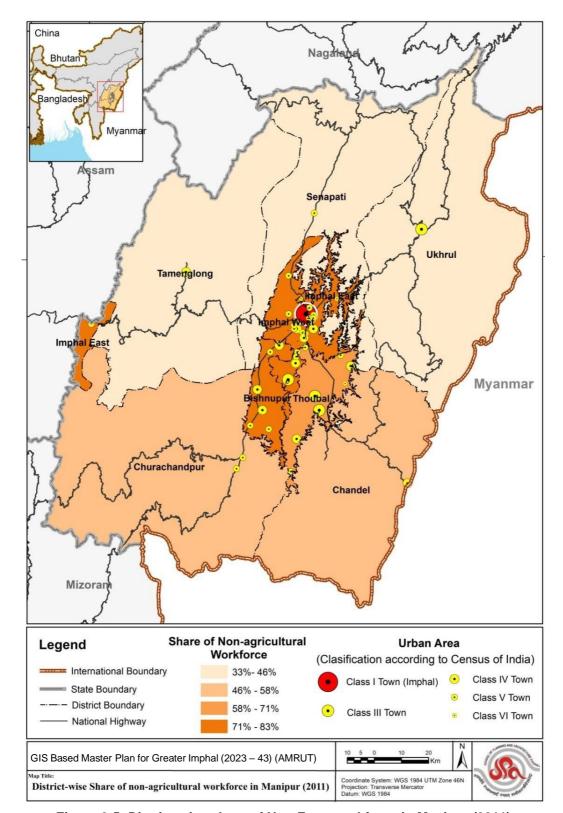


Figure 2-5: District-wise share of Non-Farm workforce in Manipur (2011)

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, there is no sharp difference between hill and valley districts in terms of literacy. Education plays a significant role in Thoubal's demographic profile. The city exhibits a commendable literacy rate of 82.83%, surpassing the state average of 76.94%. Breaking down the literacy rates, male literacy stands at 91.76%, showcasing a higher literacy rate among males, while female literacy is reported at 73.97%. These literacy figures reflect the educational landscape and potential areas for targeted interventions to improve female literacy rates (Figure 2-6).

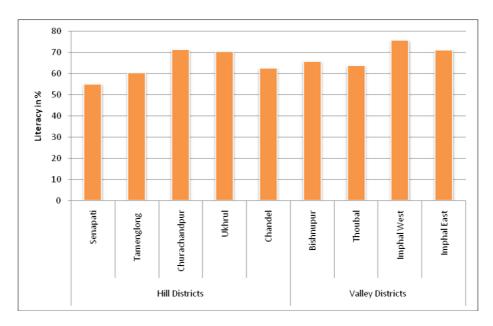


Figure 2-6: District wise Literacy in Manipur (2011)

Source: Primary Census Abstract, Census of India, 2011

2.3.3. People Groups

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 in the 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 the valley 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 population of 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	

District	SC (%)	ST (%)	Others (%)
Tamenglong	0.02	95.72	4.26
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).

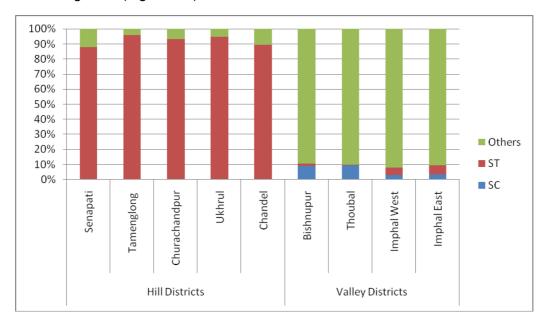


Figure 2-7: District-wise Caste Composition in Manipur

Source: Primary Census Abstract, Census of India, 2011

2.4. Transport System

2.4.1. Connectivity

Thoubal relies primarily on Tata Magic, Auto, and Winger as the main means of transport to and from the town. These vehicles play a significant role in the local transportation ecosystem, providing essential connectivity for residents. However, it is noted that other public transport systems, such as buses, trains, and air transport, have faced challenges and decline due to the extensive use of Tata Magic and similar modes of transport.

Road: The strategic location of Thoubal is evident in its road connectivity. The Asian Highway 1 (AH-1) passes through the heart of Thoubal town, forming a crucial artery for transportation. This highway connects Thoubal with Imphal to the north and east, extending further to Moreh, the border town of Manipur. Additionally, Thoubal is linked to Yairipok and Mayang-Imphal through inter-district roads. Regular private taxis operate between Imphal and Thoubal, facilitating transportation for residents and visitors. Yairipok, located only 5 km from Thoubal, serves as an important connection point for reaching other places in the Imphal East district. Figure 8-2 shows the major road connectivity of Thoubal.



Figure 2-8: Major Road Connectivity in Thoubal

Air: The nearest airport to Thoubal is the Tulihal Airport, also known as Imphal Airport or Bir Tikendrajit International Airport. Tourists traveling to Imphal generally need to board stopover flights to Guwahati from major cities like Kolkata, Mumbai, Delhi, or Bangalore. The Imphal Airport is approximately 30 kilometers away from Thoubal, providing air connectivity for those traveling by air.

Railways: Manipur lacks a dedicated railhead, and the nearest railway station to Thoubal is situated in Dimapur, which is around 230 kilometers away. While rail transport is not directly accessible in Thoubal, the availability of the Dimapur railway station provides an alternative means for those who prefer or require rail travel. Understanding the regional setting of Thoubal involves recognizing the dominance of specific modes of transport, the significance of road networks, and the challenges faced by other transportation systems. The town's connection to major roads, airports, and the nearest railway station collectively influences the overall accessibility and mobility options available to the residents of Thoubal.

2.4.2. Vehicle Registration

In Thoubal, the transport dynamics are largely defined by the dominance of two-wheelers, with motorcycles and scooters comprising a substantial 78% of total vehicle registrations, amounting to 1,361 units. This overwhelming preference underscores the adaptability and efficiency of two-

wheelers in navigating the region's landscape. Motor cars and three-wheelers, often utilized for passenger services, each constitute 8% of the registrations, which translates to 148 and 141 vehicles respectively. Goods carriers account for a smaller segment at 5% with 80 registrations, reflecting the essential role they play in supporting the local economy. The data from Thoubal underscores a transportation ecosystem that leans heavily on two-wheelers, suggesting a potential area of focus for traffic management and road safety initiatives, as well as the need for strategies to bolster public transportation services and commercial logistics support.

Table 2-4: Vehicle Registration - 2019

Mode	Vehicles	%
Motor Car	148	8%
Three-Wheeler (Passenger)	141	8%
Goods Carrier	80	5%
M-Cycle/Scooter	1361	78%

2.5 Tourism

Thoubal, nestled in the picturesque state of Manipur, boasts a rich tapestry of cultural heritage and breathtaking natural landscapes, making it a hidden gem for travelers seeking authentic experiences. With its serene lakes, verdant hills, and vibrant festivals, Thoubal offers a perfect blend of tranquility and adventure. The Loktak Lake, adorned with floating islands and colorful water lilies, is a haven for birdwatchers and nature enthusiasts. Visitors can immerse themselves in the traditional Manipuri way of life by exploring the bustling markets, savoring local delicacies, and witnessing age-old art forms like Thang-Ta martial arts and Manipuri dance performances. For the more adventurous souls, trekking through the lush forests of Khongjom or exploring the ancient temples and ruins scattered across the region promises an unforgettable journey through time. Thoubal's charm lies in its ability to captivate the senses and leave a lasting impression on all who wander through its enchanting landscapes.

3 Review of Past Studies

3.1. Master Plan for Greater Imphal & District Report of Thoubal

To understand the present physical structure of the city, it is important to understand the past planning efforts for the Thoubal area. District Report of Thoubal was published in the year 2008 to identify the issues relating to disparities across socio-religious communities have attracted much attention of the government of India of late. There is a growing realization about the relative backwardness of the religious minorities more particularly the Muslim as a religious community in India.

3.1.1. Road Infrastructure and Connectivity

The district has a fairly developed system of road transport. All towns and important villages in the district are connected either by the National or State highways or district or village roads. The district has the highest road density among all the districts in the state 145.96 km/per sq. km. area. The National Highway No. 102- Indo-Burma Road, passes through the heart of the district and connects Lilong with Pallel via Thoubal.

3.1.2. Institutional Framework

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

Town Planning Department, Govt. of Manipur Planning and Development Authority, Govt. of 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

3.2. Review of State Transport Policy, Manipur

Directorate of Settlement and Land Records, Govt. of Manipur

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 Sugnu/Serou/Chandel/Kakching/Pallel NH/102. etc along **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).

Categories	Imphal	Imphal	Thoubal	Bishnupur	Kangpokpi	Senapati	Ukhrul	Churachandpur	Total
of vehicles	West	East							
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-	7754	1831	956	402	274	425	45	928	12615
rickshaw									
2 -	114977	12791	12801	1461	175	905	353	7391	150854
wheelers									
Trailers	395	2	66					56	519
Others	405	24	251				2	73	755
Total	165120	19205	17356	4087	1937	2478	1048	11003	222234

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

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. Issues and Challenges in Transport Sector

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:

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.

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.

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 city.

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

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.

Data collection

4.1. Introduction

Traffic and Transportation Study (Comprehensive Mobility Plan (CMP)) conducted surveys in detail for Thoubal Municipal Council Area to identify the 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 has been 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, has 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:

Traffic Characteristics Travel Characteristics Road Network Characteristics Parking Characteristics **IPT Characteristics**

The traffic surveys will be 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 has been 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 4-1.

Table 41: Traffic Volume Count survey locations

Outer-Cordon (OC)	Mid-Block (MB)
Indo-Myanmar Road (Near SBI Thoubal)	MI Road
	Wangkhem-Yairipok Road

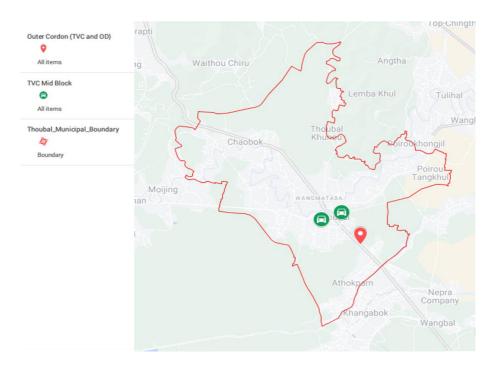


Figure 41 Traffic Volume Count Survey Location in Thoubal Municipal Area

4.2.2. Parking Survey

Parking in Thoubal mainly consists of on-street parking as designated off-street parking locations are absent. 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 4-2 shows the parking locations in study area.



Figure 42: Parking Location in Thoubal Municipal Area

4.2.3. Origin-Destination Survey

Origin-destination surveys 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 and 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 will be 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 carried out in both peak and antipeak directions during peak and off-peak hours. The journey time and running speed observed and impact of the prevailing traffic on journey and running speed during peak and off-peak hours for each section shall be established to indicate the level of congestion. Typical delays and their causes 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 survey is to collect data on travel characteristics of household residents and general characteristics of the household influencing trip making. The study area divided into zones. A sample size required as per standard transport planning procedures or minimum of 2% of household is about 275 household as per the current household size covered. Based on the survey, travel demand characteristics 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 shall be 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 which will be 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 shall be looked after. Meeting with concerned authorities to collect the all relevant information and seek their cooperation will be done.

4.4. Proposed Traffic Surveys

The proposed 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	1	12 Hours
2	Traffic Volume Count (TVC)	2	12 Hours
3	House Hold Survey Samples	Population (Covering Thoubal)	275
5	Parking On Street & Off street	01	12 Hours
6	Speed & Delay Surveys	30Km	Primary Network
7	Road Network Inventory survey	30Km	Primary Network
8	Intermediate Public Transport (IPT) Survey	1	12 Hours

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	9.8	7.5%
2	Sub- Arterial Road	12.7	9.7%
3	Collector	50.9	39.0%
4	Local roads	57.2	43.8%
	Total	130.6	100

It is observed that, arterial road account for 7.5% share, sub-arterial roads 9.7% of road network share while collector streets share 39.0% of the total primary network, respectively. **Figure5-1** show the road network hierarchy.

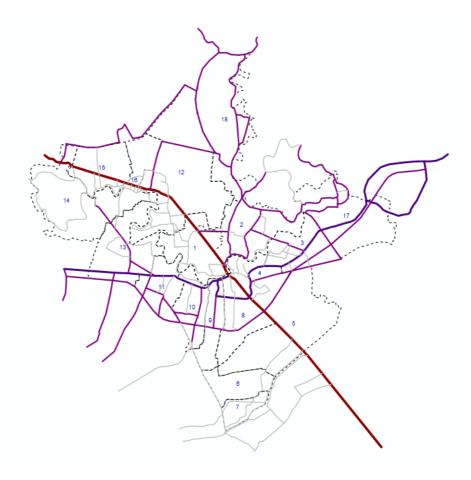


Figure 51 Existing Road Network hierarchy

5.2.2. Speed and Delay

Speed and delay surveys which are an integral part of any transportation related studies were carried out on primary road network. The Table 5-2 shows salient characteristics of the speed and delay observed in the study area during peak hours.

Table 52 Corridor speeds on the primary network

Origin	Destination	Distance (in KM)	Time (Minutes)	Speed (KMPH)
Indo Maynmar Road (Near Khunb Impak)	Indo Maynmar Road (Sinam Leikai)	2.23	2.55	52.45
Indo Maynmar Road (Sinam Leikai)	Bharat Petroleum Petrol Pump , NES THOUBAL	1.38	1.58	52.29
Bharat Petroleum Petrol Pump , NES THOUBAL	Medivet druģ house thoubal	1.64	2.15	45.85
Medivet druģ house thoubal	Thoubal Mela Ground	1.00	2.77	21.69
Thoubal Mela Ground	District Officer(Horticulture & Soil Conservation) Thoubal	1.07	1.55	41.26
District Officer(Horticulture & Soil Conservation) Thoubal	CSC, Khangabok Awang Leikai	2.51	4.08	36.85

Origin	Destination	Distance (in KM)	Time (Minutes)	Speed (KMPH)
CSC, Khangabok Awang Leikai	The Knowledge Hut Tutorial	2.53	3.83	39.58

5.2.3. Footpath Availability

Footpath is available along the major arterial road and main CBD roads around 6.73 km of road network as shown in Table 5-3 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 53 Footpath availability

Footpath	Road length (in Km)	% Share
Present	6.73	5%
Absent	123.87	95%
Total	130.6	100%

5.3. Traffic Characteristics

5.3.1. Traffic Characteristics at Outer Cordon Point

The traffic analysis revealed in all 13,770 vehicles enter in and out of Thoubal. In terms of direction split a total traffic volume of 7527 PCUs are entering Thoubal while 6423 PCUs leave Thoubal at the outer cordon locations every day. The directional distributions of traffic volume at outer cordon locations are show in Figure 5-2.



Figure 52 Traffic Flow Pattern (in PCUs) at Outer Cordon locations (12hours)

The Level of Service (LOS) at outer cordon location was assessed to determine the existing situation of traffic and the available infrastructure. Peak hour LOS is assessed for the location and is presented in Table 54.

Table 54 LOS at Outer Cordon Locations

S. No	Peak Time	Peak Hour Volume (PCU)	LOS
OC	1215 to 1315	1330	А

The Level of Service (LOS) at outer cordon location is shown in Figure 533.

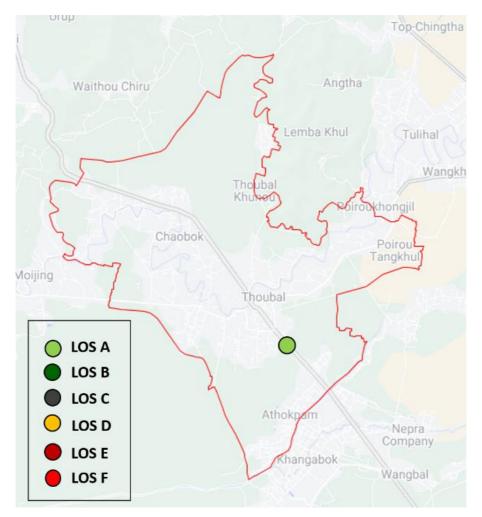


Figure 53 Level of Service at various Outer cordon survey locations

Hourly traffic volume for outer cordon location of Thoubal was assessed to determine the peak hour traffic of the city. It has been observed that 1215 to 1315 hours was the peak hour with 1330 PCUs. Figure 5-4 shows the hourly variation of traffic at the outer cordon surveyed.



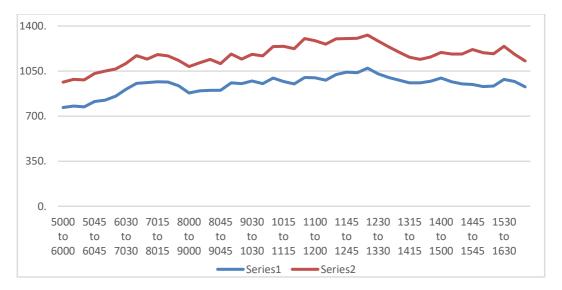


Figure 54 Hourly Traffic Volume at Outer cordon survey location

Vehicular composition at the outer cordon surveyed in Thoubal and it was observed that fourwheeler comprise a major share of 32% followed by two-wheeler (31%) and auto rickshaw (16%). Figure 5-5 shows the vehicular composition at the outer cordon surveyed.

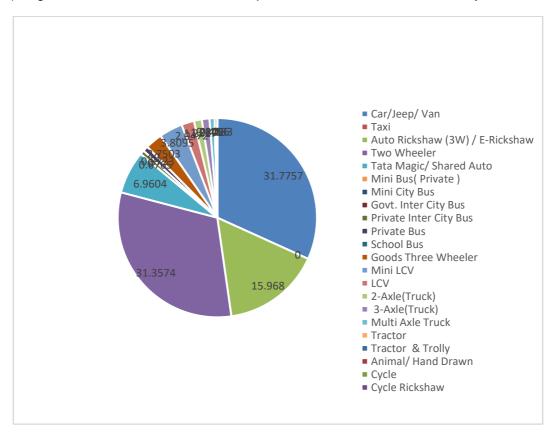


Figure 55 Level of Service at various Outer cordon survey locations

5.3.2. Traffic Characteristics at Mid-Block

On an average day about 10,744 vehicles pass through the mid-block locations, MB-7 accounting for 63.5% followed by MB-6 (36.4%) respectively. The peak hour share at all midblock location varies from 12% to 16%. Figure 56 shows the average daily traffic volume at mid-block locations.

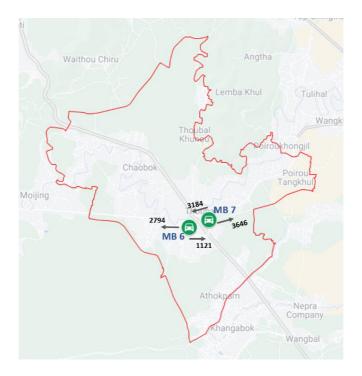


Figure 56 Average Daily Traffic at Mid-Block Location

The Level of Service (LOS) for all the two locations were analyzed to know the existing situation of the traffic flow with respect to the present carrying capacity of the road infrastructure. Figure 57 below shows the LOS at various mid-block locations.

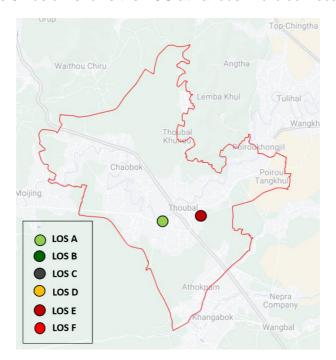


Figure 57 Level of Service at Mid-Block

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 275 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 5-8 below shows the distribution of household size in the study area.

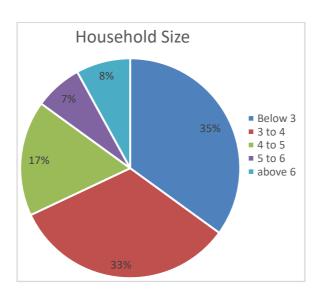


Figure 58: Distribution of Household Size

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 5-5.

Table 55: Distribution of Vehicle Ownership

Vehicle Ownership	% Share

Total	100.00%
Three Vehicle	0.17%
Two Vehicle	22.03%
One Vehicle	56.60%
No Vehicle	21.20%

5.4.2. Travel Characteristics

The per capita trip rate (PCTR) assessed from the household surveys shows that the PCTR including walk trips is 1.05 while it is 0.78 without walk trips in study area as shown in Table 56 below.

Table 56: Per-Capita Trip Rate (PCTR)

Parameter	With Walk	Without Walk
PCTR	1.05	0.78

In terms of modal share, it is observed that nearly 37% trips are made by Auto Rickshaws followed by Two wheeler trip share of 30% and 9% share of four wheeler respectively in the study area (Figure 59).

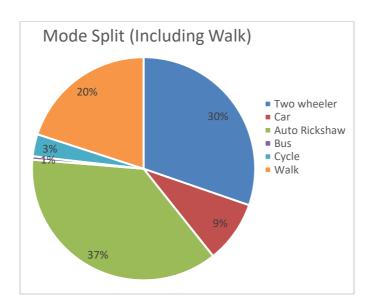


Figure 59 Distribution of trips by Mode of Travel (with Walk)

Amongst vehicular trips (excluding walk) Auto Rickshaw account for 48% share followed by cars (12%), Two wheelers (39%) and buses (1%) share respectively in study area (Figure 510).

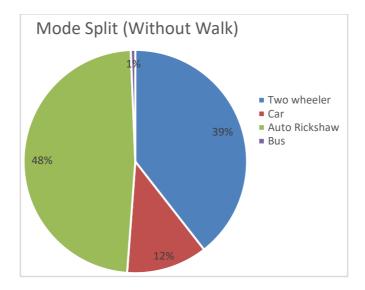


Figure 510 Distribution of trips by Mode of Travel (without Walk)

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 511).

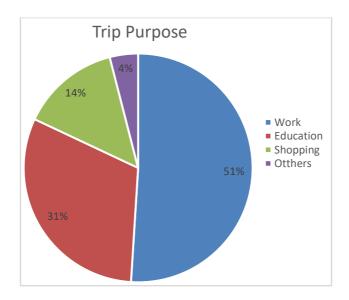


Figure 511 Distribution of trips by Purpose of Travel

In terms of trip length analysis, the average trip length overall at the city level is 3.1 km in the study area while it varies across for different modes as shown in Table 57. The modal trip lengths in study area in case of MNT modes vary between 0.6 km for walk to 1.6 km for Cycle while for personalized modes the average trip length vary from 3.0 km in case of two wheelers to 4.1 km in case of cars, respectively shown in Table 5-7.

Table 57 Mode-wise average trip length (km)

Mode	Average Trip Length (in KM)

Car	4.1
Two-Wheeler	3.0
Auto	2.8
Walk	0.6
Cycle	1.6

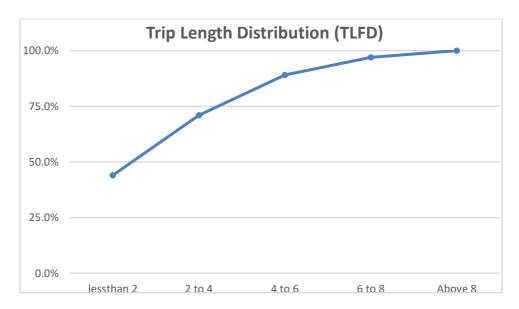


Figure 512 Mode-wise TLFD

5.5. Intermediate Public Transport (IPT) System Characteristics

Intermediate Public Transport in Thoubal is a vital last mile connectivity providing system. It includes Auto Rickshaws, Cycle Rickshaws, Tata Magic and Maruti Van. It helps in people accessing and dispersing the main transport mode and helps them do short trips within their locality. In Thoubal this system plays a major role as the public transport network is not available in all areas. Intermediate Public Transport (IPT) survey was conducted in the Thoubal city at the existing routes of IPT service.

5.5.1. Physical Characteristics

The average cost paid by the IPT users is observed that 78% of IPT users pay Rs. 25-50 followed by upto Rs. 25 (18%) and Rs. 50-75 (4%) as shown in Figure 513

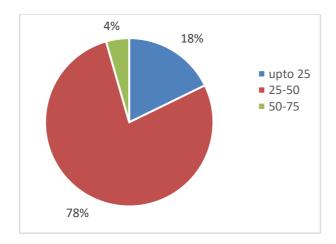


Figure 513 Cost paid by IPT users (in terms of Percentage Shares)

IPT mode is mostly used for trip to education (42%) followed by home (25%), wok (22%) and social (11%) purposes respectively.

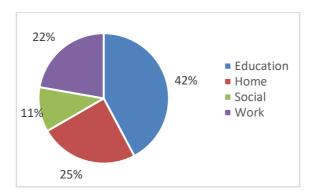


Figure 514 Trip Purpose Distribution of IPT Modes (in terms of Percentage Shares)

Table 58 Trip Purpose Distribution of IPT Modes

Trip Purpose	Percentage Share
Education	42.2%
Home	24.4%
Social	11.1%
Work	22.2%
Total	100%

The access distance for the IPT mode from the home or workplace varies up to 7.5 km m. The maximum users of IPT mode (92.9%) reside within the radius of 5-7.5 km (Figure 515).

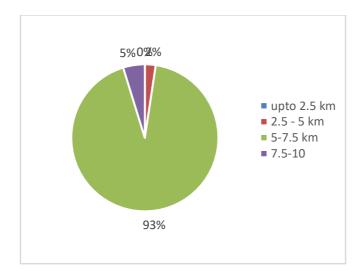


Figure 515 Access distance of IPT users (in terms of Percentage Shares)

The waiting time for IPT mode is 10-20 minutes (62.2%) followed by 5-10 minutes (24.4%) and upto 5 minutes (6.7%) respectively (Figure 5-16).

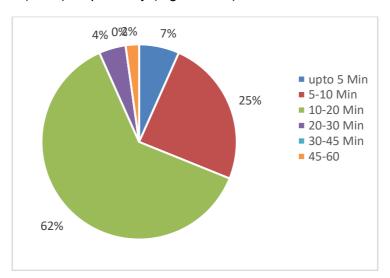


Figure 516 Waiting Time of IPT users (in terms of Percentage Shares)

5.6. Parking Characteristics

Parking characteristics within Thoubal area have been analysed 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 5166 and Table 599).

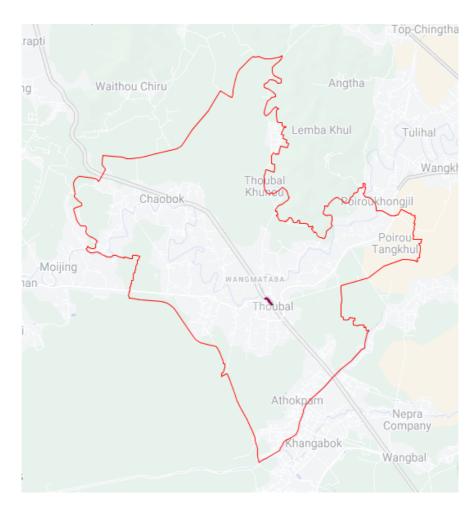


Figure 516 Parking Locations Surveyed

Table 59 Parking Locations Surveyed

S. No.	Location	Landmark
1	P1	Thoubal Market- On-street
2	P2	Thoubal Market

Parking surveys were carried out at two locations for 9 hours. Surveys were carried out at two parking locations, namely, Thoubal Market On-street and Thoubal Market. At all the locations parking for two-wheelers, car and auto rickshaw 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 5-10. It can be observed that parking is done mainly for short term, i.e., less than 2 hours.

Table 510 Location wise Parking duration

Mode	Landmarks	Thoubal Market On- street	Thoubal Market
Two-	Short Term (Upto 2 Hrs)	66%	83%
Wheel er	Medium Term (2 to 4 Hrs)	15%	12%
	Long Term (More than 4 Hrs)	19%	5%
Car	Short Term (Upto 2 Hrs)	43%	96%
	Medium Term (2 to 4 Hrs)	21%	2%
	Long Term (More than 4 Hrs)	36%	2%
Auto	Short Term (Upto 2 Hrs)	44%	94%
Ricksh aw	Medium Term (2 to 4 Hrs)	30%	4%
	Long Term (More than 4 Hrs)	26%	2%

Parking Accumulation

Two wheelers, car parking and auto rickshaw 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 517 Figure 5-21 & Table 511 respectively.



Figure 517 Parking Accumulation at Thoubal Market-On street Parking Location



Figure 518 Parking Accumulation at Thoubal Market Parking Location

Table 511 Parking Accumulation at Parking locations (in ECS)

Landmark	Peak Hour	Parking Demand (ECS)
Thoubal Market- On-street	1200 hours	60.75
Thoubal Market	1300 hours	56.5

5.7. Issues

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

5.7.1. Issues with Road Network

- A single road serves as the connection between Imphal and Thoubal, highlighting a potential vulnerability in terms of transportation within and regional connectivity.
- The road connecting Thoubal to Imphal is a continuous four-lane stretch; however, it contends with a persistent parking problem.
 On-street parking issues along this route hinder traffic flow and necessitate targeted



solutions to ensure the smooth operation of this crucial four-lane corridor.

The presence of the market further exacerbates congestion along this stretch, adding to

the challenges faced by traffic flow.

As there are no other significant road connections, traffic is concentrated on this four-lane road connecting Thoubal to Imphal. The lack of alternative routes underscores the importance of addressing parking issues to facilitate efficient traffic flow along this crucial corridor.

The absence of a footpath along this vital road connecting Thoubal to Imphal poses a significant challenge. Introducing proper



pedestrian infrastructure is essential to ensure the safety and convenience of pedestrians using this route

5.7.2. Issues with Public Transport

- Thoubal is connected by bus to Imphal, but the limited frequency poses challenges, compelling people to rely on alternative transportation modes like autos or Tata Magic.
- Additionally, the absence of inter-city bus services further restricts transportation options, highlighting the need for improved connectivity and more frequent inter-city bus services in Thoubal.



5.7.3. Issues with IPT

The existing public transport modes, namely autos and Tata Magic, lack dedicated parking facilities, leading to on-street and lane encroachments. This parking situation underscores the necessity for establishing proper parking spaces to alleviate congestion and ensure the smooth flow of traffic along the carriageway.



5.7.4. Issues with Parking

On-street parking along the four-lane road near Thoubal Keithel market is causing congestion problems. The lack of organized parking contributes to traffic disruptions.

The parking accumulation is high in major market that is the Thoubal Keithel, one of the major commercial nodes resulting in spillover of parking on the carriageway. The haphazard parking of IPT vehicles obstructs traffic flow and creates challenges for other road users, exacerbating congestion and safety hazards. There is also an absence of adequate number of off-street parking facilities.









5.7.5. Issues with Walkability

Most wards in Thoubal don't have dedicated footpath specially the internal roads, the available footpath in are not suitable for walking. Major issues include -

Footpaths are not designed to be universally accessible, lacking features such as ramps and tactile pavers. This limits mobility for people with disabilities and elderly residents.

Lack of maintenance has resulted in broken footpath surfaces posing safety risks to pedestrians and creating obstacles to smooth walking.

Footpaths are frequently encroached upon by hawkers, vendors, and obstructions, further reducing available space for pedestrians and hindering pedestrian movement.

Parking encroachment on footpaths is observed in the market area.

Both internal and main roads lack adequate pedestrian crossing facilities, making pedestrians vulnerable to traffic accidents.











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 Thoubal

The service levels of current transport infrastructure available at Thoubal 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 Thoubal

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

S. No.	Benchmark	Present LoS	Comments
1	Availability of Public Transport	4	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.

S. No.	Benchmark	Present LoS	Comments
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 20 traffic zones and is designated as Traffic Analysis Zones (TAZ), with total of 18 Internal traffic zones where each sector in Thoubal Municipal Council Area has been considered as a traffic zone. Whereas, 02 traffic zones are as the external zones for Thoubal Municipal Council Area. The internal traffic zone map is provided in the Figure 61.

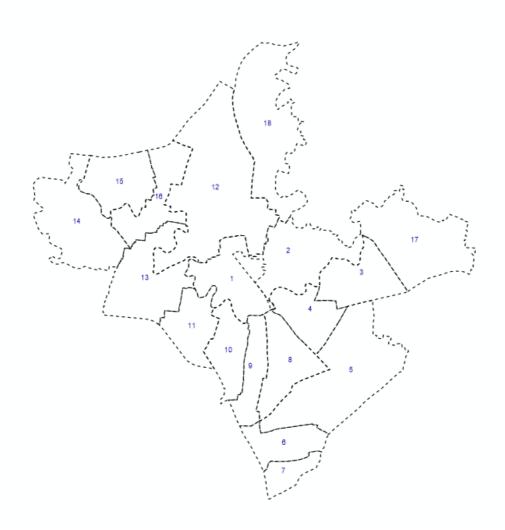


Figure 61 Traffic Analysis Zone system

7.3. Transport Network

The road network in Thoubal Municipal Council 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 Thoubal Municipal Council 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 62 show the network in the study area. Table 61 shows different types of links in the study area.

Table 61: 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		

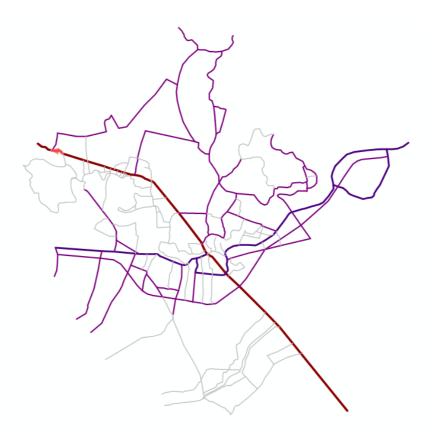


Figure 62 : Coded Road Network in the study area

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 62.

Table 62: 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.

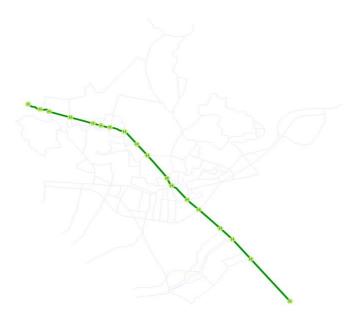


Figure 63 Coded Transit Network in the study area

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 socioeconomic 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.

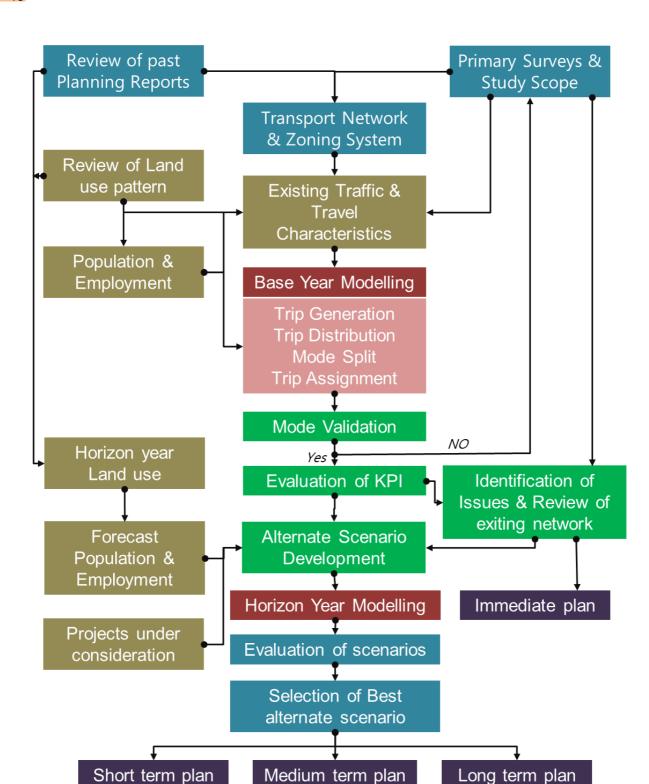


Figure 64 Sequential Travel Demand Modelling Process

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:

$$Y_i = M * X_i + C$$

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) =
$$0.78 \times (Population \ of \ city)$$
 ($R^2 = 0.72$)

P Value < $0.05 \ and \ t$ - value is 8.4

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 nonresidential 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 R² is presented below:

Trip Attraction =
$$1.45 \times (Employment) + 534$$
 ($R^2 = 0.57$)

P-value for constant and intercept < 0.05, t- value is 3.71

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

Trips between zone i to zone j T_{ii}

Production from zone j $A_i =$ Attraction to zone j

 $A_iB_i =$ Row/column balancing factor

 $F(C_{ii}) =$ Cost Deterrence from zone i to zone j

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

Where

 $F(C)_{ii} =$ Travel time / distance / generalized cost from zone i to zone i

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 65 shows the comparison of observed Trip Length Frequency Distribution (TLFD) form household survey and modelled Trip Length Frequency Distribution (TLFD).

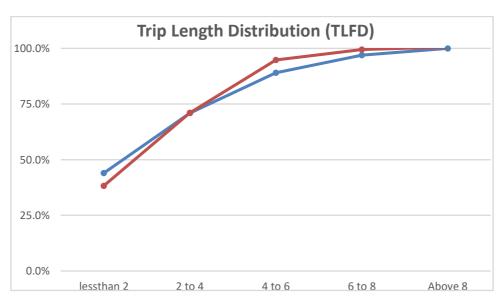


Figure 65 Trip Length Frequency Distribution (TLFD) in cumulative (%)

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 63 shows the comparison of observed and modelled TLFD.

Table 63 Trip Distribution Model Validation

Details	Observed	Modelled	% Error
ATL	3.0	3.03	2.7%

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 644 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.

Modes	% Observed	% Modelled	% Error
Two-wheeler	39.5%	38.50%	-2.42%
Car	11.7%	10.30%	-12.11%
Auto Rickshaw	48.2%	50.70%	5.24%
Bus	0.7%	0.50%	-23.20%

Table 64 Mode-wise Validation

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 -All or Nothing Assignment Capacity Restrained Assignment Multipath Traffic Assignment 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 = Volume (PCU/Hr) С = 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 66 below shows the peak hour private trip assignment for base year (2024).

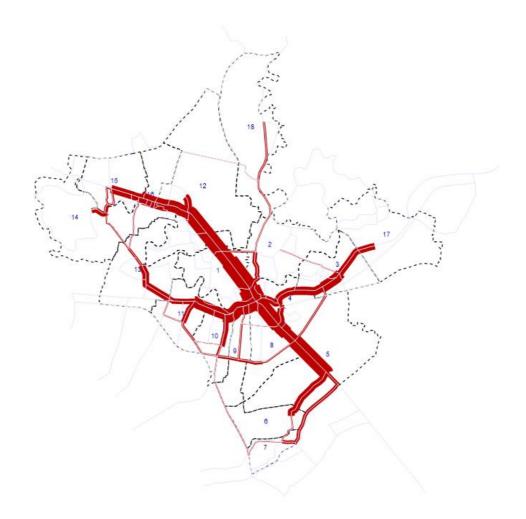


Figure 66 Base year Peak hour Private Transport Assignment - 2024

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.

- 1. 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.
- 2. 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:

$$GT = IVTT + (WTFAC \times WT) + AcessEgresstime + Walktime + (TRFAC \times TR) + \frac{FARE}{VOT}$$

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 667 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 realworld 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

Thoubal 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 Thoubal study area estimated population by 2044 would be 0.62 lakhs and it is further estimated to reach 0.87 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. The Table 71 below shows the population projection for 2044.

Table 71 Projected Population for Thoubal – 2044

Year	Estimated Population
Base Year 2024	0.62 lakhs
Horizon Year 2044	0.87 lakhs

Work Force Participation Rate (WFPR)

The workforce participation rate (WFPR) is estimated as 45.0% in 2024. The WFPR during the horizon year (2044) is expected to be 47.0%.

Modal Share

The modal share in favour of public transport (bus and mini bus) is very low (around 0.5%). 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 10%. 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 2041, 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 2041. It is estimated that, in Thoubal population would be 0.87lacs in the horizon year 2044 including proposed developments.

8.3. Employment Distribution Strategy

As per Master Plan 2041 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 a 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 based on combinations of road and transit System networks. Scenarios will be created based on network development options. The identified scenario will be tested and evaluated based on scenario evaluation parameters.

8.5. Identification of Appropriate Scenarios of Urban Development

Based on the various alternative strategies of population and employment distribution besides network developments in the BAU scenarios of urban development are evolved by combining all possible alternate strategies. From these the following tone scenario 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 2041 and Vision Plan of Thoubal are considered. This is a Business as Usual (BAU) case in which most of the future growth will be accommodated in the Greenfield areas. For the estimated Master Plan population of 0.87 lakhs, an employment of 0.41 lakhs is estimated.

9 Horizon year Travel demand forecast - 2044

9.1. Background

The forecasted travel demand for the year 2044 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 behavior will remain same in the horizon year. For the horizon year, three scenarios were developed as follows:

BAU : Master Plan + committed development projects

9.4. 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 23.0% in the year 2041 from present value of 30% in 2024. From the trip assignment it is observed that the V/C ratio in 2044 would be 0.68. Figure 81 shows the peak hour PCU and passenger assignment (PT) respectively for HY 2041.

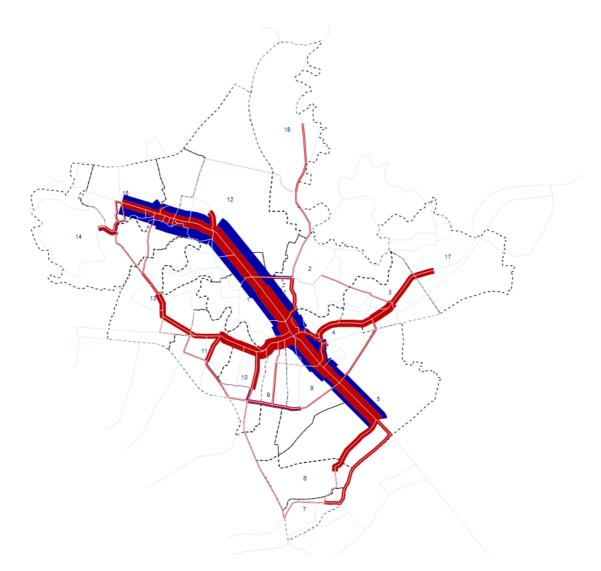


Figure 81 Peak Hour PCU assignment of BAU Scenario (Peak Hour – HY2044)

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 Thoubal. 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 Thoubal, the vision and goals have been identified for the CMP based on existing socio-economic and travel characteristics of the resident population in Thoubal. These are described in following sections.

10.2 Vision for Thoubal

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

The stated vision of CMP, which is based on contextual situation and consultation with stakeholder organizations, focuses on developing Thoubal 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 1% to 15% 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 15% of the total trips to be performed using bicycle modes in the future from a present low share of 3%

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 Mobility Plan Proposals

Several traffic & transportation surveys were conducted Thoubal 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 Thoubal based on extensive data analysis and travel demand modelling efforts carried out.

11.1. Active Transport Improvement

11.1.1. Footpath Improvement

From the data analysis it is observed that presently only 5% of the total network is covered by footpath resulting in footpath length of 6.73 km. Major areas that have footpath include the major arterial road and main CBD roads. Due to the absence is majority of the network, Pedestrians 'walking experience on carriageway is neither safe nor convenient. Based on walkability analysis about 94.29 km 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 width footpath is suggested on the one side of the road with network length of 87.18 and a footpath of 2.5 m width along the main spine of length 7.11 km on either side of the road abutting to the commercial areas. The Figure 9-1 shows the proposed footpath widths in the study area.



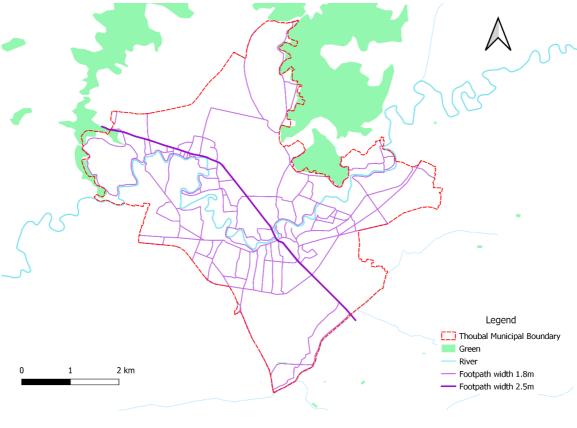


Figure 91 Proposed Footpath

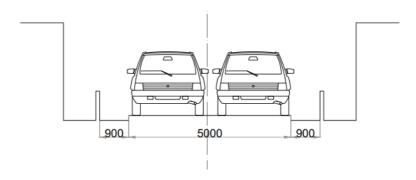


Figure 92 Existing cross section of internal roads (Row - 6.8M)

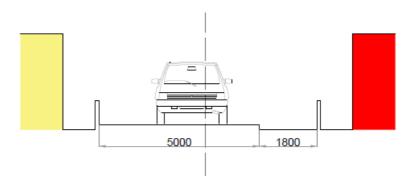


Figure 93 Proposed cross-section of 1.8m footpath length (RoW – 6.8M)

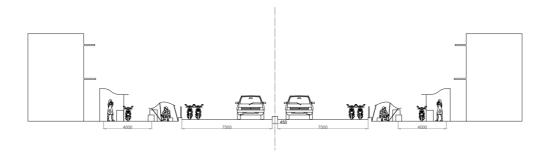


Figure 94 Existing cross-section of main spine (NH 102) - RoW 28M

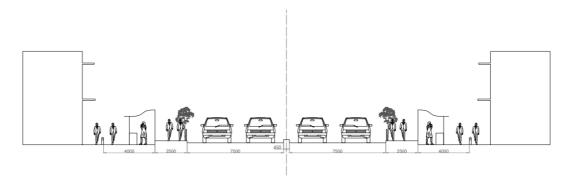


Figure 95 Proposed cross-section of 2.5m footpath length (NH 102) - RoW 28M

11.1.2. Bicycle network

In response to the growing need for sustainable transportation solutions in Thoubal, Three Public Bicycle Sharing (PBS) stations are proposed. These stations are proposed near the main spine of the town and the bustling market area, encouraging residents and visitors to opt for cycling. This initiative aims to ease traffic congestion, particularly in high-density areas, while promoting environmental and health benefits associated with cycling.

The proposed locations for the PBS stations is also near the prohibited parking zone. This placement is particularly advantageous as it will encourage the use of bicycles in areas where parking is restricted, thus alleviating parking congestion and promoting cycling as a viable alternative.

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.

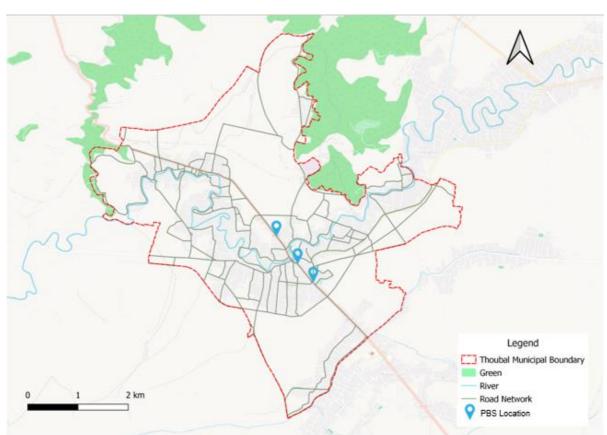
Tourists who need flexibility and independence in experiencing the city at their own convenience.

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 below shows the Proposed PBS in Thoubal City.

Figure 96 Proposed PBS Location

11.2. Public Transport Improvement

In Thoubal, there are currently two major bus routes that serve the area: the Imphal to Moreh route and the Imphal to Kasom Khullen route. Both of these important routes pass through Thoubal, providing connectivity for the region majorly in the north and eastern part of the city.

In light of the need for improved public transport connectivity in the western part of Thoubal, it is proposed to reroute the existing Imphal to Kasom Khullen bus route. Currently, this route passes through Thoubal's main spine up to the center before heading east towards Kasom Khullen. The proposed re-route extend to cover the western region of Thoubal.

This modification will ensure more comprehensive coverage and significantly enhance connectivity within the study area. By incorporating the western part of Thoubal into this route, residents in these areas will gain better access to public transport, facilitating easier travel to and from central Thoubal, as well as to Imphal and Kasom Khullen. This rerouting strategy is not only a response to the present demand but also a proactive step towards creating a more inclusive and well-connected public transportation network in Thoubal.

Proposed new route with Mini bus/Cab operations

Proposed to introduce a new mini bus/Cab route along the southern boundary of Thoubal Municipal Council. This initiative aims to connect neighboring areas as well as for accessibility within Thoubal. The introduction of this mini bus/cab service will offer residents a reliable and

convenient mode of transportation, facilitating easier commutes to various parts of Thoubal and its surroundings. This route is strategically planned to cover key residential and commercial areas, ensuring maximum coverage and benefit to the community. By strategically linking key locations within Thoubal and extending to neighboring areas, this new mini bus route will greatly enhance connectivity, making travel between different parts of the town and nearby regions more seamless and efficient for residents. The service will operate at regular intervals, providing timely and frequent transportation options to the public. In addition to improving local transit connectivity, this new bus route is expected to contribute to reducing traffic congestion by offering a viable alternative to private vehicles. These combined proposals are targeted to increase the public transport share from present 0.5% to almost 10% for the horizon year 2044.

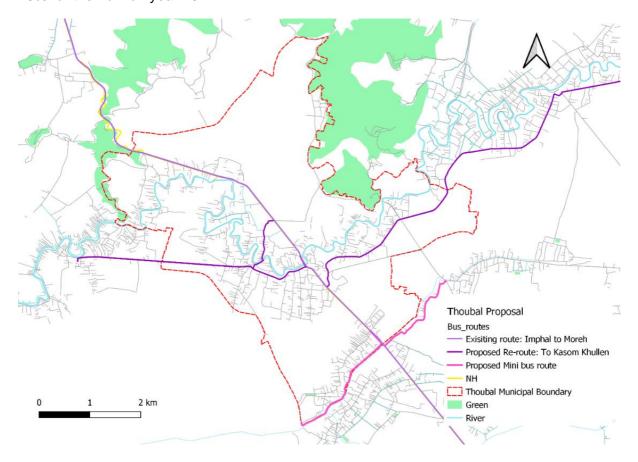


Figure 97 Public Transport Proposal

11.3. Road Network Improvement

11.3.1. Road Widening

As per the survey and analysis, several roads are identified in Thoubal for road widening. This road widening proposal will significantly ease traffic congestion, especially during peak hours, enhancing the flow of vehicles and reducing travel time for commuters. In addition to the primary focus on widening the roads, the roads will encompass the installation of all essential street infrastructure like adequate street lighting, signages and pedestrian walkways, ensuring a comprehensive upgrade of Thoubal's infrastructure, ensuring better connectivity and safety.

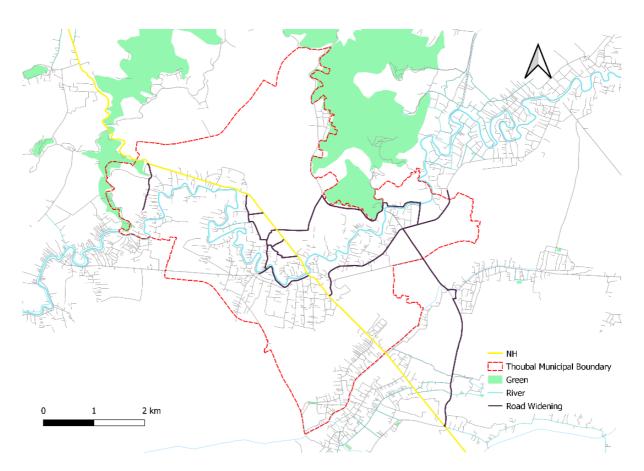


Figure 98 Proposed Roads for Widening

11.4. Proposed Parking zones

To cater to the congestion near the Thoubal Keithel Market in Thoubal, a stretch dedicated for the establishment of a no-parking zone spanning approximately one kilometer is proposed. This initiative aims to streamline traffic flow, reduce congestion for decreased travel time and enhance pedestrian safety in the area. On-street parking is prohibited on the stretch and to accommodate vehicular parking needs, parking facilities will be made available on the adjacent residential street which have volume capacity ratio less than 0.7. This arrangement is expected to provide convenient access for visitors and local residents while maintaining an orderly traffic system. Furthermore, this proposal also comprises the development of a wellconstructed pedestrian pathways along this stretch which will help in easy accessibility to the market. These pathways are intended to facilitate safe and comfortable walking conditions for pedestrians, thereby encouraging foot traffic and contributing to a more pedestrian-friendly environment. The new proposed stretch for prohibited parking and section with walking pathways are shown in the figure below



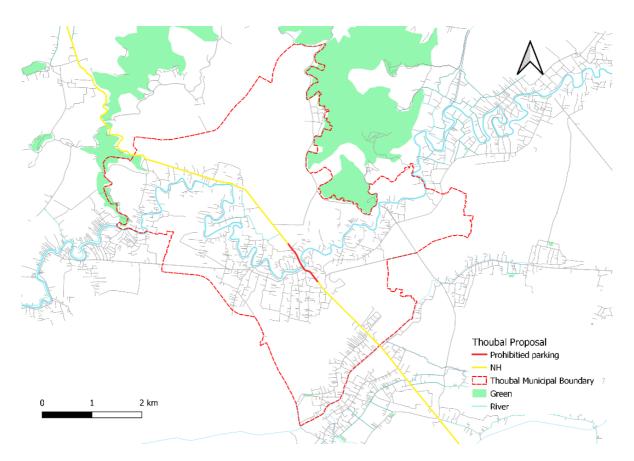


Figure 99 Prohibited Parking Stretch

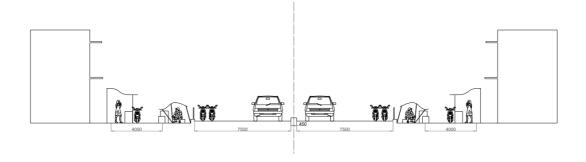


Figure 910 Existing cross-section of Thoubal Market Road

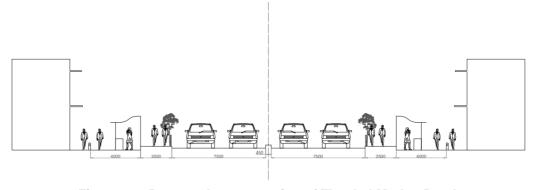


Figure 911 Proposed cross-section of Thoubal Market Road

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 Impo	rtance	·
	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
Mobility	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.
	Promotion of CNG Vehicles	
Energy	Promotion of E-Rickshaws	Projects that saves the fuel energy resources should be given the high priority
	Promotion of NMT vehicles	should be given the high phonty
	Promotion of Public Transport	Projects that give better environmental conditions
Environment	Pedestrian and NMT tracks	in the city by enhancing the share of public transport and NMT trips should gave high priority
Co2 Mitigation	Promotion of Public transport & NMT Road cost Pricing Reducing the impact of Traffic congestion	Projects that give better healthy living condition for the users should gave high priority
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 Torm Dlon
Phase IV	2039 - 2044	Long Term Plan

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. 781.4 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	40	in Km	10.0		400.0		400.0
2	Road Widening	30	in Km	5.0	37.5	37.5	75.0	150.0
3	Dedicated Cycle track	10	in Km	0.7	7.0			7.0
4	PBS	5	in No's	0.0	0.1			0.1
5	Footpath	94.29	in Km	0.6	52.8			52.8
6	Pelican Signal	5	in No's	0.1		0.7		0.7
7	Grade seperated for safe pedestrain crossing	5	in No's	3.9		19.3		19.3
8	Pedestrianized zones	3	in Km	6.3		18.8		18.8
9	Augmentation of Buses	60	in No's	0.8	12.0	12.0	24.0	48.0
10	Buses quee shelters (Bus Stops)	15	in No's	0.2	0.6	0.6	1.1	2.3
11	Multi Modal Transit Center (MMTC)	1	in No's	20.6			20.6	20.6
12	Off street Parking	1	in No's	7.0			7.0	7.0
13	Multi Level Car Parking (MLCP)	1	in No's	25.0			25.0	25.0
14	Intelligent Transport Systems (ITS)				5.0	5.0	10.0	20.0
15	Junction Improvement	5	in No's	2.0	2.5	2.5	5.0	10.0
Total Project Cost (in Cr.)					117.4	496.3	167.7	781.4

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 Thoubal, 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 Gol, 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.

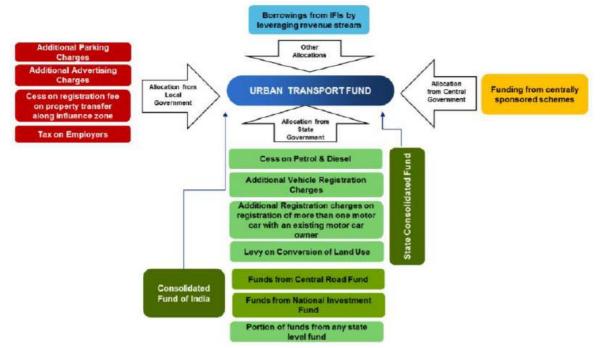


Figure 12-1 Collection of funds from Central, State and Local Governments

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.

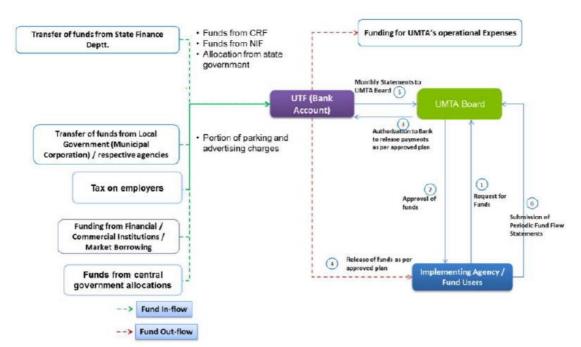


Figure 12-2 Fund flow mechanism to and from UTF

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	25% of the total revenue accrued to RTIDF from Green Tax/ Surcharge on taxes on registration of vehicles				

State / City:	Pimpri Chinchwad	Jaipur			
State / City.	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	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

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	
	Cluster Bus Scheme	New Delhi	Transport Department, GNCTD	Gross Cost Contract	10	
	BRTs in Jaipur	Jaipur	JCTSL	Cost plus contract (BOOM)	10	
Public	Bus Operations is Indore	Indore	AICTSL	Net Cost Contract	10	
Transport	Bus Operations is Bhopal	Bhopal	Net Cost		10	
	Bus Operations is Jabalpur	Jabalpur	JCTSL	Net Cost Contract	10	
	Hyderabad Metro	Hyderabad	Govt. of AP	вот	35	
	Mumbai Monorail	Mumbai	MMRDA	воот	35	
	Bus terminal cum Commercial Complex	Mohali	ali GMADA & DBOT		Bus terminal - 20 Yrs. Commercial Complex - 90 Years	
Inter State	Amritsar Inter- city Bus Terminal	Amritsar	DoT, Punjab	вот	11 years 5 months	
Bus Terminal	ISBT - Dehradun	Dehradun Development Authority		DBFOT	20	
	Hyderabad International Airport	Hyderabad	Govt. of AP	вот	30 + 30	
Parking	MLCP - Kamla Nagar	New Delhi	lew Delhi NDMC B		30	
	MLCP - BKS Marg	New Delhi	NDMC	вот	30	
	MLCP - Sarojini Nagar	New Delhi	NDMC	вот	30	

Sectors	Projects	City	Authority	Form of Partnership	Concession Period
Bus-Q- Shelter	197 BQS for NDMC area	New Delhi	NDMC	вот	15
	Bridge over river Amravati	Karur	PWD	вот	20
	Chennai ORR - Phase 1	Chennai	TNRDC	DBFOT	20
Outer Ring	Chennai ORR - Phase 2	Chennai	TNRDC	BOT Annuity	20
Roads / New links	DND Flyover	Delhi - Noida	SPV	воот	30
	Bypass	Sypass Coimbatore		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 Thoubal

PPP in Parking

A public-private partnership model on BOOT basis may be adopted to operate parking in Thoubal. 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.