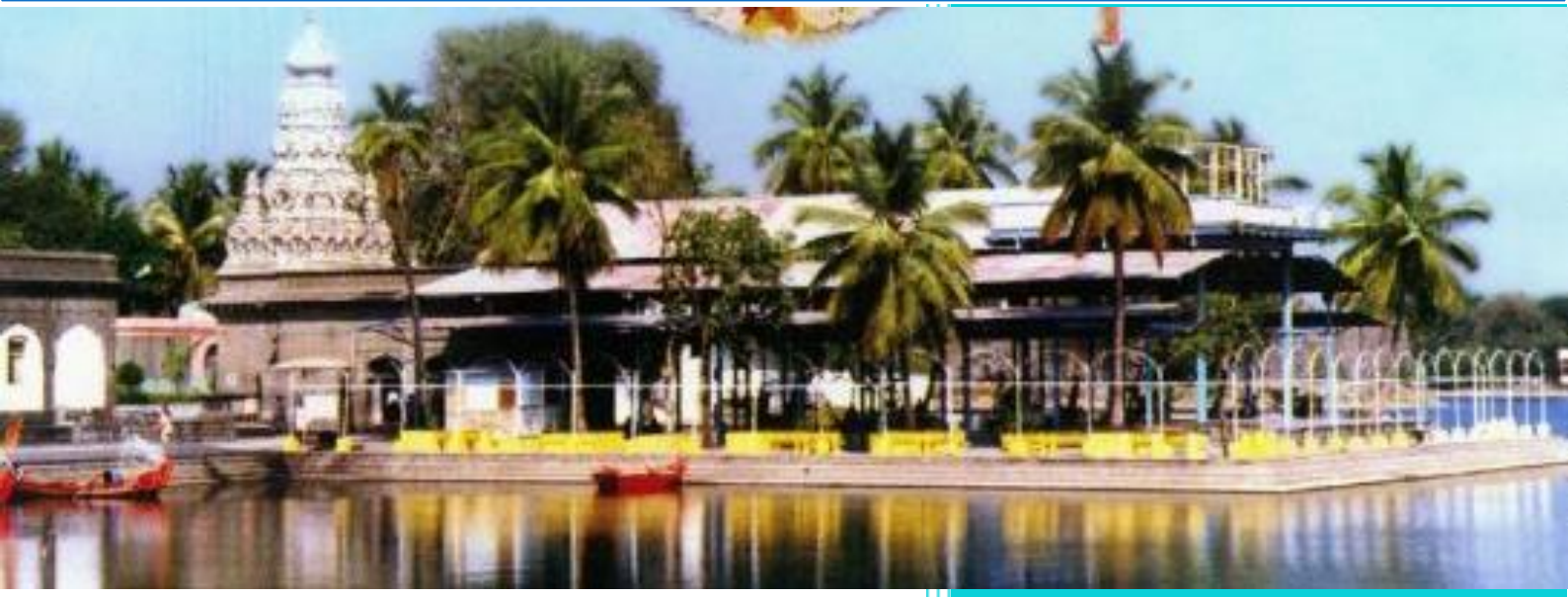
Urban Mass Transit Company Limited

2015

COMPREHENSIVE MOBILITY PLAN - SOLAPUR



Inception Report

Solapur Municipal Corporation

Quality Management

Revision	Date	Report Prepared By	Report Reviewed By	Report Approved By	Description
1	22nd April, 2015	Harshita Sarma M	N. Sheshadri		First Draft
2	5th May, 2015	Harshita Sarma M	RM Alagappan	S.Ramakrishna	Second Draft

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Table of Contents

List of Tables

List of Figures

Chapter 1. Introduction

1.1. Project Background

Solapur is located in the Western Indian state of Maharashtra. It is an important node and plays a critical role in the district as headquarter of Solapur district administration. Solapur houses all the administrative offices of the district level administration and has a strong industrial presence. Solapur historically is regarded as an industrial city prominently having the textile units. One of the key events triggering the industrial growth was starting up the railway in Solapur in 1880.

Solapur was earlier known for its Shri. Siddheshwar temple but eventually emerged to be one of the largest industrial towns in Maharashtra. The city is among the pioneers in India in development of co-operative sugar factories. The western part of the city has cotton textile industries, power looms and connectivity to the railway station. The eastern part has handlooms and oil industry on Akkalkot Road and Hyderabad Road. The extension of railway line from Mumbai has contributed to industrial development of Solapur also inviting in-migration from various parts of country especially laborers from Andhra Pradesh region in the past decades.

As per the Census of India 2011, the population of Solapur was 9.51 lakh which is spread over an area of 178.57 Sq km. Solapur expected tremendous development in the late nineties which resulted in the city limits getting expanded from 33.03 Sq km in 1989 to 178.57 Sq.km in the year 1992.

Solapur is well connected by road with major cities of Maharashtra as well as the adjoining State Capital of Hyderabad and important cities in Karnataka through a network of road and rail network

1.2. Comprehensive Mobility Plan for Solapur

Solapur has been witnessing extremely rapid growth, yet the infrastructure has not been encouraging. Urban Mass Transit Company Limited is given the mandate for conducting the Comprehensive Mobility Plan which will prepare an overall transportation/mobility plan which is integrated with the land use plan and through the projected mobility needs of the city spells out the manner in which such mobility needs are to be met.

1.3. Objectives and Scope of the Study

Comprehensive Mobility Plan is a long term vision for desirable accessibility and mobility pattern for people and goods in the city to provide, safe, secure, efficient, reliable and seamless connectivity that supports and enhances economic, social and environmental sustainability.

As per Ministry of Urban Development (MoUD) guidelines, a Comprehensive Mobility Plan for the Indian cities should have following objectives:

- To provide long term vision(s) and goals for desirable urban transport system and urban development in Indian cities.
- To illustrate a basic plan for urban development and include a list of proposed urban land use and transport measures to be implemented within a time span of 20 years.
- To ensure that the most appropriate, sustainable and cost effective implementation program is undertaken in the urban transport sector.
- The CMP should be integrated with the Master Plan, Comprehensive Development Plan and Comprehensive Traffic and Transportation Study.

The scope of work for the preparation of the Comprehensive Mobility Plan is as follows;

a. Understand the present travel characteristics and forecast travel demand for the planning horizon.
b. Estimate emissions from urban transport based on the travel demand and technological choices.
c. Integrate transport options with land use structure and develop alternative scenarios for sustainable transport.
d. Work out the mobility plan which is economically, socially, environmentally and technologically sustainable and be an integral part of development plans / master plans.
e. Suggest an implementation programme for a successful execution of the selected interventions.

1.4. Organization of the Report

This Inception Report of the study is organized in four sections including this introductory section. The study area profile is presented in Chapter II. The study approach and methodology is described in Chapter III and Work Plan or Schedule for the study is presented in chapter IV.

Chapter 2. City Profile - Solapur

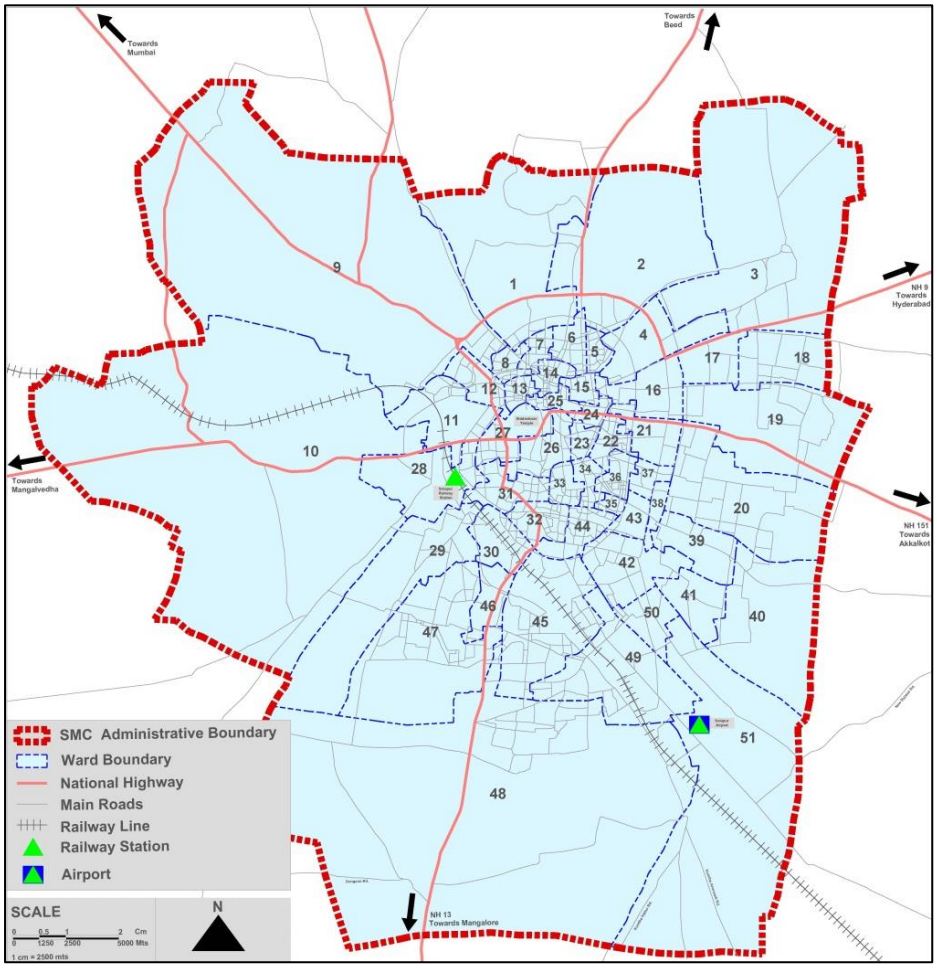
2.1. Regional Setting

Solapur is the 4th largest district in the western Indian state of Maharashtra in its southern region. Solapur is an important node and plays a critical role in the district as headquarter for district administration. Solapur houses all the administrative offices of the district level administration and has a strong industrial presence. Solapur historically is regarded as an industrial city prominently having the textile units. One of the key events triggering the industrial growth was starting up the railway in Solapur in 1880.

2.2. Administrative Boundary

Solapur lies in the basin of river Bhima and the municipal jurisdiction of the city encompasses an area of 178.57 km^2. It accommodated a population of 8.72 lakh as per census 2001 which grew to 9.51 Lakh as per Census 2011. The administrative boundary is shown in the Figure 2-1.

Figure 2-1: Administrative Boundary of Solapur



Source: City Development Plan, Solapur

Urban Mass Transit Company Limited

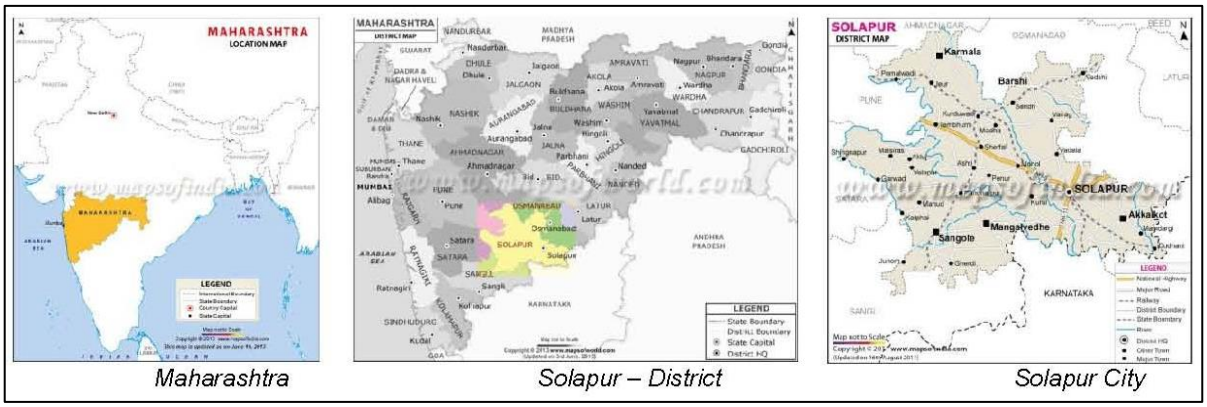
Solapur was earlier known for its Shri. Siddheshwar temple but eventually emerged to be one of the largest industrial towns in Maharashtra. The city is among the pioneer in India in development of co-operative sugar factories. The western part of the city has cotton textile industries, power looms and connectivity to the railway station. The eastern part has handlooms and oil industry in the eastern part on Akkalkot and Hyderabad road. The extension of railway line from Mumbai has contributed to industrial development of Solapur also inviting in-migration from various parts of country especially labors from Andhra Pradesh region in the past decades.

Solapur expected tremendous development in late nineties which resulted in the city limits expansion from 33.03 km^2 to 178.57 km^2 in the year 1992 but the population growth was not contingent to the increase in the area of the city. Important reasons for the low growth was decline in the Government subsidy for cooperatives, inability of textile mills to switch to latest technologies led to shut down of textile units in Solapur. Some of the prominent players in the textile industry like Vishnu Textile and Laxmi Textile winded up their operations because of financial crisis, this has resulted into closing down of dependent ancillary units, eventually increasing unemployment. Currently, the workers population is 354935 with a work participation rate of 37.3%. This is lower than the national average of 39.1% and state average of 43.98%.

2.3. Location and Connectivity

Solapur is located in major road and rail routes between Mumbai and Hyderabad, with a branch line to Bijapur and Gadag cities in South Indian state of Karnataka. The city is connected with Pune through national highway number 9 (NH-9) which also passes through Hyderabad. The location of Solapur city is shown in the Figure 2-2.

Figure 2-2: Location of Solapur City

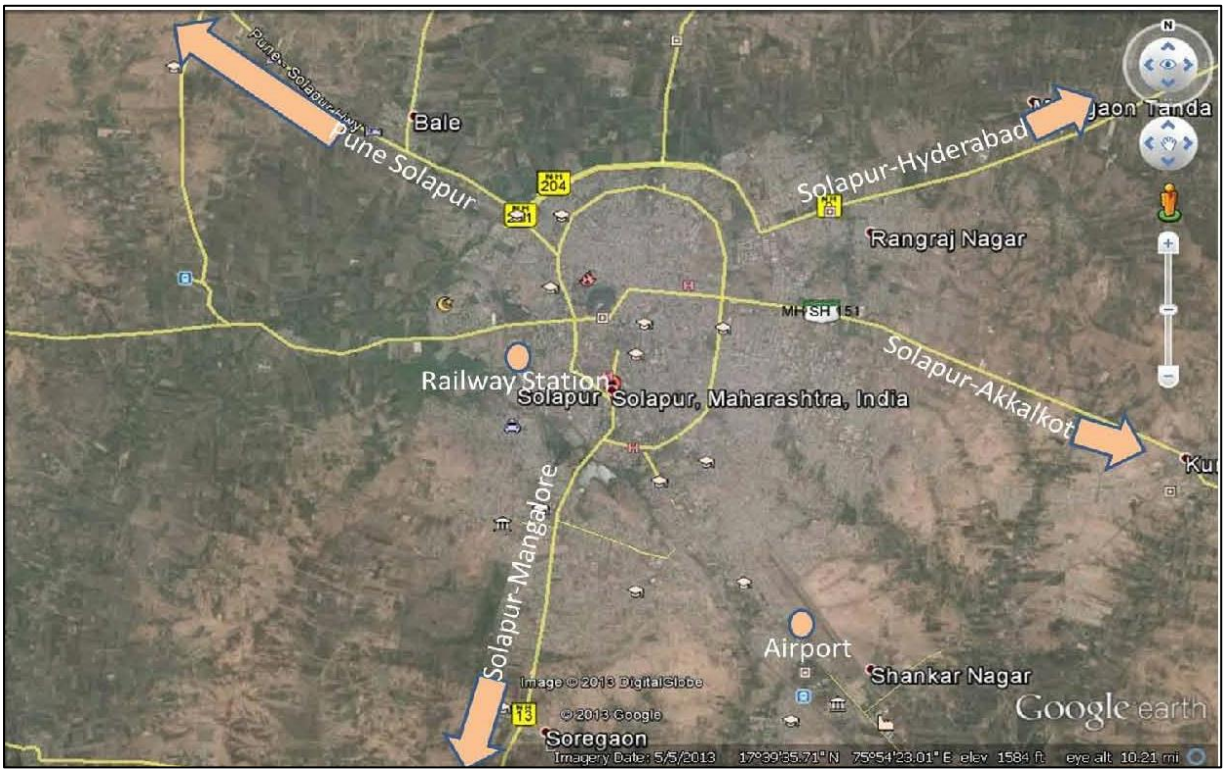


Source: City Development Plan, Solapur

The city lies centrally in the basin of river Bhima and the watershed of river Adila (a tributary of river Sina). The city is rested on hard rock and acts as a gateway to Bhima and Krishna Basin. Solapur district is surrounded by Ahmednagar district in North, Osmanabad and Andra Pradesh in the east, Sangli and Karnataka to the south and Satara and Pune district to the west. It is located at 17°.10‟ and 18°.32‟ north-latitude and 74°.42‟ and 76°.15‟ east longitude. It has an average elevation of 457 meters above mean sea level.

Solapur is well connected by roadways and railways to all major cities in Maharashtra and neighboring states. The city is connected with Karnataka by four National Highways –9 via Pune and Vijayawada. NH-13 to Mangalore; NH-211 to Dhule and NH-204 to Ratnagiri and Nagpur. It is also connected with important cities in Maharashtra such as Nagpur, Sangli, Kolhapur, Nanded etc. Busses from Maharashtra and Andhra Pradesh state transport corporation operate from the Solapur bus stand. The connectivity of Solapur city to major urban centers is shown in the Figure 2-3.

Figure 2-3: Connectivity of Solapur to Major Urban Centers



Source: City Development Plan, Solapur

2.4. Physical and Geographical Setting

Solapur was ruled by various dynasties such as Andhrabhartyas, Chalukyas, Rashtrakutas, Yadavas and Bahamanis. The word Solapur is said to have been derived from word “Sola” meaning sixteen and “Pur”

meaning villages. The city is formed with a conglomeration of sixteen villages. The second theory is that Solapur is not derived from sixteen villages but has a different history. The theory is that the town was called Sonnalage in the inscriptions of Shivayogi Shri Shankaracharya. This eventually came to be pronounced as Sonnalagi. Eventually with time with changes in the ruling dynasties the name changed and it came to be called as Sandalpur during Mughal rule and eventually Solapur which was pronounced by British as Solapur.

In the nineteenth century, the city was a part of Ahmednagar district. In 1930, the city enjoyed freedom for three days when the British rule was overthrown in Solapur by the locals.

After independence in 1956, the city was a part of State of Bombay. In 1960, it became an independent district in the state of Maharashtra.

Solapur has historic importance in contributing to the freedom of India; the municipal council was the first to hoist our national flag in 1930. A lot of freedom fighters such as Shri Mallappa Dhanshetti, Shri.Kurban Hussain, Shri.Jagnnath Shinde and Shri.Kisan Sarda fought for independence from Solapur. As mark of respect, statues of freedom fighters were built in the cities' Hutatma Chowk.

2.5. Socio Economic Parameters

2.5.1.Demographic

2.5.1.1. Population

Solapur grew rapidly as an industrial town in 1970s. This is also reflected in the population growth during the same period. The decadal growth was very high between 1971 and 1991, when the down turn of the textile industry begun.

Table 2-1: Population Trend of Solapur Municipal Corporation (SMC)

Year	Population	Decadal Growth (%)
1971	3,98,361	-
1981	5,14,660	29.24
1991	6,04,215	17.36
2001	8,72,424	44.39
2011	9,51,558	9.07

Source: Census of India 2011

It can be observed from the Table 2-1 above table that the population growth of Solapur was at its peak during 1981-91 owing to the industrialization of the city and opening up of new industries in the

textile sector. The population growth during 1991-2001 cannot be considered because the city limits were expanded in 1992 resulting to increase in population and thus higher growth rate of population. Due to closure of these mills and diminishing industrial growth, the diminishing population growth is observed. In the last decade (2001-11) growth of the population has come down to 9.07% from 44.39% in 1991-2001.

2.5.1.2. Population Density

Overall density of the core city has been high over the years until the increase in city limits in 1992. The city area has been changing over the years in last four decades and hence the density pattern varies. In 1971 the density of the city was 17149 persons per km2 which increased to 20159 persons per km2 in 1981. In 1992, 13 villages adjoining to SMC were merged in the municipal area increasing the area of SMC jurisdiction from 33.03 km2 to 178.57 km2. This increase in the municipal area resulted in decline in the gross population density from 20159 to 4886 person per km2 in 2001 and further it increased to 5329 person per km2 in 2011. The Table 2-2 presents the change in the gross population density in the city during last four decades.

Table 2-2: Decade Wise Population and Density of Solapur Municipal Corporation (SMC)

Year	Population	Area (Sq. Km)	Gross Density	
			Persons per Sq.km	Persons per hectare
1971	3,98,361	23.23	17,149	171
1981	5,14,660	25.23	20,159	202
1991	6,04,215	33.03	18,293	182
2001	8,72,424	178.57	4,886	49
2011	**9,51,558**	**178.57**	**5,329**	**53**

Source: Census of India & SMC

2.5.2. Economic

2.5.2.1. Occupational Structure

The composition of the work force conveys a picture of the way of life of the people and their social and economic activities. The total work force is 3,54,935 in 2011. The majority of the work force is main workers, 93% of the working population is main workers and 7 % are marginal workers.

Table 2-3: Sectorial Distribution of the Workers in Solapur

Year	Sector	Primary	Secondary	Tertiary	Non Workers
1971	% of total population	0.82	15.02	12.62	71.54
	% of working population	2.88	52.76	44.36	-

Year	Sector	Primary	Secondary	Tertiary	Non Workers
1981	% of total population	0.55	2.16	28.35	59.41
	% of working population	1.76	6.95	91.29	-
1991	% of total population	0.75	14.62	15.68	32.72
	% of working population	2.38	47.08	50.54	-
2001	% of total population	1.14	6.03	27.63	65.20
	% of working population	3.26	17.32	79.42	-
2011	% of total population	1.28	4.04	31.98	62.70
	% of working population	3.44	10.83	85.74	-

Source: Census of India 2011 and SMC CDP

From the Table 2-3, it can be inferred that the sectorial distribution of workers shows that the major concentration is in the tertiary sector, owing to gradual shift from the secondary sector. It can be observed from the data of the last decade that the percentage of secondary workers compared to the total workers has reduced from 17.32% to 10.83%. The reasons behind this can be attributed to the diminishing industrial growth resultant of the poor infrastructure conditions in the industrial area of SMC.

2.5.2.2. Work force Participation Rate

The worker population of the SMC has increased by decadal growth rate of 17% during the last decade with an annual increase in the worker population of 1.57%. As compared to this the non-worker population which contributes to 60-65% of the city's population has grown by a decadal growth of 4.88% with an annual increase of 0.48%. According to the provisional Census of 2011, the workforce participation rate (WPR) is SMC has improved marginally from 35% to 37% during the last decade. The Table 2-4 below shows the WPR for Solapur.

Table 2-4: Workforce Participation Rate in Solapur

S. No.	Details	2001	% of total population	2011	% of total population	Growth (%)	CAGR (%)
1	Total workers (main + marginal)	303,590	34.80	354,935	37.30	16.91	1.57
2	Total Non-Workers	568,888	65.20	596,623	62.70	4.88	0.48
Work Force Participation Rate (WFPR)		**34.80**		**37.30**			

Source: Census of India 2011 and CDP, Solapur

2.5.2.3. Economic Status of Solapur

Solapur being located on an important junction of the North-South railway line, had a good base for industries. There are approximately 98 medium and 8,986 smaller industries in the district Chaddars (Solapur bed sheets) have earned Solapur a reputation and fame for their durability and novel designs. The handloom and power loom weaving industry provides employment to a large number of workers. Solapur has the largest Beedi industry in Maharashtra and is also known for its market in oilseeds. It is home to one of the oldest Industry group in India- the Kirloskar group, which sowed the seeds of industrialization by establishing a factory at Solapur way back in 1900. The company was hived off to Kirloskar Ferrous Industries Limited- KFIL. The company is a major industry in Solapur and is instrumental in generating good revenue for the city. Solapur also houses a large industrial estate developed by the Maharashtra Industrial Development Corporation (MIDC) on the Akkalkot road of Solapur. Other major industries that have their presence in Solapur are BF-NTPC Energy Systems ltd (BFNESL), a J between forgings maker Bharat Forge Ltd and power generation company NTPC Ltd and Precision Camshafts and Balaji Amines Ltd. India an ISO 9001:2008 certified company.

Beedi industry is the second important industry in Solapur. There are 115 units of 29 various Beedi factories. In these 115 units there are about 70000 lady workers and 1725 factory workers in the district.

2.6. Spatial Setting and Land Use

2.6.1. Growth Pattern

Solapur Municipal Corporation (SMC) was established on 1st May 1964, with 23.23 km^2 jurisdiction area. The Corporation was constituted under the provisions of Bombay Provincial Municipal Corporations Act, 1949, (now Maharashtra Municipal Corporations Act, 2012) and is also governed by the provisions of 74th Constitutional Amendments Act 1992 (CAA)[1]. Municipal jurisdiction of SMC was expanded at various times. As per the Census 2011, the municipal jurisdiction of SMC covers 178.57 km^2 areas which accommodate population of 9.51 lakh. The time-line for original city extension is presented in the Table 2-5 below:

Table 2-5: Chronology of events in expansion of Solapur Municipal Limits

Date	City Limits Details	Extension	Area in Sq kms
29/09/1967	Original City Limits		23.23

[1] City Development Plan for Solapur - 2041

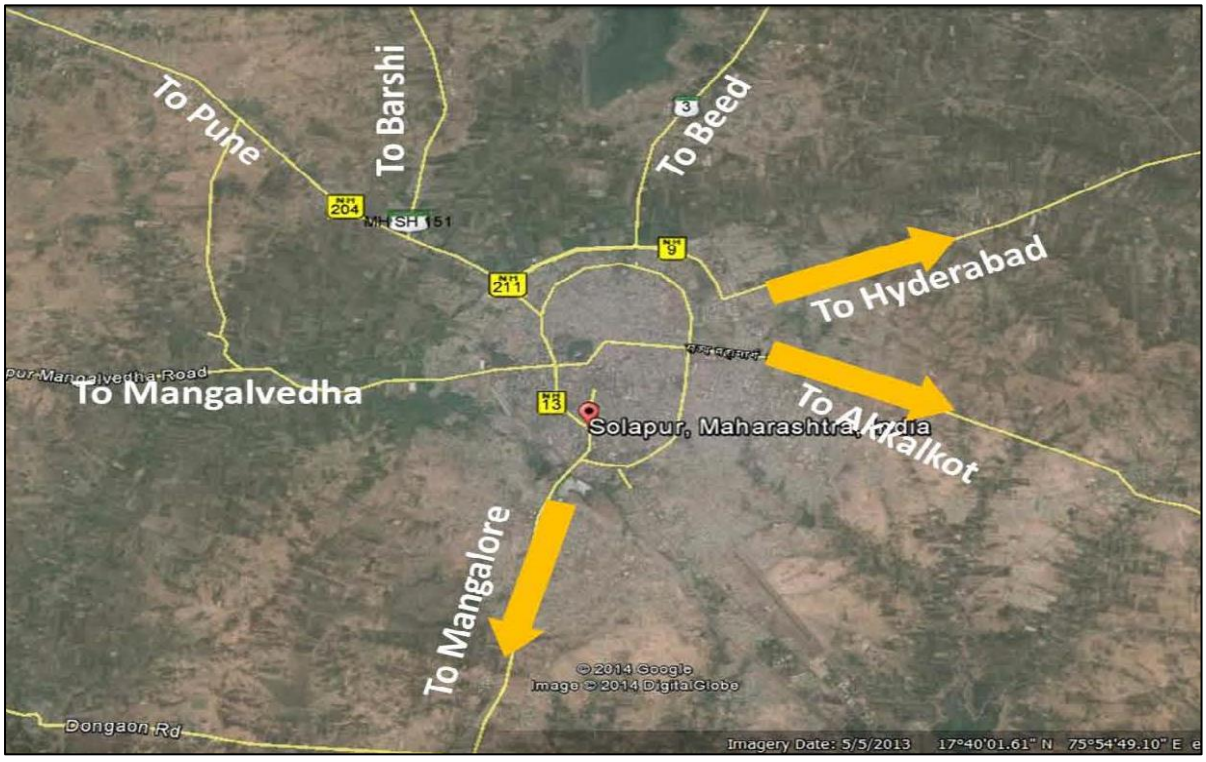
Date	City Limits Details	Extension	Area in Sq kms
01/07/1979	Vijapur and Hotgi Road Area included in SMC	First Extension	2.30
01/04/1989	Salgarwadi, Beedi Kamgar Vasahat and S. No. 23 of Shelgi added in SMC	Second Extension	7.50
05/05/1992	Thirteen surrounding villages included in SMC	Third Extension	145.54
Total	Area as on 05/05/1992		178.57

Source: Solapur Development Plan, 1997-2017

2.6.2. Spatial Growth Trends

Solapur has access points from all the four direction. From the north Beed-Solapur highway is entering in to city and in the south direction the national highway 13 connects Solapur with Managalore. The state highway 151, which passes through the Solapur, connects Barshi with Akkalkot in Solapur district.

Figure 2-4: Growth Directions of Solapur City.



Based on the discussions with the town planning department of the SMC, it can be mentioned that the city is growing in the direction along the roads connecting to Hyderabad and Akkalkot *(*Figure 2-4*).* The main reason attributable to the growth direction may be the proximity to the MIDC located between the Akkalkot road and Hyderabad road and major work force working in this industrial estate comes from Andhra Pradesh and Karnataka. Also it should be noted that the growth of the city is happening at a very

slow pace, as only 20% of the area has been developed when compared to the development plan prepared in 1997 which was approved by the State Government in 2004.

2.6.3. Land-use Analysis

The development plan for Solapur city, prepared in 1997, describes the existing (1994) as well as the proposed (2017) land use pattern for Solapur. As per the development plan, 25% of the city area was developed and it comprised various urban amenities along with the residential area. The total undeveloped area constituted about 75% of the total land under the jurisdiction of the SMC. This was mainly due to the expansion of the city limit to 178.57 km^2 including additional 13 villages and the area around which remained undeveloped because of lack of infrastructure.

The Table 2-6 presents the land use break up in Solapur. Since the current land use break up for the SMC area is not available, the prevailing land use presented in the development plan is presented here. The development plan proposed an increase in the residential area from 1160.4 ha to 6513.41 ha an aggregate increase of 461%. However as per the discussions with the department officials, there is no significant development in the extended areas of the city due to lack of infrastructure and basic amenities.

Table 2-6: Land Use Proposed in the Development Plan of Solapur

Land Use	Existing (1994)			Proposed (2017)		
	Area (Ha)	% of Total Area	% of developed Area	Area (Ha)	% of Total Area	% of Developed Area
Residential	1160.4	6.50%	25.44%	6513.41	36.47%	59.59%
Mixed Use	121.1	0.68%	2.66%	1191.97	6.67%	10.36%
Industrial	287.2	1.61%	6.30%	452.76	2.54%	3.93%
Commercial	167.5	0.94%	3.67%	204.96	1.15%	1.78%
Transport and Communication	896.2	5.02%	19.65%	1027.08	5.75%	8.92%
Public and Semi Public	680.84	3.81%	14.93%	652.9	3.66%	5.67%
Public Utilities	40.96	0.23%	0.90%	75.48	0.42%	0.66%
Garden, Play Ground				260.75	1.46%	2.27%
Burial Cremation Ground	76.96	0.43%	1.69%	84.81	0.47%	0.74%
Water Bodies	377.43	2.11%	8.27%	492.04	2.76%	4.28%

Land Use	Existing (1994)			Proposed (2017)		
	Area (Ha)	% of Total Area	% of developed Area	Area (Ha)	% of Total Area	% of Developed Area
Agricultural Land	11926.61	66.79%	-	6348.34	35.55%	55.16%
Vacant Land	1369.2	7.67%	-	-		
SPA-I (MIDC +MHADA)	460	2.58%	10.08%	553	3.10%	4.80%
SPA-II (MHADA)	293	1.64%	6.42%			
Total Area	17857.5	100.00%		17857.5	100.00%	
Developed Area	4561.69	25.54%		11509.16	64.45%	
Un Developed Area	13295.81	74.46%		6348.34	35.55%	

Source: Development Plan of Solapur (1997-2017)

2.6.3.1. Comparison with URDPFI Guidelines[2]

The land use of Solapur as provided in the development plan has been compared with urban and regional development plan formulation and implementation (URDPFI) guidelines to assess the adequacy of existing areas under various land uses. As indicated in the table below, the city lacks adequate land use share under residential, industrial, public and semi-public, and recreational categories. Commercial and transportation use is meeting URDPFI guidelines.

Table 2-7: Existing Land Use and Comparison with URDPFI Guidelines

Category	URDPFI Guidelines	Existing (1994)
Residential	40 – 45%	7.81%
Commercial	3 – 4 %	0.94%
Industrial	8 – 10%	5.83%
Public & Semi Public	10 – 12%	3.81%
Recreational	18 - 20%	
Transportation	12 - 14%	5.02 %
Agricultural/Vacant/Forest and Water Bodies	Balance	77%

From the Table 2-7, it could be observed that the road network constitutes 5.02% of the total Solapur city area. As per the URDPFI Guidelines, the city should have an area under transportation between 12-14%, which the city is not meeting the requirement. The core city is encompassed within two ring roads

[2] For cities with population – 5 to 10 lakhs

which if developed efficiently can resolve most of the congestion issues within the city. The roads developed within the city area, are not adequate to accommodate the traffic load. These roads have also been encroached in some parts of the city; the road network does not cater efficiently to the areas which were merged in to the municipal limits in 1992.

2.7. Traffic and Transportation System

2.7.1. Connectivity

2.7.1.1. Road Connectivity:

Solapur is well-connected by road with major cities of Maharashtra as well as the adjoining State Capital of Hyderabad and important cities in Karnataka by four National Highways namely;

- NH 9 highway connecting Pune with Vijaywada via Hyderabad,
- NH-13 connecting Solapur to Mangalore, Karnataka
- NH-211 connecting Solapur to Dhule and;
- NH 204 connecting Ratnagiri-Nagpur passes through city.

Recently, sanctioned National Highways- Solapur - Gulbarga and Ratnagiri-Solapur-Nagpur (Refer to Figure 2-3***).***

2.7.1.2. Rail Connectivity

Solapur Railway Station is the main hub within the city. The Solapur Railway Division is an important division connecting South India to Western and North West India. Trains from Ahmedabad, Jaipur, New Delhi, Mumbai, Pune etc,. ply to Southern states (Telangana, Karnataka, Tamil Nadu & Kerala) via Solapur.

It is served daily by Solapur Bangalore express, Solapur Nagpur, Solapur Pune Hutatma Express, Solapur Mumbai, Solapur Jaipur Superfast express and Solapur Goa Express

2.7.1.3. Air Connectivity

Solapur Airport is located to the South of the Solapur city. At present it is not covered by any airline operator.

2.7.2. Road Network

In SMC the city engineer department is responsible for the development if roads in the city. Solapur being a city of industrial importance has a comprehensive road network in the city. Also the city is well connected to the nearby regional centers like Pune, Aurangabad, Beed etc. Also there are certain

sections of the important national highways and state highways pass through Solapur. The total road length in the city is 1903 km which is represented in the Figure 2-5. The Figure 2-6 provides the type of roads according to their carriageway width as well as according to their top material. As per the road hierarchy presented in the Figure 2-6, 42% roads are under the classification of other roads, 52% roads fall under the classification of collector roads and remaining 6% roads fall under sub arterial and arterial roads.

Figure 2-5: Road Network in Solapur City

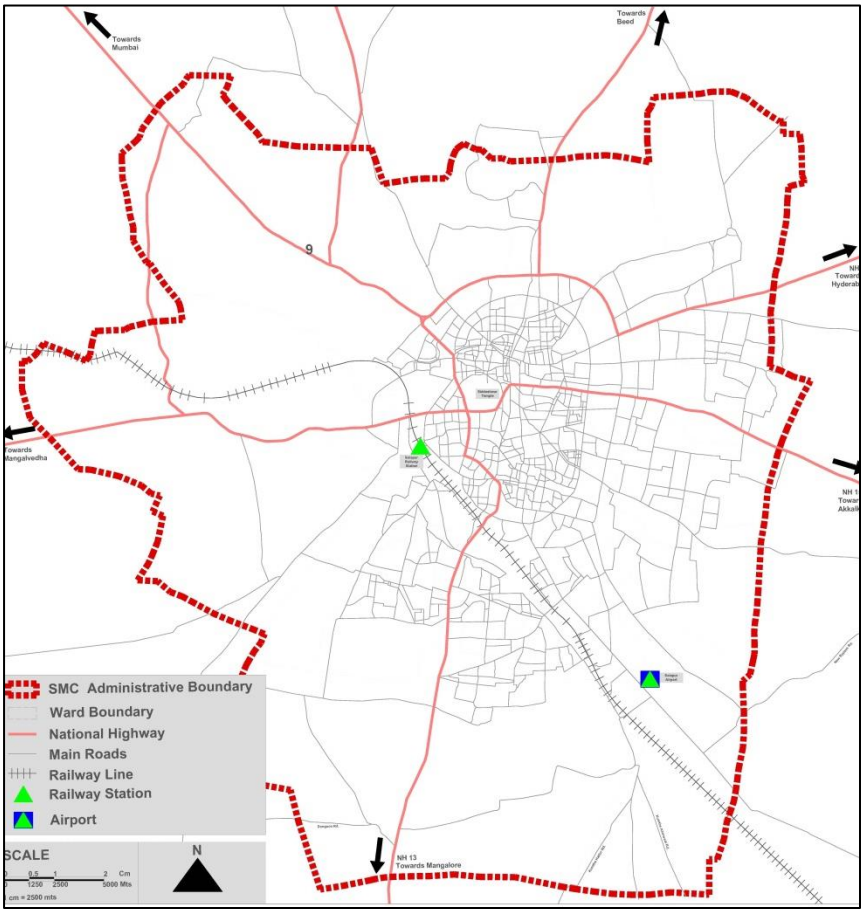
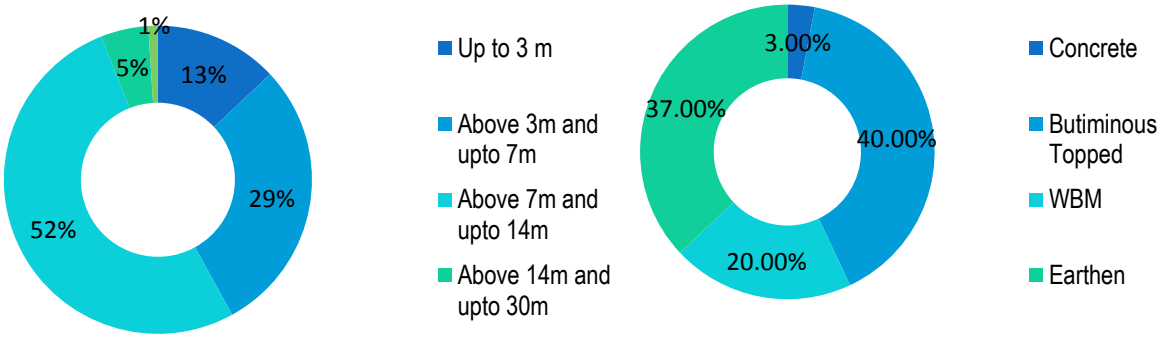


Figure 2-6: Category of Roads in Solapur Municipal Corporation (SMC) area



Source: City Development Plan, Solapur

With regard to the condition of roads, as presented in the figure below, 63% roads are surfaced and 37% roads are un-surfaced. Majority of these un-surfaced roads are in the extended city areas.

Some of the major junctions in Solapur are as follows:-

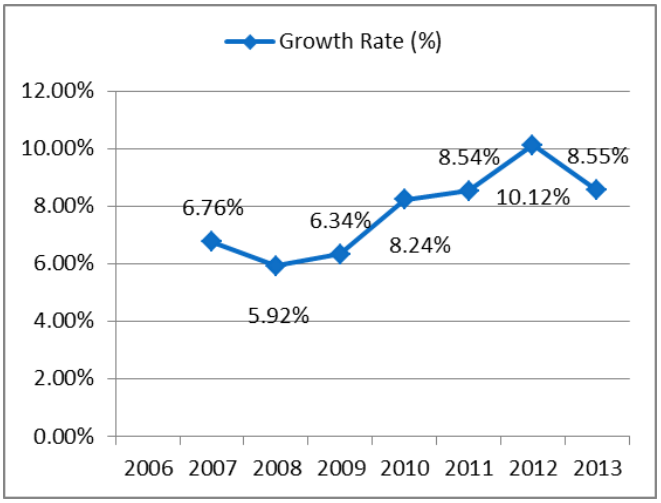
1. Railway Station Area;
2. Panjrapol (Bus Stand Area)
3. Sat Rasta
4. Lucky Chowk
5. Rangbhavan
6. Park Chowk
7. Kontam Chowk
8. Ashok Chowk
9. Shivaji Chowk
10. Chatrapati Sambhaji Chowk (on Pune Solapur Road)

2.7.3. Registered Vehicles in Solapur City

Major mode of transportation used by the citizen of the city is two wheelers. The motor vehicle statistics of the Solapur reveals that of the total 5,54,731 vehicle registered in the city till 31st March 2013, of which 4,09,021 are two wheelers which constitute approximately 75% of the total vehicles in the city. When the same figures for the subsequent year are assessed, it can be seen that the total vehicles in the city has grown to 5,54,731 registering a growth rate of 9.35%. While the share of 2 Wheelers remains at 80%. The Figure 2-7 & Table 2-8 represents the composition of the registered vehicles in the city of Solapur

Figure 2-7: Growth of Vehicles in Solapur City

Year	No. of Vehicles Registered	Growth Rate (%)
2006	314,376	
2007	337,182	6.76%
2008	358,417	5.92%
2009	382,663	6.34%
2010	417,013	8.24%
2011	455,944	8.54%
2012	507,298	10.12%
2013	554,731	8.55%



Source: Motor Transport Statistics of Maharashtra 2010 – 2011, 2011-12 and 2012-13

Urban Mass Transit Company Limited

Table 2-8: Mode wise distribution of vehicles registered in Solapur City

Vehicle Wise	No. of Registered Vehicles 2011	% Share of Vehicles 2011	No. of Registered Vehicles 2012	% Share of Vehicles 2012	No. of Registered Vehicles 2013	% Share of Vehicles 2013
Two Wheeler	364,806	80.03%	407,562	80.31%	409,021	73.73%
Four Wheeler	31,032	6.81%	34,448	6.79%	85,905	15.49%
Goods Vehicle	23,970	5.26%	25,279	4.98%	27,471	4.95%
Tractors	13,151	2.89%	16,612	3.27%	11,820	2.13%
Trailer	12,559	2.76%	12,962	2.55%	3,473	0.63%
Auto Rickshaws	8,614	1.89%	8,569	1.69%	8,538	1.54%
Taxis	984	0.22%	1,150	0.23%	4,610	0.83%
Buses	447	0.10%	404	0.08%	2,396	0.43%
Other Vehicles	247	0.05%	474	0.09%	1,497	0.27%
Total	**455,810**	**100.00%**	**507,460**	**100.00%**	**554,731**	**100.00%**

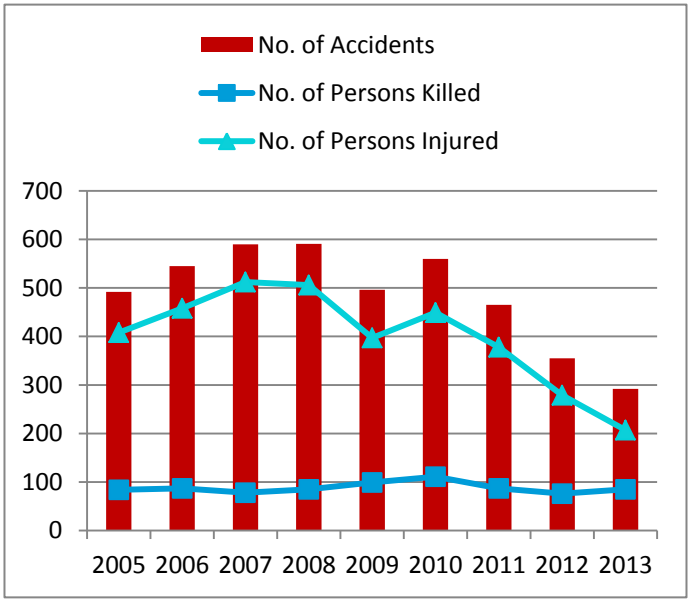
Source: Motor Transport Statistics of Maharashtra 2010 – 2011, 2011-12 and 2012-13

2.7.4. Accidents

The trend of motor vehicle accidents in Solapur from 2005 onwards is shown in the Figure 2-8 below.

Figure 2-8: Accidents Trend in Solapur City

Year	No. of Accidents	No. of Persons Killed	No. of Persons Injured
2005	492	84	408
2006	545	87	458
2007	590	78	512
2008	591	85	506
2009	496	99	397
2010	560	111	449
2011	465	87	378
2012	355	76	279
2013	292	85	207



Source: Motor Transport Statistics of Maharashtra 2010 – 2011, 2011-12 and 2012-13

The mixed nature of roads, improper junction geometric and un-signalized junctions lead to major accidents in Solapur. It has been observed that nearly 98% of the accidents occurred due to the rash driving of motor vehicles. It can be observed from the above figure that the number of accidents in the Solapur has decreased from 449 in 2010 to 207 in 2013. This shows that improvement measures w.r.t the road conditions and traffic management in the city are taken by the traffic police department.

2.7.5. Pedestrian and NMV Facilities

The city has inadequate pedestrian infrastructure. There is no foot over bridges, sub-ways, pedestrian-only traffic signals. In fact the city lacks in provisions for dedicated NMV lanes and dedicated parking facilities for cycle rickshaws.

2.7.6. Parking Characteristics

Most of the internal road network specifically the network in the core city area faces major difficulty of congestion and unavailability of the full right of way (RoW) due to encroachment by haphazard on-street parking. The city lacks in provision of sufficient and dedicated off street parking facilities. Also the on-street parking is not managed and maintained in structured manner. This is effectively reducing the network capacity and further adding to the congestion level. Vijapur Road, Karkhana Road, Akkalkot Road, Park Chowk, Zhila Parisad Road, Saraf Katta, Kontam Chowk Area, Station Road, Navi Peth are the main areas crowded with unauthorized on-street parking.

2.7.7. Public Transport Characteristics

Before independence, the facilities for public transportation in Solapur were provided by private companies. The Solapur Municipality had implemented the Bombay Municipal Burrows Act (1925) and started local bus services in Solapur from 10-01-1949. In 1978 the services of bus transportation were extended to Holgi Road, Industrial Places, Sugar Factories, Airport, MIDC, Vijapur Raoad and nearby villages, while developing the city.

Currently the urban public transportation in Solapur is managed by the Solapur Municipal Transport (SMT). SMT was established in April, 1965 based on the B.P.M.C Act 1949. Currently, SMT operates 106 own buses and 40 additional buses on hire basis. The ownership of the hired buses remains with the private operator, however the manpower for running the operations is supplied by SMT. Based on the daily ridership data collected from the SMT, it was observed that in the year 2012-13; 50,724 passengers used public transport, which essentially means that 5% of the city population use public transportation facility. SMT operates city bus services on 39 routes. The age wise distribution of 106

buses, around 70% of the fleet is at least 15 years old and face high operation cost, breakdowns and high pollution levels.[3]

Solapur Municipal Transport (SMT) had submitted a detailed project report, to avail the funds under the extended JnNURM Scheme, which has been duly approved by the Central Sanctioning and Monitoring Committee (CSMC) meeting. This would imbibe 200 buses on the streets of Solapur.

2.7.7.1. Public Transportation Ridership

Table 2-9, there has been no substantial increase in the public transport ridership in SMC from 2007-08 to 2012-23 owing to the condition of the buses available with the SMT. Also, the available fleet of the buses is not entirely owned by the SMT and is rented from the private agencies which puts the additional financial burden on SMT. The total available fleet with the SMT (combined fleet from the private operators as well as from the private suppliers) is 146 buses. As against this, the average daily fleet available for the operations remains in the range of 65-80 buses i.e, 45% to 55% of the total available fleet.

Table 2-9: Passenger and Fleet Details of Solapur Municipal Transport (SMT)

Year	Total Fleet	Average Daily Fleet	Average Passenger per day
2007-08	127	78	46148
2008-09	134	84	56356
2009-10	91	80	50230
2010-11	92	65	44326
2011-12	102	69	48900
2012-13	146	73	50724

Source: Detailed Project Report for Solapur Municipal Transport (SMT)

2.7.8. Issues

Based on the reconnaissance survey, the following observations were made with respect to the city's traffic and transportation.

Land use

- Road network constitutes 5.02% of the total Solapur city area. As per the URDPFI Guidelines, the city should have an area under transportation between 12-14%.

[3] Detailed Project Report for procurement of Buses under the extended JnNURM Scheme for Solapur

Road Network

- Major portion of the roads in the city are unpaved, i.e. 37% of the total roads in the city are un-paved roads. Movement of vehicles on the un-paved roads leads to increase in soil particles to rise and lead to increased air pollution in the city. Also the time taken for travel on the un-paved roads is more compared to the paved roads.
- Other road elements such as street lighting, footpaths, and faulty junction designs have been missing.
- In Solapur, 13 intersections are having the automated signal indicators. Considering the road length of the city, additional 20 junctions / intersections in the city are to be provided with automated signals.
- There is no provision of street infrastructure for the differently abled people, who have been completely neglected.

Public Transportation

- Condition of public transportation in the city needs up-gradation, Of the total estimated population of the city in 2013, only five percent of the population use public transport.
- The SMC has a bus fleet of 146 buses for the public transportation in the city. As mentioned in the section 70% of the buses are more than 15 years old. Of the total bus fleet in the city, only 50% is available for daily bus operations.

Parking

- In absence of the dedicated parking spaces in the core city, and commercial activities in the core city lead to use of the available row for on street parking reducing the available right of way for traffic movement.

Non-Motorized Transport

- Based on the reconnaissance survey, it was observed that majority of the people use cycles and cycle rickshaws for their daily travel requirement, yet there is no provision of dedicated NMV lanes within the city.

2.8. Observations from City Development Plan, Solapur

To make Solapur city a transportation node for the region with efficient road network and safe, reliable public transport system, the following development goals were suggested in the CDP

- Increase the share of public transport and minimize traffic congestion

- Minimize road accidents and improve the pedestrian related infrastructure.

To achieve the same the following strategies were suggested;

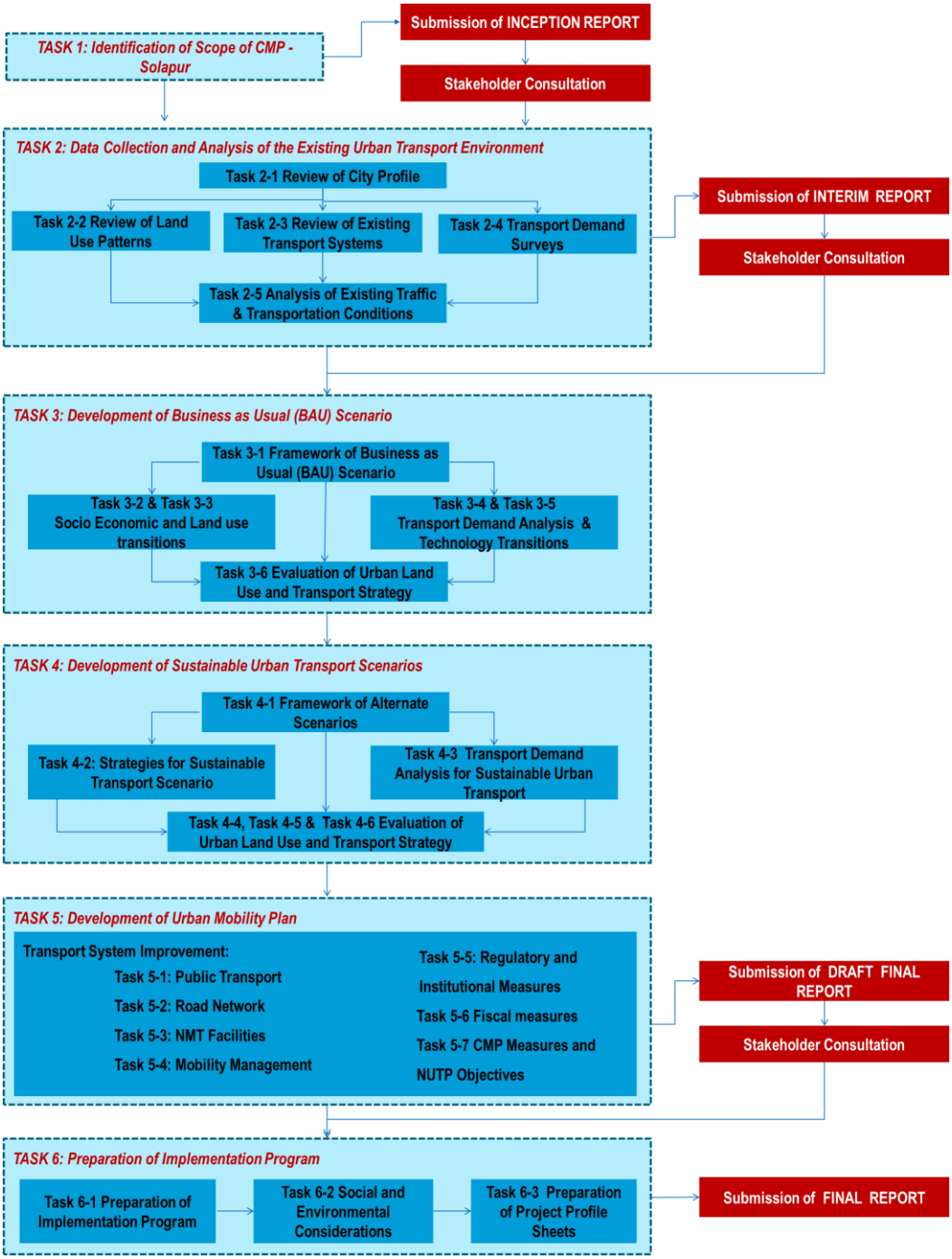
- Prepare a comprehensive traffic and transportation plan for the city,
- Undertake a road condition survey for the entire road network in the city,
- Improve traffic management systems by diverting traffic and creating one way traffic systems in congested roads,
- Prepare an inventory of roads to be provided with footpaths,
- Route rationalization of existing bus routes
- Prepare a business plan for DMT
- Develop a multi storied parking and paid parking at the identified locations at the earliest.

CDP has envisaged a total sectoral capital investment in the traffic and transportation for the horizon year 2021 to be Rs 632.42 crores. The CDP also suggested the possibility of executing the identified interventions through PPP mode.

Chapter 3. Approach and Methodology

This chapter defines the approach and methodology of the study, based on the CMP Toolkit as published by the Ministry of Urban Development (MoUD), Government of India (GoI). The Study shall be accomplished through a series of tasks, which are explained in detail in the following sections. The study methodology is shown in the Figure 3-1.

Figure 3-1: Study Methodology



3.1. Mobilization and Reconnaissance

3.1.1. Initial Consultations

Before mobilizing the team and resources, UMTC has consulted the SMC Officials and discussed about the project in detail to ensure that UMTC understood the agreement terms, the scope of work and the expectations of the client team.

3.1.2. Kick-Off Meeting

The kick meeting with the client is an important activity. The kick off meeting would serve the following purposes:

- Introduction between UMTC and client team
- Jointly identify the geographical scope of the study area for study purposes
- Establish general communication and project progress reporting procedures
- Establish coordination mechanism between different agencies involved in the Technical Advisory Committee.
- Review and assessment of project needs and Consultants approach and methodology, team deployed, staffing schedule etc.
- Undertake preliminary field reconnaissance along with client for understanding of issues
- Identify key issues of the client and agree on the methodology to tackle them

Accordingly, the consultants had a kickoff meeting with the staff of SMC in Solapur on March 18-19, 2015 and met with other stakeholders like SMC, RTO etc.

3.2. Scope of Work

The tasks to be taken up as part of the study are mentioned below;

- Task 1: Delineate the planning area and the planning horizon
- Task 2: Data Collection and Analysis of the Existing Urban Transport and Environment
- Task 3: Development of Business as Usual (BAU) Scenario
- Task 4: Development of Sustainable Urban Transport Scenarios
- Task 5: Development of Urban Mobility Plan
- Task 6: Preparation of Implementation Program

The detailed methodology for performing each of these tasks is mentioned as under;

3.2.1. Task 1: Defining the Scope of CMP

3.2.1.1. Delineate the Planning Area

The planning area for the study has been delineated based on the following parameters;

- Existing growth pattern of city.
- Existing urban agglomeration as identified in the master plan/regional plan of Solapur city.
- Areas that forms the part of the urban settlements and fringe area limits.

Based on the afore-mentioned aspects and in consultation with the stakeholders including Solapur Municipal Corporation (SMC), the city plan covers an area of 178.57 Sq. kms. The study area of Solapur is shown in the Figure 2-1.

3.2.1.2. Determine Planning Horizons

CMP provides a roadmap for the development of transport-related infrastructure to provide desirable level of mobility and reduction in carbon emissions. The plan relies on “avoid, shift and improve” methodology, i.e., avoid motorized trips where possible or give options of using shared/public transport. It encourages a shift to low carbon modes and an improvement in the overall efficiency of motorized vehicles.

It has been ascertained that the overall goal of CMP Solapur can be realized over a long term horizon period of 20 years. This timeframe has been divided into three time horizons. The three horizon periods are divided as follows;

1. **Short-term:** The short-term time horizon will last for 0-3 years, starting from 2015-2019. It will focus on short term planning measures that include intersection improvements, signalization of intersections, improvement of non-motorized transport, improvement in pedestrian facilities, traffic circulation plans, parking plans etc. the overall emphasis will remain on imporving the safety and accessibility standards.
2. **Medium term:** The time period for this horizon will last for five to ten years, till 2025. The focus will be on medium term planning projects such as NMT corridors, city bus networks and NMT networks. The objective of medium term planning is to arrest the current trend of heavy dependency on private vehicles and set ground for higher PT and NMT usage in the future.
3. **Long term:** This is a 20 year long term period, lasting up to 2035 with a long-term vision of achieving overall low carbon mobility goals.

3.2.1.3. Work Plan

The period of preparation of CMP for Solapur is estimated to be about 8 months for the current study area of 178.57 Sq kms of Solapur Municipal Corporation (SMC).

3.2.2. Task 2: Data Collection and Analysis of the Existing Urban Transport and Environment.

3.2.2.1. Task 2-1: Review of the City Profile

The various aspects which define the profile of the study area are studied in this task. The likely points are mentioned below and the CMP includes detailed study of these points;

- **Preliminary Reconnaissance:** One of the first tasks that we would undertake to appreciate the transport issues in proposed cities is to conduct a reconnaissance that covers;
    - Location and area
    - Population and Demographic Data
    - Land Use
    - Regional Linkages
    - Socio economic data
    - Environmental Issues such as natural conservation areas.
- **Review of Past Studies and Data Collection:** A thorough review of the past studies, which have significance to the current study, will be undertaken to understand the growth of transport scenario in Solapur over the years. The study reports that will be reviewed include the following;
    - Earlier CTTS and other reports done, if any
    - National Urban Transport Policy, Ministry of Urban Development and Poverty Alleviation – 2006
    - Study of Traffic and Transportation Policies and Strategies in Urban Areas in India
    - City Development Plans, if any
    - Land Use Master Plan, if any
    - Ongoing DPRs, if any
    - Any other related plans/studies

The Consultant team would extensively travel in the Study Area to appreciate the transport system demand and supply scenario, problems, network deficiencies, understand the role of public transport system and make a preliminary assessment of the same. Also, a list of all the concerned officers will be prepared to establish a rapport and open-up communication and to train a few among them.

3.2.2.2. Task 2-2: Delineation of Traffic Analysis Zones

For the purpose of analysis and development of travel demand forecasting model, the study area is required to be sub-divided into smaller areas known as Traffic Analysis Zones (TAZ's). The TAZ's would be delineated based on the factors such as administrative boundaries, physical barriers like water bodies, railway lines, highways and homogeneous land uses.

3.2.2.3. Task 2-3: Review of Land use Pattern and Population Density

Keeping in view of Solapur City, existing and proposed future land use maps of the study area will be plotted in an appropriate GIS platform like Arc Info and Arc GIS and following parameters would be observed and analyzed;

- The proportion of land use for various purposes i.e, Residential, Commercial, Institutional, Recreational, Transportation etc.
- Accessibility of people between different types of land use area.
- Densities of each type of land use i.e. population density, employment density (number of employment opportunities per commercial and land area used) etc.

The study of these trends gives a broad idea on the development pattern of the city.

3.2.2.4. Task 2-4: Review of the Existing Transport Systems

A review of existing transport infrastructure and facilities will be done for all the transport modes including public transport (private and public), private vehicles, walking, cycling, cycle rickshaw, auto rickshaw, shared auto rickshaw etc,.The data requirement of the same could be analyzed w.r.t the previous studies, secondary data and primary surveys, which would be visually represented on maps and tables.

3.2.2.5. Task 2-5: Study of Existing Travel Behavior.

The primary surveys conducted would cover the travel behaviors of all individuals within a household, and the data should be segregated by mode and trip purpose. The detailed methodology for the collection of travel demand data and the required primary surveys is explained in the following chapter.

3.2.2.6. Task 2-6: Review of Energy and Environment

Energy considerations are one of the key concerns of the "Smart city". Quantifying the energy consumptions for transport is important in estimating the CO_2 and local air pollution emissions from transport related activities. The vehicle stock can be obtained from the vehicle registration records Hence the data shall be collected for the fuel sales in the study area and total fuel sold various gas

stations in the study area shall give an approximation on the total energy consumed for the transport sector in the study area.

3.2.2.7. Task 2-7: Service Level Benchmarks

Infrastructural data collected should be compared with the service level benchmarks to understand the level of service provided to the citizen of certain specified parameters. Some of the indicators are as mentioned below;

1. Public Transport Facilities
2. Pedestrian Infrastructure Facilities
3. Non-Motorized Transport (NMT) facilities
4. Level of Usage of Intelligent Transport System (ITS) facilities
5. Travel speed (motorized and mass transit) along the major corridors
6. Availability of Parking spaces
7. Road Safety
8. Pollution levels
9. Integrated Land use Transport system
10. Financial Sustainability of Public Transport by bus.

3.2.3. Task 3: Development of Business as Usual (BAU) Scenario

3.2.3.1. Task 3-1: Framework for Scenarios:

The scenario represents the future based on the continuation of past trends and is often used as a reference point or benchmark for assessing the need for policy interventions. The BAU scenario extrapolates existing trends and assumes no radical policy interventions for sustainable development and emission mitigation. However, it does incorporate infrastructure development and land use according to the Master Plans.

3.2.3.2. Task 3-2: Socio Economic Projections

The future demand for the system will be based on an estimation of the following socio-economic aspects.

- **Population Growth:** It will be projected based on the trends available from studies conducted in the past and census data.
- **Economic Growth:** The overall economic growth of the city will be projected based on the growth trends of the Per Capita Income and the Gross Domestic Product (GDP). The relation

between economic growth, particularly income growth with the increase in vehicle ownership may be useful measure for projecting per capita carbon emission trends for different income strata of the population.

- **Vehicular Growth:** The growth in number of private and public vehicles will be projected using the vehicle registration records from the local Road Transport Office/Authority (RTO/RTA) in Solapur.
- **Sectoral Growth:** The growth trends for primary, secondary and tertiary sectors of the economy will need to be considered to present an overall growth of the Solapur city. Each of these sectors lead to unique travel demands and expectations from the transportation system. Therefore, each will need to be estimated for developing a comprehensive travel demand model.

3.2.3.3. Task 3-3: Land Use Transitions

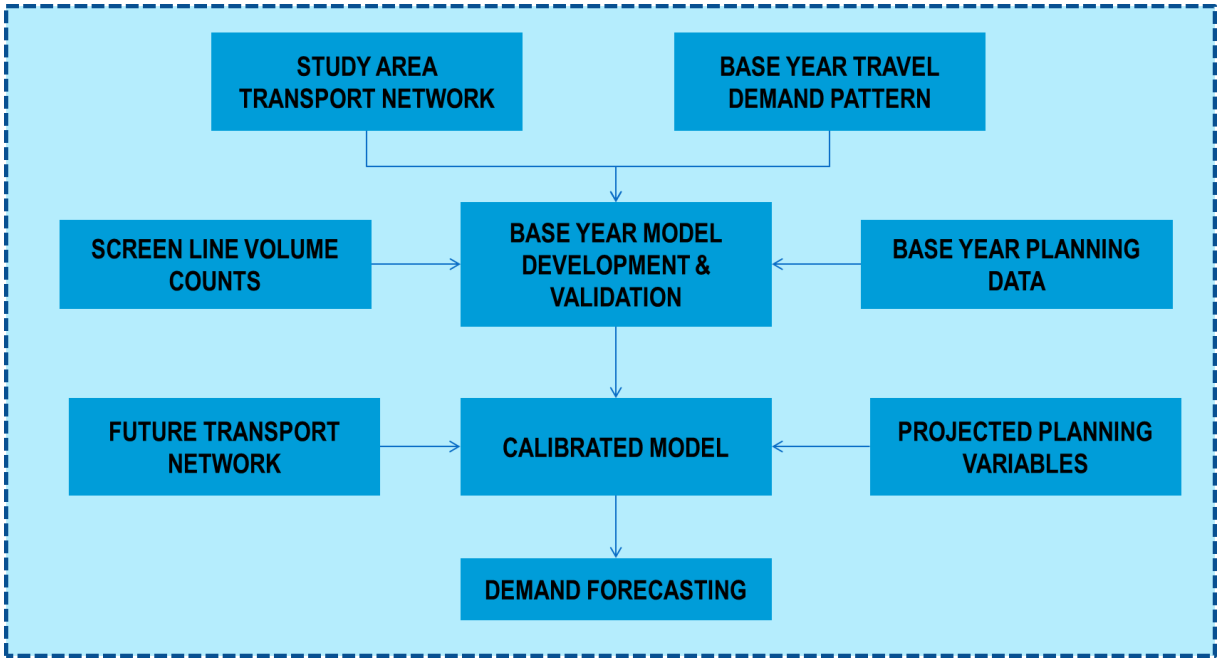
The objectives of a successful land use development and growth models is to identify where, how much and what kind of land use will develop. When modelling urban developments, it is necessary to consider changes from a vacant land to built-up, as well as changes in the land use itself, such as from residential to commercial. The change in the land-use of different categories would be assessed and projected for the future years, based on which the impact of land-use on transport would be analyzed.

3.2.3.4. Task 3-4: Transport Demand Analysis

The demand for the passenger transport can be estimated using a four stage model. A travel demand model for Solapur will be developed to simulate the existing travel conditions, and forecast the future travel demand and its impacts. This model developed using GIS based transportation softwares such as VISUM/CUBE.

Broadly speaking, travel demand models are used to determine the number of trips (demand) on a given network (supply) at any point of time. Travel demand forecasting models are used to predict the change in travel pattern, magnitude and utilization of transportation system in response to the changes in the regional development, demographic and transportation system. The broad framework for the transport modelling is shown in the Figure 3-2.

Figure 3-2: Broad Framework for Travel Demand Modelling



The model development is based on a conventional 4-stage transport model approach. It includes;

1. Trip Generation – calculating the number of origins and destinations for each zone.
2. Trip Distribution – attaching the origins and destinations for complete trips.
3. Mode Choice – determining the mode for each trip (TW, car, auto, Public transport).
4. Assignment –assigning passengers to their respective highway and transit networks.

The highway (road) network with all the major roads and some key minor roads. The transit system would be built with the existing public transport system in all its forms i.e. bus and rail, Minibuses and shared auto with their routes, frequency, fare structure etc.

Calibration: Trip ends (derived from the Trip end models) will be used to build base year trip matrices by mode using distribution functions from past information. Distribution function is adjusted until assigned flows compare well with observed flows. These base year trip matrices are checked for their accuracy by assigning distributed trips by mode on the road network. The assigned traffic across the screen lines are compared with the observed traffic. Once the model is calibrated, it can be used to predict the future travel patterns under different land use transport scenarios.

The model is responsive to:

- Street congestion, travel costs, availability of competing transport modes including other Public Transport systems and the growth of the city.
- Generalized costs that include out of pocket costs i.e. fare, vehicle operating cost etc. and perceived user costs such as value of travel time, cost of waiting time for transit etc.,

- The economic development of the city. A comprehensive data on economic development in the form of land-use and transport development proposals was collected.

Peak period models provide much more accurate indications of directional travel patterns during design conditions than do daily models. However, the daily traffic forecasts can be estimated using peak today expansion factor which is obtained from the traffic survey.

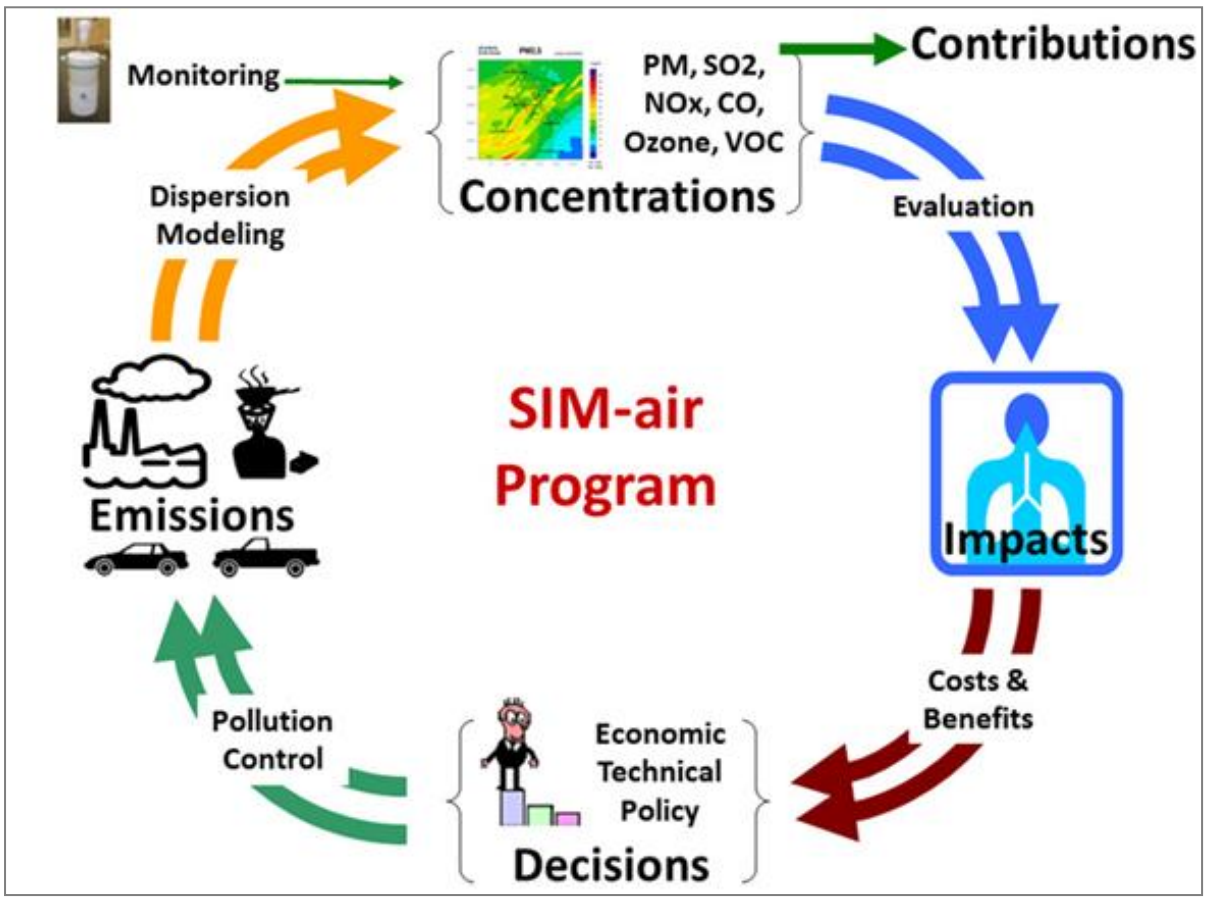
3.2.3.5. Task 3-5: Technology Transitions

An understanding of the vehicles, fuels and CO_2 emissions from electricity use in transportation system is essential to learning the implications of travel demand on CO_2 emissions and air quality.

3.2.3.6. Task 3-6: CO_2 Emissions and Air Quality

This task involves modelling the energy consumption for transport and the emissions generated in the Study area. There are a few tools available to undertake this analysis. For this study, a simple interactive model for better air quality (SIM-air), which combines a 4-stage transport model with an emission inventory and air diffusion model, which can analyze the impact of activities from different sectors, including transport, on the local environment, energy use and CO_2 emissions.

Figure 3-3: SIM- Air Program



3.2.3.7. Task 3-7: Analysis and Indicators

The indicators for the BAU scenario are similar to those estimated for the base year (Please refer to 3.2.2.7)

3.2.4. Task 4: Development of Business as Usual (BAU) Scenario

The study will develop four alternate scenarios for the horizon years, based on the four strategies that have been identified in the terms of reference for introducing mitigations to the BAU scenario. The scenarios will be analyzed to project the likely deviations from the BAU scenarios considering each indicator. The four different strategies have been detailed below;

3.2.4.1. Task 4-1 Framework for Scenario

The existing structure of Indian cities is compact with high density and multi nuclei development. This results in shorter trip length. However, the existing development strategies and plans might result in increasing trip lengths. The following scenarios shall be developed and modelled in order to reduce trip lengths.

3.2.4.2. Task 4-2 Strategies for Sustainable Urban Transport Scenario

CMP's must identify investment priorities to help achieve the sustainable city goals. The emphasis is placed on improving technology in terms of efficiency and emissions. The key strategies are as mentioned as below;

Alternate Scenario with mitigations in Urban Structure

a) **Proposed Master Plan Scenario:** Growth of the city will be assumed to be guided by the existing master plan. The strengths and weaknesses of the master plan according to low carbon targets will be evaluated.
b) **Mixed Land Use Scenario:** Structure of all new developments will be treated as mixed use. Hence, the average trip length in old and new development would aggregate to a low value and promote the use of non-motorized modes. This can arrest the creation of an activity center which would form a core for congestion and indirectly lead to an increase in emissions.
c) **Corridor Oriented Development Scenario:** Such development is usually assigned along major travel corridors. It promotes the use of high capacity public transport or mass transit systems, which help achieve low carbon targets in the city.

d) **Growth of Satellite Cities:** All new satellite cities will be treated as independent sub- cities with individual central business districts. This can restrict the commute between the main city and these satellite towns.

Alternate Scenario with Improvements in Public Transport

Improving public transport involves infrastructural improvements like reserving bus-lanes and tracks, improving location and design of stops and operational improvements. The improvement in level of service is likely to not only result in retaining the existing modal share of public transport but also cause a shift from other modes to the use of public transport. The following scenarios will be developed:

a) **City-Wide Bus Transport System**: A comprehensive citywide bus network will be developed and modelled to meet the travel demand. This network shall be evaluated against emissions and low carbon objectives.
b) **Adaptive Transit:** Change in land use is usually very tough to implement in developed and old areas of the city. Keeping in mind the nature of all areas with such land use, suitable transit such as minibuses, para transit and motor and cycle rickshaws will provide connectivity in the short and medium term.
c) **Transit-Oriented Development:** Major travel corridors will be identified in the city and mass transit modes will be provided along these corridors. The rest of the road network will be built around these major corridors by providing feeder services to them.
d) **Combination of Transport Modes**: A combination of the afore-mentioned three strategies will be adopted.

Alternate Scenario with Improvements in Non-Motorized Transport

Improving non-motorized transport (NMT), which will involve development of a conducive environment to provide barrier free, direct, continuous, comfortable, safe and secure movement. The likely shift in modal share from motorized to non-motorized modes by providing a combination of these infrastructure items will be modelled:

a) Footpaths along all arterial and sub arterial roads.
b) Exclusive cycle lanes along all arterial and sub arterial roads.
c) Traffic calming measures in residential zones.
d) Adequate street furniture to promote NMT modes and spaces for street hawkers and vendors.
e) Public bicycling and bicycling schemes.

Alternate Scenario with Advancements in Vehicle Technology

Technological changes and their diffusion are determined at the national level and will be provided as an input to the city level scenarios. The urban transport scenario can be improved by the following improvements in technology:

a) Use of Intelligent Transport Systems (ITS) to manage all modes of traffic in an efficient and better way.
b) Improvement in vehicle and fuel technology to reduce emissions of particular vehicles, such as conversion of all public transport to low emission fuels, for example, CNG or bio-fuels.

3.2.4.3. Task 4-3 Transport Demand Analysis of Alternative Strategies for Sustainable Urban Transport

The above mentioned scenario's aim is to improve transport infrastructure and increase the cost of using personal motorized vehicles. Two methods can be used to estimate travel demand for different modes under alternative scenarios;

In this method, a four-step model (as discussed in Task 3-4) is repeated, taking into account changes in parameters associated with different modes such as cost, travel time, availability, comfort and safety. These changes result in changed impedance to different modes and consequently, changes in the people's transport choices.

3.2.4.4. Task 4-4 Technology Transitions under a Low Carbon Scenario

In this scenario, the fuel mix is expected to diversify further from BAU towards bio-fuels, electricity and natural gas. Vehicle efficiency will also improve, and thus the overall demand for fuels will be lower. This can be affected by central/state policy interventions.

3.2.4.5. Task 4-5 CO_2 Emissions and Air Quality

The model framework is same as the BAU scenario for estimating CO_2 emissions and air quality.

3.2.4.6. Task 4-6 Analysis and Indicators (Comparison with Benchmarks)

The various indicators for the sustainable urban transport scenario are similar to those estimated for the base year (Task 2-8); which would be indeed compared.

3.2.5. Task 5: Development of Urban Mobility Plan

Based on the analysis of existing urban transport, BAU scenario, preferred land use and transport scenario vision and strategy for development a detailed urban mobility plan for the city should be prepared.

With multiple modes, multiple choices and multiple costs for transport, transport itself is not a single element entity. Solutions for transport, hence, must have a multi-pronged approach, which are mentioned as under.

3.2.5.1. Task 5-1 Integrated Land Use and Urban Mobility Plan

Traffic patterns and volumes have been changing in the study area during the last several years. Continued development and redevelopment within the proposed cities including commercial, industrial, institutional and residential, is anticipated to affect traffic patterns and volumes to an even greater extent.

The plan will be used to guide the development and maintenance of a safe, affordable and efficient road network to meet the projected economic development and social needs of the study cities over the next 20 years.

The proposed plan will focus on improving public safety, serving the regional economy and social needs while complementing ongoing land development. The plan will recommend solutions with a view to providing an efficient, economical, socially responsible and environmentally sustainable road network in the study cities. The solutions are to be developed to a conceptual planning level (i.e., single line with associated functional characteristics) with preliminary cost estimates. The plan will recommend strategies that will contribute to sustainable transportation including alternative sources of funding for the recommended solutions.

As part of Land-use integration and Network development, we will look into the following two strategies:

- Strategy 1: Transit Oriented Development (TOD) – strengthening the mass transit system with development focused on major transport nodes.
- Strategy 2: Adaptive Transit- refers to the development of transport systems that can be adopted to the existing city structure, typically for those with low density and spread out development.

3.2.5.2. Task 5-2 Formulation of the Public Transport Improvement Plan

Based on the projected demand by various modes of transport, it will be assessed that other forms of transportations systems may be required for meeting the demand in the horizon years. The configuration and combination of various modes of transport which can meet the travel demand will be decided based on the envisaged travel pattern.

Choices on public transit options are choices about a city's future. Multiple choices exist in mass transit industry. The type of public transit system chosen for proposed cities will have a big impact on

- Traffic Congestion
- Air and noise pollution
- Transport affordability
- Service availability to all

Public transport plan include measures to enhance the current bus systems, additional low/medium/high mass transit options.

The Mass Rapid Transit Systems (MRTS) available can be broadly grouped into a 'rail system' and a 'bus system' classification. The distinguishing characteristic is whether the transit vehicle can use city streets without special modifications, or whether the vehicle requires special "guideways" to operate. In simplest terms, the vehicles in the rail system must operate on rails, or other guideways that cannot be used by automobiles. The bus system can have its own dedicated guideway, but these vehicles are able to leave the guideway and use city streets. This distinction is important in areas where limited right-of-way (ROW) is available. Within these rail and bus families, different technologies have different performance characteristics and requirements to be implemented.

The different technologies can be compared based upon their performance characteristics, and the requirements to construct and operate.

The following characteristics are important in identifying a suitable transit system for the proposed cities:

- Carrying Capacity - In determining what technology may be appropriate for a region, the first item to be considered is the desired carrying capacity of the system. Some technologies can carry many more riders than others. This capacity is measured in terms of the number of passengers per hour per direction (PPHPD) that can be carried. This is calculated by simply multiplying vehicle capacity times the number of buses or trains operating per hour passing a given station. For most rail systems, the carrying capacity can be increased by adding additional cars to the train, without requiring additional operators or improvements in the signaling system. Buses offer some flexibility to use larger equipment, but significant increases in carrying capacity will require more vehicles and operators, which increases operating costs.
- Geometric Constraints - Geometric (physical) constraints required of the technology include estimated turning radius, space/right-of-way availability, profile grade, guideway length, and station spacing.

- Capital and Operating Costs - Every project presents an unique set of costs including initial capital investments to build and equip the system, periodic capital expenditures during its life to renew certain project elements, and ongoing costs to operate the service and maintain all of the system elements in good working order.

Several Mass Transit options are available that include both the rail system and the bus system. The transit systems considered here include:

- Heavy Rail Transit (HRT) or Subway or Metro
- Monorail (MRL)
- Light Rail Transit (LRT)
- Commuter Rail (CR)
- Bus Rapid Transit (BRT)
- Potential to develop a Trunk and Feeder PT Network

Selection of a particular type of Mass Transit System for the Town will depend on the characteristics of the options discussed above. The traffic projections from transportation model will give a picture about the future demand. It will also identify the critical corridors where a Mass Rapid Transit System is required. A detailed reconnaissance of these corridors will determine the practical feasibility of introducing the type of transit system considered.

Availability of funding will also play a major role in starting up a particular type of transit operation. As Consultants, we make a thorough study of all the factors, and based on that, will recommend a particular Mass Rapid System for the city.

3.2.5.3. Task 5-3 Preparation of Road Network Development Plan

It is important to list out the road projects which are to be developed, strengthened, upgraded and inter-connected including hierarchical road network, arterial road construction/widening projects, secondary road construction/widening projects, intersection improvement projects, flyover projects, railway over bridge or under pass projects. The hierarchical road network shall be based on the travel demand. The strategies shall reflect induced demand effects to estimate the overall benefit of any new road capacity.

3.2.5.4. Task 5-4 Preparation of NMT Facility Improvement Plan

It is important that initiatives are taken to not only preserve but to enhance the share and safety of the NMT. The NMT strategies would focus on the following:

- Maintain path surfaces. Establish a system to quickly identify and correct problems.

- Establish connected walking networks.
- Provide adequate walkway widths. Prevent vendors, pavement dwellers, vehicle parking and other uses from blocking walkways.
- Create bike lanes and bicycle boulevards (streets where bicycles have priority and motorists must drive at low speeds) where appropriate.
- Correct roadway hazards to non-motorized transport.
- Use street furniture (e.g. benches) and pedestrian friendly design features
- Provide bicycle safety education, law enforcement and encouragement.
- Integrate cycling with transit.
- Provide bicycle parking/rickshaw stands.
- Address security concerns of pedestrians and cyclists
- Address the tourism needs of each city with respect to its attraction as a tourist centre
- Cycle Stands and Rickshaws Stands
- Develop /encourage bike rentals/sharing

3.2.5.5. Task 5-5 Freight Movement Plan

The industrial growth of the study area would demand a suitable freight management strategy. Various strategies of increasing the efficiency of freight and commercial transport include:

- Segregation of long distance commercial vehicles from city roads
- Decongesting the market areas
- Route management of cargo movement
- Truck/Freight terminals
- Use of small and medium size vehicles with modern emission controls in the central city areas
- Restricted movement of commercial vehicles in central business districts and other mobility corridors.

3.2.5.6. Task 5-6 Mobility Management Measures

In CMP, traffic management plans cover parking management plans, traffic control measures, inter modal facilities, demand management measures, traffic safety plan and ITS.

3.2.5.7. Task 5-7 Development of Fiscal Measures

Fiscal Measures shall be considered to achieve the balanced modal split, and to secure the budget necessary to implement urban transport projects. As fiscal measures usually correspond to institutional and regulatory measures, the following aspects may have to be examined;

- Fare policy for public transportation, intermediate public transport and parking;
- Subsidy policy for public transport operators and intermediate transport operators;
- Taxation on private vehicles and public transport vehicles;
- Permits and regularization of intermediate public transport;
- Potential for road congestion charging;
- Influence private vehicle usage through parking and disincentavize free parking with private developments;
- Setting up of Unified Metropolitan Transport Authority to coordinate urban transport and related issues in million plus cities;
- Creating Special Purpose Vehicles particularly for Mass Transit System.

3.2.5.8. Task 5-8 Mobility Improvement Measures and NUTP Objectives

The land use and transport measures proposed in the CMP shall improve the mobility in the metropolitan area and cover the critical issues addressed in the NUTP.

3.2.6.Task 6: Preparation of the Implementation Program

This task involves the preparation of a comprehensive implementation plan for the proposed measures. The plan will include details on timeline for implementation and cost estimation. An assessment of potential benefits arising from each proposed measure will be detailed out. In addition, agencies responsible for each project will be identified as part of the implementation plan.

3.2.6.1. Task 6-1 Preparation of Implementation Programs

The above mentioned tasks involve the development of the various urban mobility measures as discussed earlier. The necessary interventions for these measures include a set of actionable projects to be implemented in the city and prioritized based on a linear timeframe. CMP's shall identify strategies based on the following timeframe categories;

- Immediate priority/actions (0 to 2 years)
- Short Term (2-5 years)
- Medium Term (5-10 years)

- Long Term (more than 10 years)

All the projects are presented to the city stakeholders and the implementing agency to identify the priority of the projects.

3.2.6.2. Task 6-2 Identification and Prioritization of Projects

The following criteria will be used for prioritizing and phasing of projects:

- Urgency of Implementation
- Capital Investment
- Ease of Implementation
- Resource Availability
- Environmental Impact Assessment

The phasing of projects will be done according to the long-Term, medium-term , short-term and Immediate requirements.

Projects, which require minimal capital and resource allocation and are expected to provide instant benefit to the traffic problems are given high priority and will fall under Immediate and Short-term Projects. On the other hand, projects that require high amounts of capital inflow, provide longer-term rather than immediate benefits and involve complex issues like land availability problems may be identified for medium and long-term implementation.

3.2.6.3. Task 6-3 Funding of Projects

As the CMP is a long term vision for the city authority, the overall ownership of the CMP lies with the ULB's. Given the ULB's dependence on funding, a city's CMP would make a resource assessment for all projects listed in the CMP and would suggest the city authority, city-specific and project specific indicative source of financing for the project.

3.2.6.4. Task 6-4 Monitoring of CMP Implementation

As per the MoUD advisory, CMP is the basis for approving projects, plans and various regulatory measures within the city related to transport, and it is therefore important to monitor and measure the impact of interventions taken as an outcome of CMP.

Chapter 4. Data Collection Plan

Keeping in view of the Solapur city, which requires an immense amount of data specifically designed and collected exclusively for it. The data shall be collected from secondary sources and various field studies to elicit the traffic and transportation characteristics of Solapur City.

4.1. Collection and Review of Secondary Data

Information from secondary sources and other published reports are currently being reviewed. The detailed information relating to city's physical, demographic and socio-economic profile; its transport system characteristics; traffic and travel demand characteristics and trends; organizational set-up in the transport sector, outlays and investment priorities in the city's transport system; etc. shall be compiled.

4.2. Primary Surveys

It is planned to conduct Traffic and Transportation Study (Comprehensive Mobility Plan (CMP)) in detail for Solapur that will guide the urban development of the city for the future and to undertake identified transport infrastructure projects to ease the existing congestion levels. It is therefore, necessary to have an estimate of existing traffic condition and travel pattern through various traffic surveys obtained from suitable selected traffic survey location in the study area. The following surveys would be taken up as part of the study;

1. Classified Volume Count Surveys and Road Side Interview Surveys at Cordon Locations
2. Classified Volume Count Surveys at Screenline Locations
3. Road side interview surveys at outer cordon locations
4. Road Network Inventory Surveys
5. Turning Movement counts at Intersections
6. Bus stop waiting, boarding-alighting survey
7. Bus/Rail terminal passenger count survey (Boarding and Alighting)
8. Bus/Rail OD Survey
9. Pedestrian Volume Count at Junctions and Midblock
10. Speed and Delay at Peak hour and Off Peak Hour
11. Household Interview Survey
12. Vehicle Operator Survey (Taxi, Goods, Auto)
13. NMT opinion Survey
14. Parking Survey (on street & off street)

15. Mode wise vehicle occupancy surveys.
16. Light meter surveys
17. Environmental/Energy Surveys

Primary Surveys would be carried out by UMTC. An illustrative list of surveys that would be conducted by UMTC is as enlisted in this section. The survey formats are attached as Annexure 1.

4.2.1. Classified Volume Count Surveys at Screen-line Locations

4.2.1.1. Objective of the Survey

The main objective of the survey is to estimate the classified vehicular volumes crossing the screen lines (imaginary lines drawn along water bodies/ railway lines etc) to be used for validation of the transport model.

4.2.1.2. Scope of Survey

- Defining the screen lines and designating the traffic count stations
- Counting of vehicles classified by the type of vehicle crossing the screen lines for 16 hours during the peak and the period preceding and succeeding the peak duration.

4.2.1.3. Conduct of the Survey

Manual traffic counts will be carried out at all locations where the road network cuts across the screen lines. Map indicating screen line survey location is given below. The city has well defined railway track (North – South) which can be used for model validation. Also an additional screen line (water body in East – West direction) will be used for making model more robust. Traffic counts will be carried out on a typical working day for 16 hours covering both morning and evening peak periods. At each identified station, both directional counts will be carried out by vehicle type. i.e. cars, jeeps, vans, buses, trucks, MAVs, LCV's tractors, motorized two wheelers and three wheelers, and slow moving vehicles. Screen line locations identified for Solapur CMP is shown in Figure 4-1.

1. SC 1 – Kumthe Aherwadi Railway Crossing
2. SC 2 – Hatture Vastri Railway Crossing
3. SC 3 – Model Colony/Girija Colony Managal Karyalay Point
4. SC 4 – Asara Bridge, Konark Nagar Crossing
5. SC 5 – Solapur Mangalore Highway/ Patrakar Bhawan
6. SC 6 – Navi Peth Crossing
7. SC 7 – Modi Railway Crossing

8. SC 8 – Sangola Mangalwedha Railway Crossing
9. SC 9 – Dharamsi Railway Crossing
10. SC 10 – Degaon – Kegaon Road Crossing.

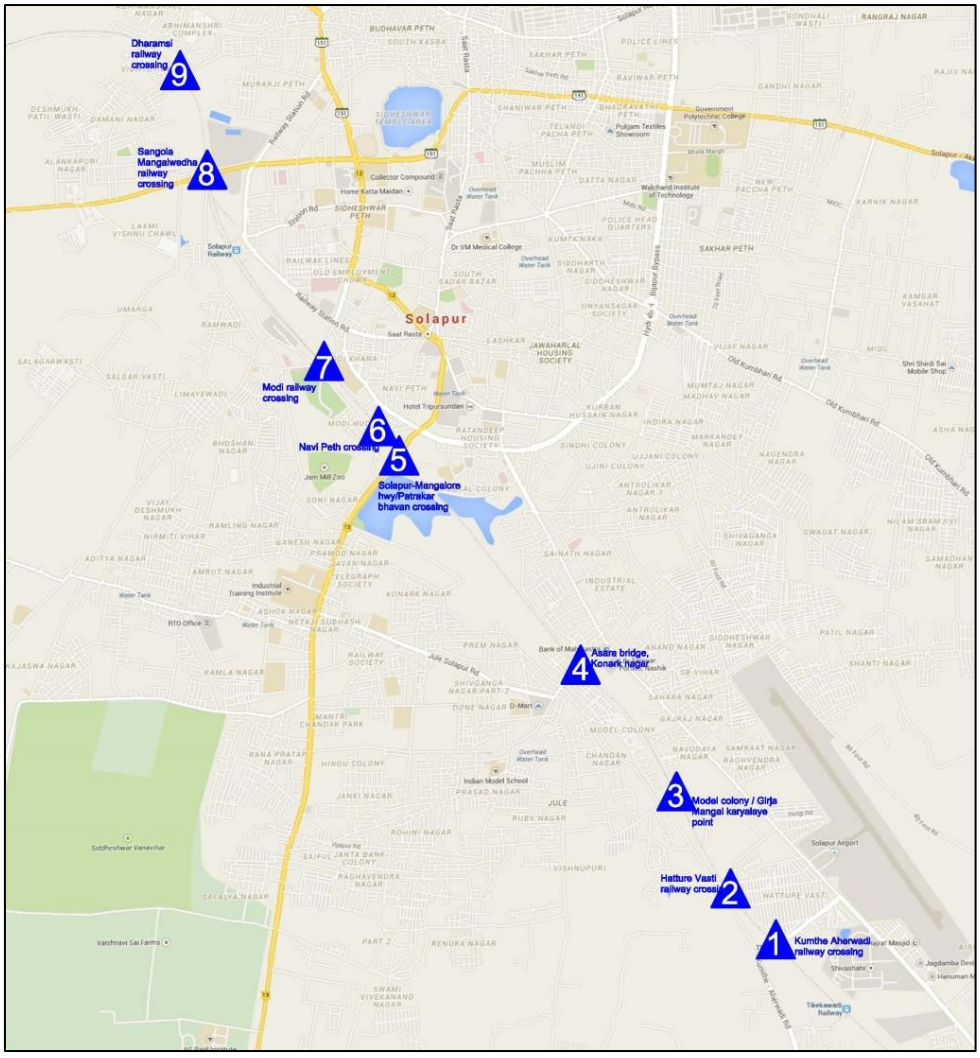
4.2.1.4. Data Entry and Analysis

The traffic data collected from the field will be scrutinized and processed. The Passenger Car Unit (PCU) values recommended by Indian Roads Congress (IRC) will be used in the analysis. All results will be presented in tabular and pie chart forms for each count station.

4.2.1.5. Key Outputs:

- Peak Hour Volume at the survey stations (Veh/Hr. and PCU/Hr)
- Traffic by Vehicle type and hourly distribution of Traffic
- Variation in flow during survey period

Figure 4-1: Screen Line Survey Locations



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4.2.2. Road side interview surveys at outer cordon locations

4.2.2.1. Survey Objectives

The main objective of the survey is to derive the passenger and freight travel pattern by road. The survey shall be conducted at the cordon points selected for the study area. These surveys will be aimed at analyzing the traffic movement within the study area and also the interaction between outer and within the study area (floating population). The data shall be used to validate the urban transport demand model and to estimate the significance of bypass/ring roads for the study area.

Mode wise trip Characteristics such as origin, destination, trip purpose, trip frequency, etc shall be elicited.

4.2.2.2. Scope of the Survey

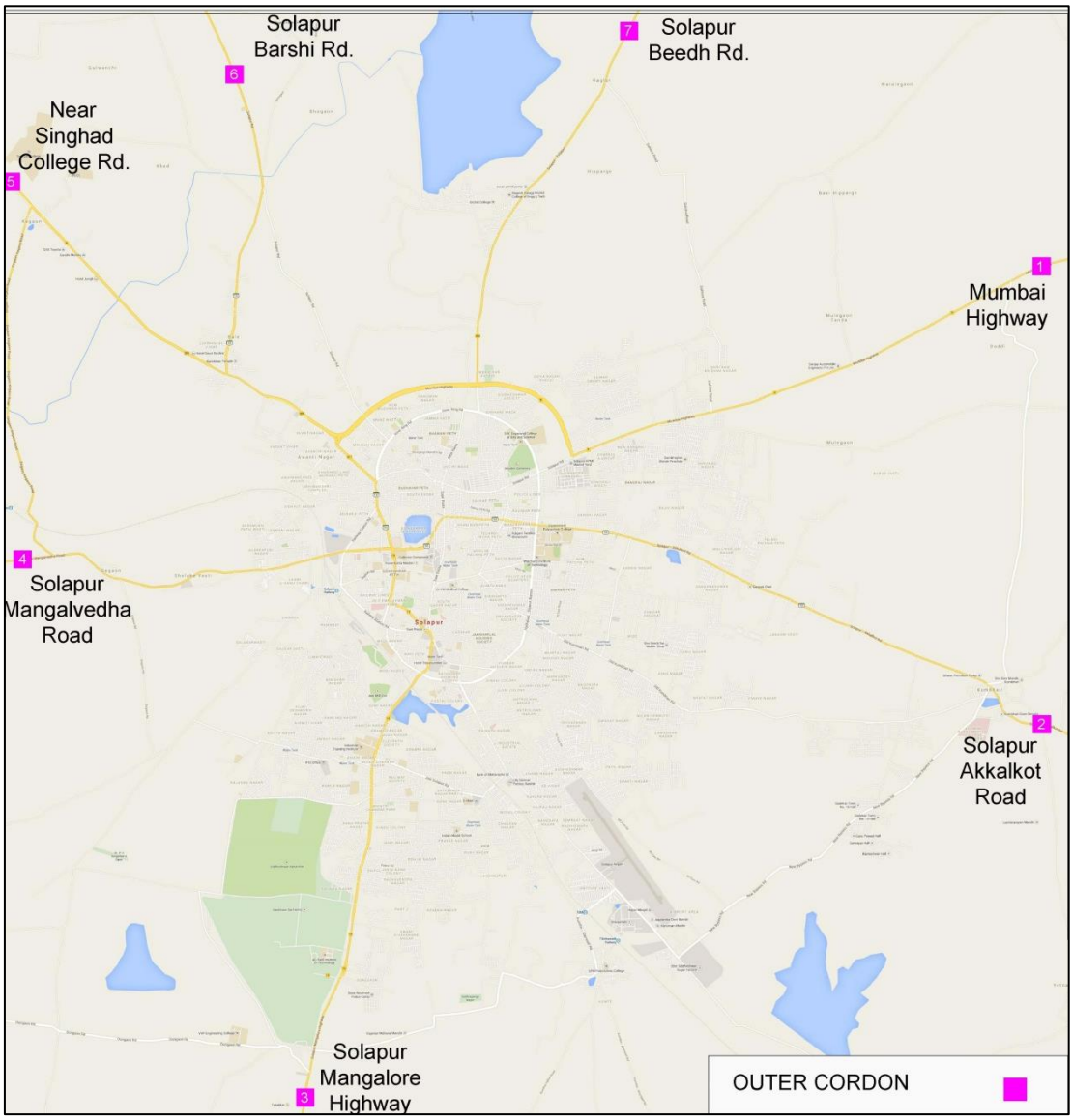
The scope of the survey includes conducting interviews at selected locations in the study area along the cordons identified in the study area. At all the locations, survey shall be carried out for 24 hours at locations on the outer cordon and for a period of 16 hours at remaining locations on the inner cordon.

4.2.2.3. Conduct of the Survey

Interviews will be carried out on a sample basis on a typical working day (to cover regular trips) by stopping the vehicles with the help of police. The objective will be to achieve minimum sample coverage of 10 percent spread across the time of the day and type of vehicles proportionately. Classified volume counts shall be carried out along with the interviews in order to calculate expansion factors. The list of outer cordon survey location is presented below. The locations area also indicated in Figure 4-2.

1. OC 1- Mumbai Highway
2. OC 2 – Solapur Akkalkot Road
3. OC 3 – Solapur Mangalore Highway
4. OC 4 – Solapur Mangalvedha Road
5. OC 5 – Near Singhad College Road
6. OC 6 – Solapur Barshi Road
7. OC 7 – Solapur Beedh Road

Figure 4-2: Outer Cordon Survey Locations



4.2.2.4. Data Entry and Analysis

Zoning: Traffic analysis zones (TAZ) adopted will be utilized to establish the travel pattern. The zoning system of the study shall be carefully designed as its hierarchical system of the fine zones within the study area and larger districts to achieve the multiple objects of the study. For the study, the administrative boundaries of wards in the Urban local body shall be retained as TAZ and outer areas shall be divided into larger zones. The zones shall relate to the road and railway networks. The population of a zone at the end of the horizon period should be preferably 15000 and not exceed 25000, so as to have realistic forecast of intra-zonal trips and to avoid overloading of the network.

The information collected will include origin and destination of trip, occupancy, trip purpose and in the case of goods vehicles their type and tonnage. The collected data will be coded according to TAZ and

processed to eliminate all illogical data and entry errors. The data will be processed and expanded to total traffic using the expansion factors for each vehicle type. Desire line diagram will be prepared for passenger and goods vehicles separately, from which the project influence area will be identified.

Location-wise and mode-wise OD matrices for peak period shall be merged to develop a single matrix for the study area using suitable computer programs and the merged OD shall be used I developing the urban transport model.

4.2.2.5. Key Outputs

- Mode-wise OD matrices
- Trip frequency
- Trip purpose
- Average Occupancy

4.2.3. Road Network Inventory Surveys

4.2.3.1. Objective of the Survey

Road network inventory will be aimed at developing and updating the network database with the existing features of roadway sections. Details like link lengths, cross-sectional details, type and general condition of the surface, pavement width, median type and width, on-street parking provision, traffic control devices, etc., will be collected.

4.2.3.2. Scope of the Survey:

- Validating the existing road network data available for the region
- Collecting the road network details for those stretches whose details are not available

4.2.3.3. Conduct of the Survey

A full-scale inventory surveys will be undertaken to create a road network database. Inventories of the following facilities will be undertaken as part of the task.

- Road Network
- Effective Road width
- Quality of riding surface
- Adjoining Land use and available Access control
- Intersection Facilities
- Pedestrian Facilities
- Parking Facilities

- Traffic Control/management Measures like one -ways.

A team of two enumerators each shall traverse the road network and the datasheet to record the road network details listed above. The network selected for road network inventory is shown in Figure 4.2.

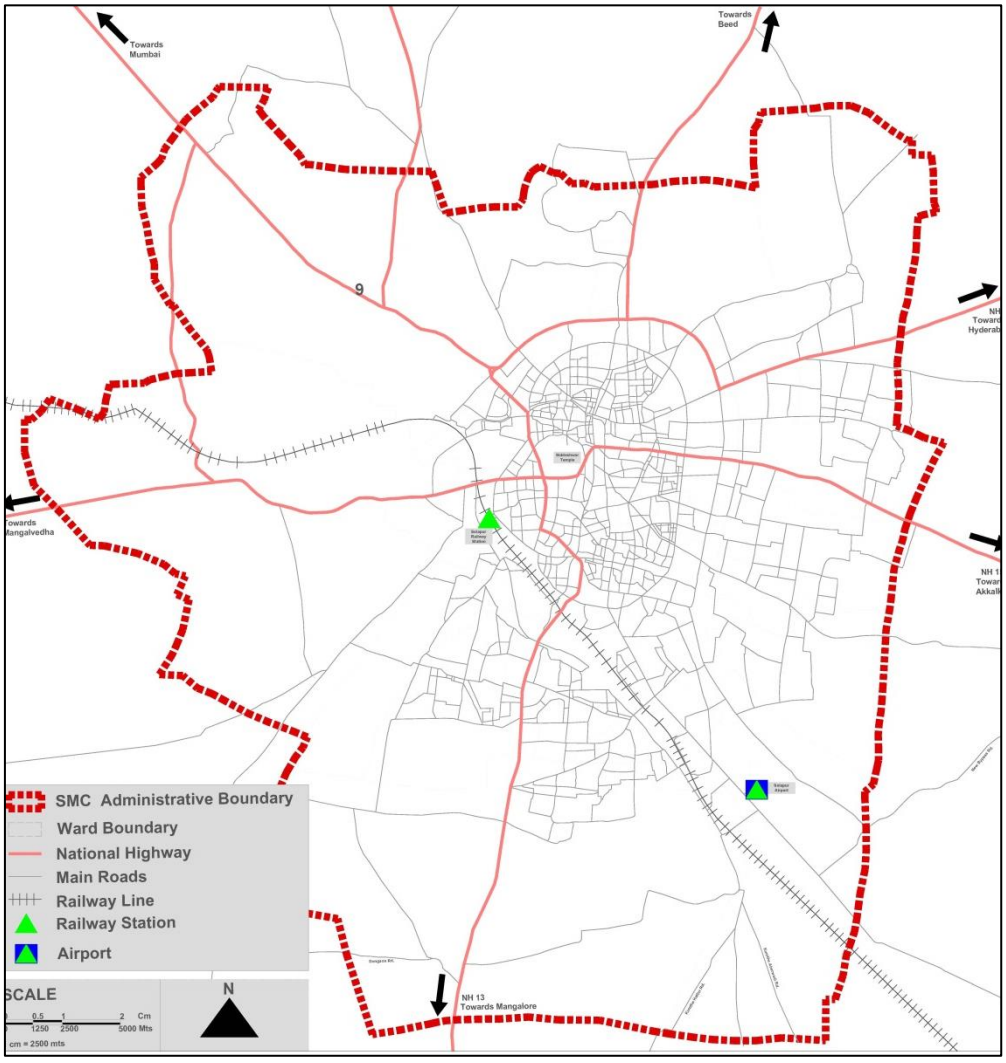
4.2.3.4. Data Entry and Analysis

The road network attribute data collected from the field will be used to develop transport network database. The database will be used in developing the base year network facilitating both qualitative and quantitative evaluation of the present sufficiency of road networks vis-à-vis existing standards and usage pattern.

4.2.3.5. Key Outputs

- Transport Network database of study area.

Figure 4-3: Road Network Inventory Surveys



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4.2.4. Turning Movement counts at Intersections

4.2.4.1. Survey Objectives

Surveys will be conducted at critical intersections identified within the city. The data will help in realising the seriousness of problem at the intersection, critical movements, etc.

4.2.4.2. Scope of Survey:

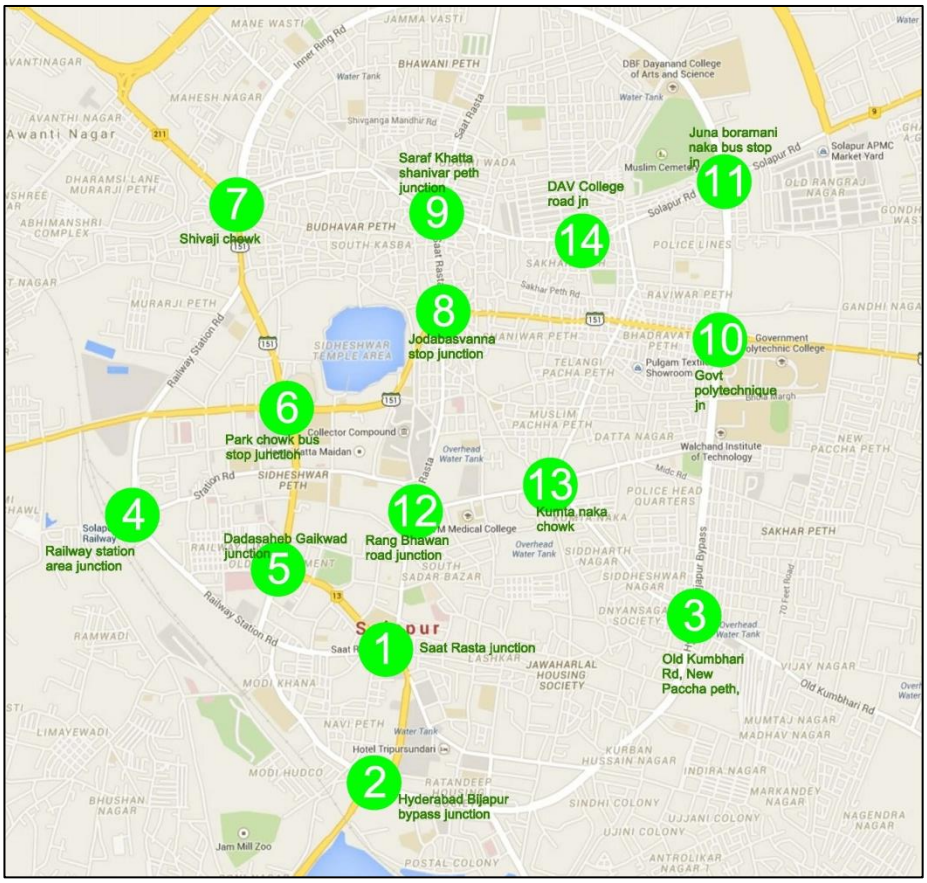
Counting of vehicles classified by the type of vehicles at the identified locations as shown in the Figure 4-3.

- JC 1 Saat Rasta Junction
- JC 2 Hyderabad Bijapur Bypass Junction
- JC 3 Old Kumbhari Road – New Pucca Peth
- JC 4 Railway Station Junction
- JC 5 Dadasaheb Gaikwad Junction
- JC 6 Park Chowk Bus Stop Location
- JC 7 Shivaji Chowk
- JC 8 Jodabasvanna Stop Junction
- JC 9 Saraf Khatta Shaniver Peth Junction
- JC 10 Government Polytechnique Junction
- JC 11 Juna Boramani Naka Bus Stop Junction
- JC 12 Rang Bhawan Jucntion
- JC 13 Kumta Naka Chowk
- JC 14 DAV College Road Junction

4.2.4.3. Key Outputs:

- Peak Hour Volume at critical junctions (Veh/Hr. and PCU/Hr)
- Traffic by Vehicle type and hourly distribution of Traffic
- Identification of traffic related issues at the junctions

Figure 4-4: Classified Turning Movement Counts Survey Locations



4.2.5. Bus stop waiting, boarding-alighting survey & Bus stop OD Survey

4.2.5.1. Survey Objective

The objective of the survey is to assess the modal split among different modes of transportation for the intra-city travelers.

4.2.5.2. Scope of the Survey

Conduct the survey for a period of 12 hours on different routes operating within the city and terminal areas.

4.2.5.3. Conduct of the Survey

Information regarding origin, destination, trip purpose, frequency of travel and other particulars are gathered. The random survey sampling technique will be adopted and survey would cover all modes i.e. taxis, auto-rickshaws, local buses, etc. Pricing information is also collected.

4.2.5.4. Data Entry and Analysis

The survey data collected from the field will be processed using appropriate analysis tools.

4.2.5.5. Key Outputs:

- Mode Choice Split
- Trip Characteristics of Mass Transport User

4.2.6. Bus/Rail OD Survey

4.2.6.1. Survey Objective

The principal objective of the study is to assess the magnitude of the movements of passengers plying between study area and the rest of the state and country.

4.2.6.2. Scope of the Survey

The survey will be planned for a period of 12 hours at intercity bus stations, railway stations, and at outer cordon points.

4.2.6.3. Conduct of the Survey

Questionnaire shall be designed to broadly collect the following information.

Trip Characteristics – origin, destination trip purpose, access mode, cost, travel time to access the terminal etc.

Enumerators will be stationed at terminals i.e. railway station, inter-city bus stations and private bus stands to interview incoming and outgoing passengers on a sample basis. The details pertaining to the trip information, further journey details, socio-economic data etc. will be collected during the interview.

Simultaneously, counts will also be carried throughout the survey duration to determine the sample size interviewed. The concerned Railway authorities, Airport officials, private bus operators and other public sector transport operators shall be contacted to get information on daily travel to expand the sample data.

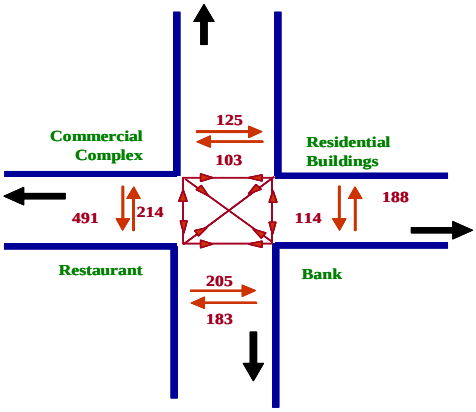
4.2.6.4. Key Outputs:

- External O-D matrix by mode and purpose
- Terminal Access mode choices/preferences

4.2.7. Pedestrian Volume Count at Junctions and Midblock

4.2.7.1. Survey Objective

The objective of the survey is to identify critical locations for pedestrian/Non-motorized vehicles movement.



4.2.7.2. Scope of the Survey

Pedestrian count surveys shall be proposed at critical locations where heavy pedestrian movement (along and across the roads and at intersections) is observed. The survey shall also cover locations abutting major traffic attraction zones like malls and major work centers.

4.2.7.3. Conduct of the Survey

Pedestrian counts will be carried out at intersection crosswalks, midblock crossings, or along sidewalks for a period of eight hours covering peak periods. The survey shall be carried out by direction of each pedestrian crossing the roadway and walking across the sidewalks. Identified locations for the Pedestrian Surveys are as follows;

- PC 1 Saat Rasta Junction
- PC 2 Hyderabad Bijapur Bypass Junction
- PC 3 Old Kumbhari Road – New Pucca Peth
- PC 4 Railway Station Junction
- PC 5 Dadasaheb Gaikwad Junction
- PC 6 Park Chowk Bus Stop Location
- PC 7 Shivaji Chowk
- PC 8 Jodabasvanna Stop Junction
- PC 9 Saraf Khatta Shaniver Peth Junction
- PC 10 Government Polytechnique Junction
- PC 11 Juna Boramani Naka Bus Stop Junction
- PC 12 Rang Bhawan Jucntion
- PC 13 Kumta Naka Chowk
- PC 14 DAV College Road Junction

4.2.7.4. Data Analysis

Data from the Pedestrian counts conducted at several locations on the selected stretches where pedestrians are

exposed to risk of accidents will be determined. The stretches from the analysis where the movement of the pedestrians is high will be marked and presented in a map. This will enable in identification of the High Risk Pedestrian Zones on the corridor roads and will enable in improvement options for pedestrian facilities

4.2.7.5. Key outputs:

- Identification of critical locations for pedestrian/Non-motorized vehicles movement
- Pedestrian Risk Zones
- Finalization of potential sites for safe

4.2.8. Speed and Delay at Peak hour and Off- Peak Hour

4.2.8.1. Survey Objectives

The principle objective of the survey is to find out the running speed, journey speed and types of delay such as stopped delay and operational delay to evaluate the level of service or quality of traffic flow of a road or entire road network system. In relation to the model, the purpose of this survey is dual – Journey speeds are used for validation of the urban transport model and to develop speed- flow functions for different categories of road network in the study area.

4.2.8.2. Scope of Work

- Carryout the surveys during peak and off-peak periods in both peak and off peak direction.
- Collection of delay information on different road stretches and at intersections in the study area

Speed studies will be conducted on all critical corridors, identified in consultation with the Client. Any additional links, which Consultants feel necessary for validation of the model, will be included.

4.2.8.3. Conduct of the Survey

There are several methods available for conducting this type of survey. Few of the methods are; moving observer method, registration number plate method and Elevated observer method. Floating car method is widely used in India. The enumerators shall note down the distance and time of travel between two junctions and stopping time of the vehicle along the road stretches, at intersections and the reasons for the same.

4.2.8.4. Key outputs:

- Travel and journey speeds along the corridors
- Delays along each of the selected corridors by type/reason
- Intersection delays

4.2.9. Household Interview Survey

4.2.9.1. Objective of the Survey

To establish and travel characteristics of the residents and the general socio-economic characteristics of the household influencing trip making. The data shall be used to develop mode-wise OD matrices to develop base year urban transport model for the study cities.

4.2.9.2. Scope of Work

The scope of the surveys includes:

- Carry out house hold surveys covering an average sample size of 2% of the population spread across the city.
- Collection of data on socio-economic characteristics, household members and their travel diary.

4.2.9.3. Conduct of the Survey

Analysis of recent electoral rolls / census details may provide a basis of selection of the sample. Stratified random sampling technique representing the entire population will be considered for selecting the samples. A statistically valid basis for expansion of the sample adequate to represent the total population of the study area and the geographical distribution of trips shall be adopted.

The survey questionnaire comprises of three sections, a) Socio-economic datasheet, b) Household member characteristic datasheet, and c) the travel diary of each individual member of the household. The travel diary section requests information for all trips made by each person in the household for the previous day. This information includes the time of the trip, the trip purpose, the address of the trip starting, ending place and the mode of travel. The respondents will also be given a set of stated preference questions to provide additional detail about their mode choice preferences across a range of travel conditions. A complete household survey script will be developed for client review Approved script will be used to develop the survey instruments. While the interviewers will be trained in the details of how to collect the survey data, the forms will be designed to be self-explanatory and to minimize the chances of miscoding or omitting data.

4.2.9.4. Ethical Issues

Utmost care will be taken during the field work to ensure total confidentiality of the responses. Field operations will be carried out as per the accepted ethical standards and human dignity. The respondents will be explained about the purpose of the study and interview before interviewing them.

4.2.9.5. Data Analysis

The household travel survey sample data thus collected will be expanded to represent the entire population. A bi-proportional fitting method will be used to correct the socio-de9mographic characteristics of the sample to the known distributions in the latest Census. Corrections for non-response will be developed based on the data on the number of contacts needed to generate a household response. Imputation methods that preserve the distribution of missing data elements will be used wherever appropriate to fill in important pieces of missing information in the survey responses.

The household survey will be used to estimate mode splits and mode choice model parameters. The trip diary information will provide descriptive information about current mode choices. Combined with network information about available mode options, this information can also be used as "revealed preference" data to estimate parameters of a mode choice model.

4.2.9.6. Key Outputs:

The outputs from the survey include

- Average household trip rate for the study area.
- Origin/destination trip matrix by mode
- Mode share
- Trip length distributions by mode

4.2.10. Vehicle Operator Survey (Taxi, Goods, Auto)

4.2.10.1. Survey Objective

Primary objective of the freight surveys is to establish the existing commercial vehicle quantum and pattern in the study area.

4.2.10.2. Scope of Survey

Collection of regional freight movement data, their origins and destinations within and outside the study area.

Collect data on commodity-wise quantity of freight movement within the study area, their frequent origins and destinations.

Collect the data on operations of industries and firms which transport goods within and outside the study area producing the demand for goods movement.

Besides trucks, a survey of operators of taxis, auto-rickshaws will be conducted to determine the operating costs, routes of operation etc.

4.2.10.3. Conduct of the Survey

Two types of field surveys will be conducted to obtain data about the goods movement:

- The cordon line / screenline Roadside interview surveys will be carried out.
- The survey of different categories of trucking companies operating in the study area and details on companies generating bulk goods will be conducted. Data collection in the cordon survey is limited to transport characteristics of the goods vehicle such as origin and destination, type of commodity, quantity and frequency of travel. The survey of industries and trucking companies is obviously a more detailed approach of collecting the information at the level of goods demand generation process.

4.2.10.4. Key Outputs

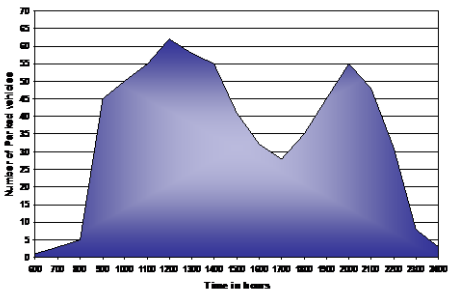
Commercial vehicle O-D Matrix

- Commercial Vehicle Operating Cost
- Truck trip rates

4.2.11. Parking Survey (on street & off street)

4.2.11.1. Survey Objective

The principal objective of the study is to assess the demand for parking, characteristics of the parked vehicles, present parking supply, etc in the study area.



4.2.11.2. Scope of the Survey

Conduct the survey for a period of 12 hours on all major corridors of work centers, business centers, shopping complexes and tourist places. The data shall be used to estimate the on-street parking demand, supply and to identify suitable short and medium term measures to handle parking demand.

4.2.11.3. Conduct of the Survey

Parking surveys will be carried out on all critical area. Enumerators are asked to note the vehicle type and registration number of parked vehicles every half an hour. Information will also be collected on the on associated parking fees and an inventory of the parking area also shall be carried out.

On street Parking Survey Locations:

During reconnaissance survey, central railway station and bus state transport terminal found as an important locations for off street parking surveys. However, the mentioned on street and off street locations will be finalized after discussion with SMC

4.2.11.4. Data Entry and Analysis

The parking data collected from the field will be processed using the appropriate analysis tools. The results will be presented in tabular and pie chart forms for each location.

4.2.11.5. Key Outputs:

- Peak Parking Demand Period and supply by Location
- Parking Demand by Vehicle Type
- Parking Duration Information

4.2.12. Environmental/Energy Surveys

In this phase, the available data on general and environmental profile will be collected from various secondary sources. Information such as population, physical and climatic features, ambient environmental quality, details of water bodies, ecological features, etc of the town comprising the area coming under the local planning area, will be obtained.

The data will be collected from various government agencies such as the Municipal Corporation, Karnataka Pollution Control Board, India Meteorological Department (IMD and published research papers, past study reports etc.

In addition to the above secondary data, field reconnaissance surveys and discussions will also be held with the stake holder agencies and institutions to understand the impacts of traffic and transportation trends on the environmental quality of the town.

Collation and analysis of the above information will provide the environmental profile of the town and its linkages with traffic and transportation.

4.3. Way forward

Based on the information/data collected from the secondary and primary sources, a basic analysis of the transport and traffic situation would be carried out, identifying characteristics and issues of the city, which would include analysis of existing urban transport situation and traffic characteristics.

Based on the existing situation analysis of traffic and transportation, a travel demand model will be developed to project future travel demand in order to estimate the likely consequences of several alternatives taking into consideration the "Business as Usual". Following the do nothing scenario the travel demand forecasts will be carried out for different horizon years. The forecast will be for different modes and in different alternate scenarios and for different time periods.

Based on the travel demand of the horizon years, a mobility plan for the city would be prepared with Short Term, Medium Term and Long Term Strategies.

Chapter 5. Work Plan & Deliverables

5.1. Work Plan, Timeline and Deliverables

UMTC will stay thoroughly engaged with the client at all points of the period of performance. The study will take 8 months to complete. The work plan for the study is presented in the Annexure 2. The deliverables are shown in Table 5-1.

Figure 5-1: Study Deliverables

Submission	Deliverable Time
Inception Report & Detailed Work Plan	M+1.5
Interim Report	M+4
Draft Final Report	M+6.5
Final Report	M+8

*M – Date of signing the Agreement

5.2. Quality Assurance Plan

UMTC will check the consistency of the data collected and will carry out the analysis using the best practices available. The deliverables will be produced in line with the Quality plan. The deliverables shall include the following reports;

- Inception Report & Detailed Work Plan
- Interim report
- Draft Final Report
- Final Report

Annexure 1

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

CLASSIFIED TRAFFIC VOLUME COUNT

Location | Date : | Day: | Enumerator :

Road Name : | Direction : | Weather:

Time	Buses				Private Vehicles & IPT						Goods Vehicles				Slow Moving Vehicles		
	City Bus	Long Distance Bus	Institutional Bus/Company Bus	Mini Bus	Van/Maxi Cab	Car	Taxi	Two Wheeler	shared Auto rickshaw	Auto Rickshaw	LCV	Trucks/2 Axle	MAV	Tractor	Cycle rickshaw	Cycles	Carts
:00 to :15																	
:15 to :30																	
:30 to :45																	
:45 to :00																	

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

TURNING VOLUME COUNT SURVEY

Junction Name :	Date :	Enumerator:
Road name :	Direction :	Weather :

Time	Buses				Private Vehicles & IPT					Goods Vehicles				Slow moving vehicles		
	City Bus	Long Distance Bus	Institutional /Company Bus	Mini bus	Van/Maxi Cab	Car/jeep	Two wheeler	Shared Auto rickshaw	Auto rickshaw	Truck /2 Axle	3 Axle/ MAV	LCV	Tractor	Cycle Rickshaw	Cycles	Cart
:00 to :15																
:15 to :30																
:30 to :45																
:45 to :00																

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

Parking Duration Survey - On Street Parking

Road name		**Date**	
Parking starting From:		**Enumerator**	
Parking ending at:		**Type of parking: Parallel/Angular/Perpendicular**	
Parking type:	Authorised/Unauthorised Paid / Free	**Length Of Parking:**	**Width Of Parking:**
Time		**Time**	**Time**

Code	Registration Number	Code	Registration Number	Code	Registration Number

No. Of Cycles/cycle rickshaws :	**No. Of Cycles/cycle rickshaws :**	**No. Of Cycles/cycle rickshaws :**
No. Of Carts :	**No. Of Carts :**	**No. Of Carts :**

Codes

CB - Car Big	*V- Van/Maxicab/Minibus*	*T- Trucks*
CS - Car Small	*B- Bus*	*M - MAV*
TW - Two Wheeler	A - Auto Rickshaw	*L- LCV*

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

SPEED AND DELAY SURVEY -Private vehicles

Road Name : Date:

No of Lanes : **Divided/Undivided:** **Oneway/Twoway:** Day :

Direction: Time :

Trip No:

Sl. No.	Time of survey	From Node	To Node	Distance (km)	Start Time in minutes	End Time in minutes	Time	Delay (Sec)	Purpose of delay

Purpose of delay: 1. Signal 2. Police control 3. Junction 4. Animal cross 5. Pedestrian cross 6. Traffic 7. Others

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

Road Side Interview Survey Format-Goods Vehicles

Name of the Road : **Interviewer :**

Date :

Location:

Day :

Direction:

Time(very Important)	Vehicle Type	Origin of the Trip	Destination of the Trip	Purpose of Journey	Trip Distance(Kms)	Goods Type	Loading in Tonnes	Trip Frequency	Market Vakue(Rs)
	1. LCV 2.Truck/ 2 Axle 2. MAV			1. Loading 2.Unloading 3.Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5.Others	
	1. Truck/ 2 Axle 2. MAV 3. LCV			1. Loading 2.Unloading 3.Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5.Others	
	1. Truck/ 2 Axle 2. MAV 3. LCV			1. Loading 2.Unloading 3.Others		1. Foodgrains, Vegetable, Cereals 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5.Others	

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

Road Side Interview Survey Format-Passenger Vehicles

Name of the Road :

Interviewer :

Date :

Location:

Day :

Direction:

Time(Very Important)	Vehicle Type	Occupancy	Origin of the Trip	Destination of the Trip	Purpose of Journey	Trip Distance(Kms)	Trip Frequency
	1. Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1. Work 2. Business 3. Education 4. Social & Recreaton 5. Tourism 6. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others
	1. Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1. Work 2. Business 3. Education 4. Social & Recreaton 5. Tourism 6. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others
	1. Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1. Work 2. Business 3. Education 4. Social & Recreaton 5. Tourism 6. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others
	1. Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1. Work 2. Business 3. Education 4. Social & Recreaton 5. Tourism 6. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others
	1. Two Wheeler 2. Car 3. Auto Rickshaw 4. Taxi				1. Work 2. Business 3. Education 4. Social & Recreaton 5. Tourism 6. Others		1. Daily 2. Alternate Day 3. Weekly 4. Monthly 5. Others

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

BUS STOP PASSENGER COUNT SURVEY

Name of Bus stop:

Road Name:

Date:

Direction:

Time(Hrs)	Route No/Name	Origin	Destination	Boarding	Alighting	Total

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

NON MOTORIZED TRANSPORT- OPINION SURVEY

Date: Location:

Dav: Interviewer:

Cycle ☐ Cycle Rickshaw ☐

1. Age:
2. Sex: (Male: M, Female: F) ☐
3. Trip Origin: ☐
4. Trip Destination: ☐
5. Distance of the trip in Km: ☐
6. Time taken for the trip : ☐
7. Trip Purpose: a)Work/Business b)Education c)Social d)Others ☐
8. Trip Frequency : a)Daily b)Weekly c)Monthly d)Rarely ☐
9. Travel & Maintenance cost per month : ☐
10. Problems while riding your vehicle: ☐

(Please rank as per your observation as 1,2,3,4,5,6 etc)

a) High Volume of Traffic ☐
b) High Speed of Vehicles ☐
c) Interference due to parking/pedestrians/bus stops ☐
d) Bad condition of road/shoulders ☐
e) Absence of proper lighting ☐
f) Difficulty in crossing junctions ☐

11. Your opinion on the necessity of separate track

a) Very essential ☐
b) Desirable ☐
c) Not required ☐
g) No idea ☐

12. Do you prefer exclusive track : Yes / No ☐

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR
HOUSEHOLD INTERVIEW SURVEY

SECTION C: INDIVIDUAL MEMBER TRIP INFORMATION (TRIPS PERFORMED ON PREVIOUS DAY)

Member No.	Trip No.	Trip Start Time	Link 2 - Main Trip (O-D)								Link 1: Start to Boarding Point					Link 3: Alighting Point to Final Destination				
			Origin	Destination	Trip Purpose	Mode	Distance (in kms)	Travel Time (in Mins)	Travel Cost (in Rs)	Waiting Time (in Mins)	Mode	Distance (in kms)	Travel Time (in Rs)	Travel Cost (In Rs.)	Waiting Time (in Mins)	Mode	Distance (in kms)	Travel Time (in Rs)	Travel Cost (In Rs.)	Waiting Time (in Mins)

Trip Purpose	1. Work	2. Business	3. Education	4. Social	5. Shopping	6. Others			
Mode of Travel	1. Car	2. Taxi	3. Shared Taxi	4. 2 Wheelers	5. Auto Rickshaw	6. Bus	7 Ferry	8. Cycle	9 Walk
Trip Length (in kms)	1. <=1	2. 1 to 2	3. 2 to 3	4. 3 to 5	5. 5 to 8	6. 8 to 10	7. >10		
Trip Time (in mins)	1. less than 5 mins	2. 5 to 10 mins	3. 10 to 15 mins	4. 15 to 20 mins	5. Greater than 20 mins				
Trip Cost (in Rs)	1. less than Rs 5	2. Rs 5 to Rs 10	3. Rs 10 to Rs 15	4. Rs 15 to Rs 20	5. Greater than Rs 20				
Waiting Time (in mins)	1. 1 to 2 mins	2. 2 to 5 mins	3. 5 to 10 mins	4. 10 to 15 mins	5. 15 to 20 mins	6. Greater than 20 mins			

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

HOUSEHOLD INTERVIEW SURVEY

Traffic Zone		Day	
Form No.		Date	
Name of the Enumerator		Name of the Supervisor	

SECTION A: HOUSEHOLD INFORMATION

1 Address of the Household

2 Telephone No./Mobile No.

3 Total No. of Family Members (Including Old Parent and Child)

4

Vehicle Type	Car	2 Wheeler	Cycle	Others
No. of Vehicles				

SECTION B: INDIVIDUAL FAMILY MEMBERS INFORMATION

S.No.	Member Name	Gender	Age	Education	Occupation	Monthly Income (in Rs)	Monthly Expenditure on Transport (in Rs)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							

CODES

Gender	1. Male	2. Female						
Age	1. 0 to 10 yrs	2. 10 to 20 yrs	3. 20 to 30 yrs	4. 30 to 40 yrs	5. above 40 yrs			
Education	1. Upto 12th Standard	2. Graduate	3. Post Graduate	4. Professional	5. Illiterate			
Occupation	1. Govt Employee	2. Private Employee	3. Student	4. Business	5. Housewife	6. Retired	7. Unemployed	8. Others
Monthly Income	1.<Rs 5,000	2. Rs 5000-10000	3. Rs 10000 - 15000	4. Rs 15000 -20000	5. Rs 20000-25000	6. >Rs 25000		
Monthly Expenditure on Transport	1. <=Rs 500	2. Rs 500 -750	3. Rs 750 - 1000	4. Rs 1000 - 1500	5. Rs 1500-2000	6. Rs 2000-2500	7. >Rs 2500	

COMPRENSIVE MOBILITY PLAN FOR SOLAPUR

ROAD INVENTORY SURVEY FORMAT

Road Name	Node Number		Length (in Kms)	Pavement Type	No of Lanes	Divided/Undivided	Oneway/Two way	Carriage Way Width(m)(Curb to Median)			Shoulder				Footpath				Drainage				Right Of Way Width(m)	Posted Speed Limit (Kmph)	Any Auto Stand (Onstreet/Offstreet)	Any Taxi Stand (Onstreet/Offstreet)	IS it a bus Route?(Yes/No)	No of Designated Bus stops	Any Bus bay?(mention the width and length)	On-street Parking	On-street Parking	Land Use (LHS)	Land Use (RHS)	Encroachments on footpaths/Shoulders	Street Lighting	Sign Boards	Road Markings	Remarks(if Cycle track,please mention)
											LHS		RHS		LHS		RHS		LHS		RHS																	
	From node	To node		Flexible/Rigid/Unpaved				LHS Width (m)	Median Width (m)	RHS Width (m)	Type (P/UP)	Width (m)	Type (P/UP)	Width (m)	Type (P/UP)	Width (m)	Type (P/UP)	Width (m)	(Opened/Closed)	Width (m)	(Opened/Closed)	Width (m)								Present/Absent	Approximte Length(m)	R/C/I/A/O/W	R/C/I/A/O/W	Heavy/ Moderate/Nil	Central / Roadside/Nil	(Fair/Good/Poor /NA)	(Fair/Good/Poor /NA)	

Land Use - R/C/I/A/O/W R- Residential ,C-Commercial, I - Instituional ,A-Agricultural O - Others , W-Waste Land

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

TRUCK OPERATORS INTERVIEW SURVEY FORMAT

---

1. Name of the Operator
2. Garage Address
3. Number of vehicles owned : LCV ☐ MAV ☐ TRUCK ☐
3. What is the route of operation?
   1._____
   2._____
4. Frequency of Trips: 1.Daily 2. Alternate Days 3.Weekly 4. Monthly 5. Quarterly
5. Average trip distance:
6. Do you have any parking facilities/Garages? (Yes / No)
7. If yes what is the size of parking facility?
8. If No, where do you park your vehicles?
9. What is the designated time duration for loading and unloading inside the city?
10. What are the truck operating routes in the city?
    1._____
    2._____
11. Do you have any truck Laybys inside the city?
12. Please tick √ if any Operational difficulties given below are there.
    1. No Parking facility
    2. Ban on some roads or time
    3. Poor quality of roads
    4. Narrow roads
    5. No terminal facilities
    6. Lack of general facilities
    7. No weighing facilities
    8. Others

Detailed Trip Information:(Last day/Last week)

Date of Travel: Day of Travel: Total Number of Trips per month:

Trip No (1)	Origin Address (2)	Destination Address (3)	Time of start (Hrs:Min) (4)	Time of finish(Hrs:Min) (5)	Trip Distance (6)	Trip Purpose (7)	Commodity type (8)	Load Carried (in Tonnes) (9)	Market Value of Commodity (in Rs)	Remarks (10)

Trip Purpose : 1-Loading, 2- Unloading, 3.Others

Commodity Type: 1. Food grains, Vegetable, Cereals, 2. Wood 3. Fisheries 4. Stone, Coals 5. Industrial Materials 6. Petroleum Products. 7. Building Materials 8. Consumer items 9. Empty 10. Rubber Related Products 11. Others

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

BUS PASSENGER INTERVIEW SURVEY

Name of the Road: **Location:** **Time :**

Date: **Direction:**

Boarding Passengers

Sno	Origin	Mode of Travel to the Bus Stop	Purpose of journey	Distance travelled to arrive at the stop (Km.)	Fare for the trip (Rs.)	Waiting time at the Bus stop(min.)	Where are you going (destination)	Approximate		Fare (Rs.)	If the destination is not near the bus stop, Which mode do you take to go from there	Average Waiting time at the Bus stop(min.)	Approximate		Fare (Rs.)
								Distance (Km)	Time(Min)				Distance (Km)	Time(Min)	
1															
2															
3															
4															
5															
6															
7															

Alighting Passengers

Sl.No.	Origin	Approximate		Fare - Trip(Rs.)	Waiting time at the Bus stop(min.)	Destination	Mode of travel from the Bus Stop	Approximate		Fare (Rs.)	Approximate Waiting time at the Bus stop(min.)	If the destination is not near the bus stop, how do you go from there	Approximate		Fare (Rs.)	Purpose of journey
		Distance Travelled (Km)	Time Taken (Min)					Distance (Km)	Time(Min)				Distance (Km)	Time(Min)		
1																
2																
3																
4																
5																
6																
7																

(Walk-1, Cycle-2,Cycle rickshaw-3 Motorcycle-4,Auto Rickshaw-5,Pvt-Car-6, Taxi-7, Bus-8, Others-9) **Trip Purpose:** Work = 1, Business = 2, Education = 3,Social & Recreation= 4, Tourism-5, Others=6

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

PEDESTRIAN COUNT SURVEY

Location :			**Date:**	
Junction type	**3 Arm / 4 Arm / 5 Arm**			
Road name :			**Direction :**	
	Please draw the junction map(Crossing the road)		**Please draw the junction map(Along the road)**	
Time	**Crossing the road**		**Along the road/Foot path**	
	Towards:----------	**Towards:----------**	**LHS**	**RHS**
:00 - :15				
:15 - :30				
:30 - :45				
:45 - :00				
:00 - :15				
:15 - :30				
:30 - :45				
:45 - :00				

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

Bus Occupancy Survey Format

Road Name: Bus Stop/Land mark: Direction:

Bus Type- M- Mofussil Bus, C-City Bus

Bus Type	Route No	Origin	Destination	Sitting	Standees	
					If Under Capacity	Crush Capacity (√)
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	
				Empty — Full	None — Full	

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

RAIL PASSENGER INTERVIEW SURVEY

Name of the Station: **Location:** **Time :**

Date: **Direction:**

Boarding Passengers

Sno	Origin	Mode of Travel to the Railway station	Purpose of journey	Distance travelled to arrive at the station (Km.)	Fare for the trip (Rs.)	Waiting time at the Railway station(min.)	Where are you going (destination)	Approximate		Fare (Rs.)	If the destination is not near the railway station, Which mode do you take to go from there	Average Waiting time at the station(min.)	Approximate		Fare (Rs.)
								Distance (Km)	Time(Min)				Distance (Km)	Time(Min)	
1															
2															
3															
4															
5															
6															
7															

Alighting Passengers

Sl.No.	Origin	Purpose of journey	Approximate		Fare - Trip(Rs.)	Waiting time at the Railway station(min.)	Destination	Mode of Travel to the Railway station	Approximate		Fare (Rs.)	Approximate Waiting time at the station(min.)	If the destination is not near the railway station, how do you go from there	Approximate		Fare (Rs.)
			Distance Travelled (Km)	Time Taken (Min)					Distance (Km)	Time(Min)				Distance (Km)	Time(Min)	
1																
2																
3																
4																
5																
6																
7																

(Walk-1, Cycle-2,Cycle rickshaw-3 Motorcycle-4,Auto Rickshaw-5,Pvt-Car-6, Taxi-7, Bus-8, Others-9)

Trip Purpose: Work = 1, Business = 2, Education = 3,Social & Recreation= 4, Tourism-5, Others=6

COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

IPT SURVEY FORMAT

Part I Para transit Vehicle Information

1. Name of the Operator
2. Garaging Address
3. Vehicle Ownership Details

Vehicle Type	No of Vehicles owned	Vehicle Registration No	Year	Make& Model	No of crew per trip (Driver/Cleaner)	No. of Working days per month	Monthly Salary (in Rs for Driver & Cleaner)	Passenger Capacity	Frequency of Trips per day	Average Annual Maintenance Cost (Rs/year)	Average service Life (in years)
Auto Rickshaw											
Share Auto											
Taxi											
Maxi cab/Pick up van											

Frequency of Trips: 1.Daily 2. Alternate Days 3.Weekly 4. Monthly 5. Quarterly

4. For Share Auto / Pick up van please mention the route of Trip:

1.----------

2..----------

Part II Trip Information:

Date of Travel: Day of Travel: Total Number of Trips per day:

Approximate Distance Traveled (in Kms) on a travel day:

Trip No	**Trip Origin Address**	**Trip Destination Address**	**Time of start (Hrs:Min)**	**Time of finish (Hrs:Min)**	**Trip Distance (in Kms)**	**Trip Purpose 1.Work 2.Business 3.Social 4.Education 5.Others**	**Number of passengers carried per trip**	**Remarks**

Comprehensive Mobility Plan for SOLAPUR

Pedestrian Count Survey-Mid Block

Location: **Shift: Day/ Night** **Date:** **Day:**
Weather: Sunny/ Cloudy/ Rainy **Enumerator:** **Sheet No:**

TIME	Across the Road		Along the Road (LHS)		Along the Road (RHS)	
	Direction 1:	Direction 2:	Direction 1:	Direction 2:	Direction 1:	Direction 2:
Hourly Total						

Comprehensive Mobility Plan for SOLAPUR

Parking Duration Survey - Off Street Parking

Location : **Date**

Entry **Exit**

Type of parking **Enumerator**

Start Time	End Time	Car	TW	Cycles	Others		Start Time	End Time	Car	TW	Cycles	Others

Annexure 2

WORK PLAN - COMPREHENSIVE MOBILITY PLAN FOR SOLAPUR

S.No	ACTIVITY	MONTH 1 (March)				MONTH 2 (April)				MONTH 3 (May)				MONTH 4 (June)				MONTH 5 (July)				MONTH 6 (August)				MONTH7 (September)				MONTH 8 (October)				MONTH 9 (November)			
		W1	W2	W3	W4	W5	W6	W7	W8	W9	W10	W11	W12	W13	W14	W15	W16	W17	W18	W19	W20	W21	W22	W23	W24	W25	W26	W27	W28	W29	W30	W31	W32	W33	W34	W35	W36
1	**Mobilization**																																				
1.1	**Review of Past Study Projects**																																				
	Understanding present institutional framework / reponsible authorities																																				
	Collect relevant reports online (CDP or any other traffic & transportation study)																																				
1.2	**Kickoff Meeting /Site Reconnaissance**																																				
	Define study area / incorporation of surrounding area and get confirmation of client on the same																																				
	Prepare list of required secondary data available with corrosponding authorities and Getting permission letter from client posting to corrosponding authorities																																				
	Collect reports in Hardcopy format, Census data, collecting GIS maps / ward maps etc.																																				
	Start Getting Quotes from different surveyors (put tentative location numbers)																																				
1.3	**Urban Planning Work**																																				
	Start Projecting potential growth in harmony with available secondary data																																				
	Report writing on growth trends and future popn / employement growth (zone / wardwise)																																				
1.4	**Finalizing Methodology and Survey Locations**																																				
	Identification of Type of Surveys / Survey Locations and finalising the same with client																																				
	Finalising Surveyor / Survey formats / Survey Location Map / Work Order to Surveyor																																				
2	**Collect and Analyse Household, Land use and Transport Data**																																				
2a	**Data Collection and Coding Network**																																				
2.1	Remaining Secondary Data Collection																																				
2.2	Traffic Surveys, Compilation & Staistical Analysis																																				
	Commencing Surveys (first start with the screen line)																																				
	Collecting specific information on short term improvments (junction photographs, off-street parking locations etc.)																																				
2.3	Network coding, building base year model																																				
2b.	**Short Term Improvement Plan and Institutional Framework**																																				
	Review proposed short term measures in any, recall outcome of reconnaisance survey and frame startegy for short term improvement plan																																				
	Start preparing junction drawings with present topographic conditions (trace if topographic drawings are available with the client or use google earth as a source for preparing base drawings)																																				
	Review information collected on Institutional Framework and putting same in the report format																																				
2b	**Data Analysis**																																				
	Make sure that surveyor start delivering data in soft copy format by second week after commencing survey																																				
	Checking data quality at screenline (cross checking with 2 hour video clip)																																				
	Start data analysis																																				
	Put analysed part in the report format																																				
3	**Developing Urban Transport Planning (UTP) Model**																																				
3.1	Base Year Model Calibration																																				
3.2	Projection of Socio economic parameters																																				
3.3	Do Nothing & Do- minimum Scenario Analysis																																				
4	**Long Term Transport Strategy and Evaluation**																																				
4.1	Development of Scenarios																																				
4.2	Evaluation of scenarios																																				
4.3	Finalization of Long Term Strategies/Plans																																				
5	**Finalising Short Term and Medium Term Transport Strategies and Plans**																																				
6	**Mobility Plan, Investment Plan and Phasing**																																				
10	**Finalising Institution Framework**																																				
11	**Stake Holder meetings**																																				
	Submittals																																				
1	**Inception report including approach & methodology and proposal regarding software/ development of model**																																				
2	**Field Survey and Analysis report/Interim Report**																																				
3	**Draft final report**																																				
4	**Final report with Executive Summary**																																				

Legend — ACTIVITY — SUBMITTAL — Final Report