Urban Mass Transit Company Limited

Amaravati Metro Rail Corporation Limited

LOW CARBON MOBILITY PLAN

ONGOLE

FINAL REPORT

DECEMBER, 2018

QUALITY MANAGEMENT

Revision	**Revision 0**
Report Prepared By	Sri Navya Annem, M Harshita Sarma, Mahesh Chenna, Siva Niranjan
Report Reviewed By	S. Rama Krishna
Report Approved By	Seshadri Iyengar
Description	Final Report of Low Carbon Mobility Plan-Ongole

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ABBREVIATIONS

CBD	Central Business District
CDP	City Development Plan
CMP	Comprehensive Mobility Plan
CPKM	Cost Per Km
DPR	Detailed Project Report
EPKM	Earning Per Km
GAD	General Arrangement Drawings
GCC	Gross Cost Contract
GIS	Geographical Information System
GoI	Government of India
IL & FS	Infrastructure Leasing and Financial Services
IOE	Institutions of Engineers
IPT	Integrated Public Transport
IRDP	Integrated Road Development Project
IT/ITES	Information Technology and Information Technology Enabled Services
ITS	Intelligent Transport System
JnNURM	Jawaharlal Nehru Urban Renewal Mission
kmph	Kilometers per hour
MoUD	Ministry of Urban Development
MRTS	Mass Rapid Transit System
APSRTC	Andhra Pradesh State Road Transport Corporation
NCC	Net Cost Contract
NH	National Highway
NMT	Non-Motorized Transport
PBS	Public Bike Sharing Schemes
PHPDT	Peak Hour Peak Direction Trips
PT	Public Transport
SEZ	Special Economic Zone
SH	State Highway
SPV	Special Purpose Vehicle
UMTC	Urban Mass Transit Company
URDPFI	Urban and Regional Development Plans Formulation and Implementation

Chapter 1

INTRODUCTION

1. INTRODUCTION

1.1 STUDY BACKGROUND

Amaravati Metro Rail Corporation (AMRCL) intends to develop Low Carbon Mobility Plan for nine towns in the state of Andhra Pradesh, with all modes including pedestrians, cyclists, Intermediate Public Transport (IPT), public transport, canal navigation etc. UMTC has been appointed as the consultant for providing the consultancy services for Low Carbon Mobility Plan, which would look in to the assessment of traffic and transportation needs for the cities based on the present and projected demand in the nine cities. Ongole is one of the nine cities identified

1.2 LOW CARBON MOBILITY PLAN

Low Carbon Mobility Plan (LCMP) provides a roadmap for infrastructure development options and investment requirements to provide a desirable level of mobility and accessibility to all sections of the citizens, while focusing on minimising carbon emissions. LCMP relies on “avoid, shift and improve” framework, i.e., avoid motorized trips, where possible or give options for using shared/public transport, encourage shift to low-carbon modes and improve the efficiency of motorized vehicles (Figure 1.2.1)

The LCM plan thus, provides technological as well as planning strategies to meet the mobility and accessibility demands of all the people by the least carbon emitting modes of transport.

Accordingly, the overall objective of the LCMP is to provide a long-term strategy, which ensures desirable mobility, safety and accessibility to people across gender and socio-economic profiles, while reducing carbon emissions.

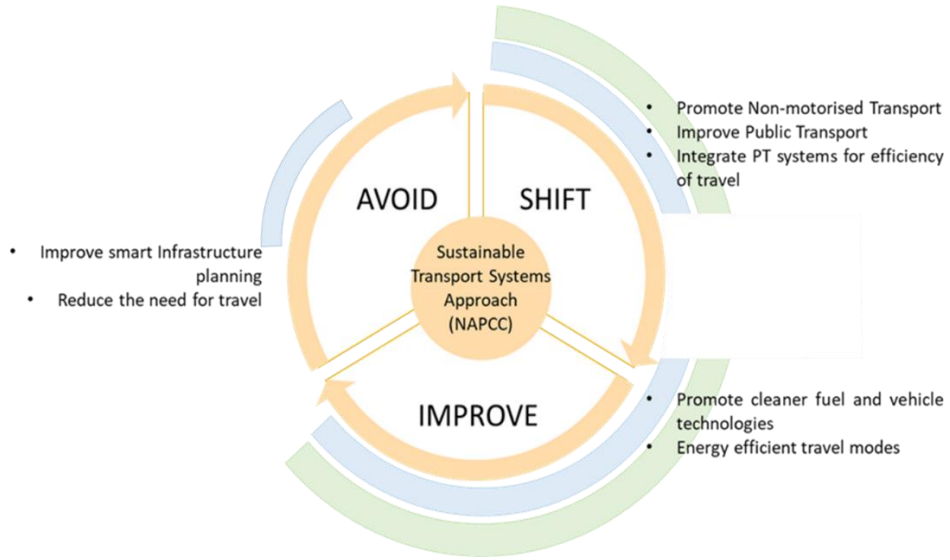


FIGURE 1.2.1 GENERALISED LCMP APPROACH

1.3 SCOPE OF LOW CARBON MOBILITY PLAN - ONGOLE

The low carbon mobility plan focusses on,

a. Providing sustainable access option for all kind of residents in Ongole.
b. Emphasizing the importance of pedestrian facilities, NMT measures and Public Transport systems
c. Increasing the efficiency and cost-effectiveness of the transportation of persons and goods
d. Integrating Land use development and transport systems
e. Strategizing effective and sustainable urban development
f. Reducing pollution, greenhouse gas emissions and energy consumption.

The low carbon mobility plan does not deal with,

a. Detail cost estimates
b. Project detailing (DPR & DBR)
c. Detail traffic engineering plans

1.4 STUDY OBJECTIVES

The objectives of the low carbon mobility plan are as stated below:

a) To improve mobility for all socio-economic groups and genders.
b) To improve air quality of Sustainable Urban Transport Scenario.
c) To improve in safety and security for pedestrians, NMT and live-ability in the city.
d) To increase sustainable transport mode share and decrease in private motor vehicle use.
e) To plan strategies for achieving desirable indicators and transportation benchmarks.

1.5 SCOPE OF THE STUDY

The Scope of work for the report is as discussed below:

1. Conducting a reconnaissance survey to identify the data needs, gaps in the existing data and to identify the primary survey locations.
2. Delineating the planning area and the traffic analysis zones.
3. Developing a Mobility Vision for Ongole.
4. Secondary data collection and analysing the existing transport and environmental needs with respect to the land use patterns and population densities for Ongole.
5. Conducting primary traffic surveys to assess the current travel patterns and behaviour in the Ongole.

6. Analysing and estimating the travel needs for the city.
7. Review of Energy consumptions and Environmental quality in the city.
8. Comparing the services to the Service Level Benchmarking indicators to understand and evaluate the level of services delivered to the citizens.
9. Developing Business as Usual scenario to assess the base year travel characteristics and the horizon year travel demand and characteristics under business as usual scenario.
10. Developing a Sustainable Urban Transport scenario by identifying strategies for sustainable transport options and analysing transport demand of alternative strategies for sustainable transport.
11. Identifying the technology transitions under the low carbon scenario and analysing carbon dioxide emissions and air quality under the sustainable scenario with the specified benchmarks.
12. Developing of low carbon mobility plan involving
    a. Integration of land use and mobility plan
    b. Formulation of public transport improvement plan
    c. Network improvements
    d. MNT facility improvement strategies
    e. Mobility management measures
    f. Freight Movement Plan
13. Identifying and prioritizing projects.
14. Identifying the funding sources
15. Preparation of the Implementation program.

1.6 APPROACH AND METHODOLOGY

Keeping in view the project objectives and the scope of the work and experience in similar projects, the approach and methodology is detailed out in the following sections. Figure 1.6-1 shows the study methodology highlighting the major tasks and their sequence.

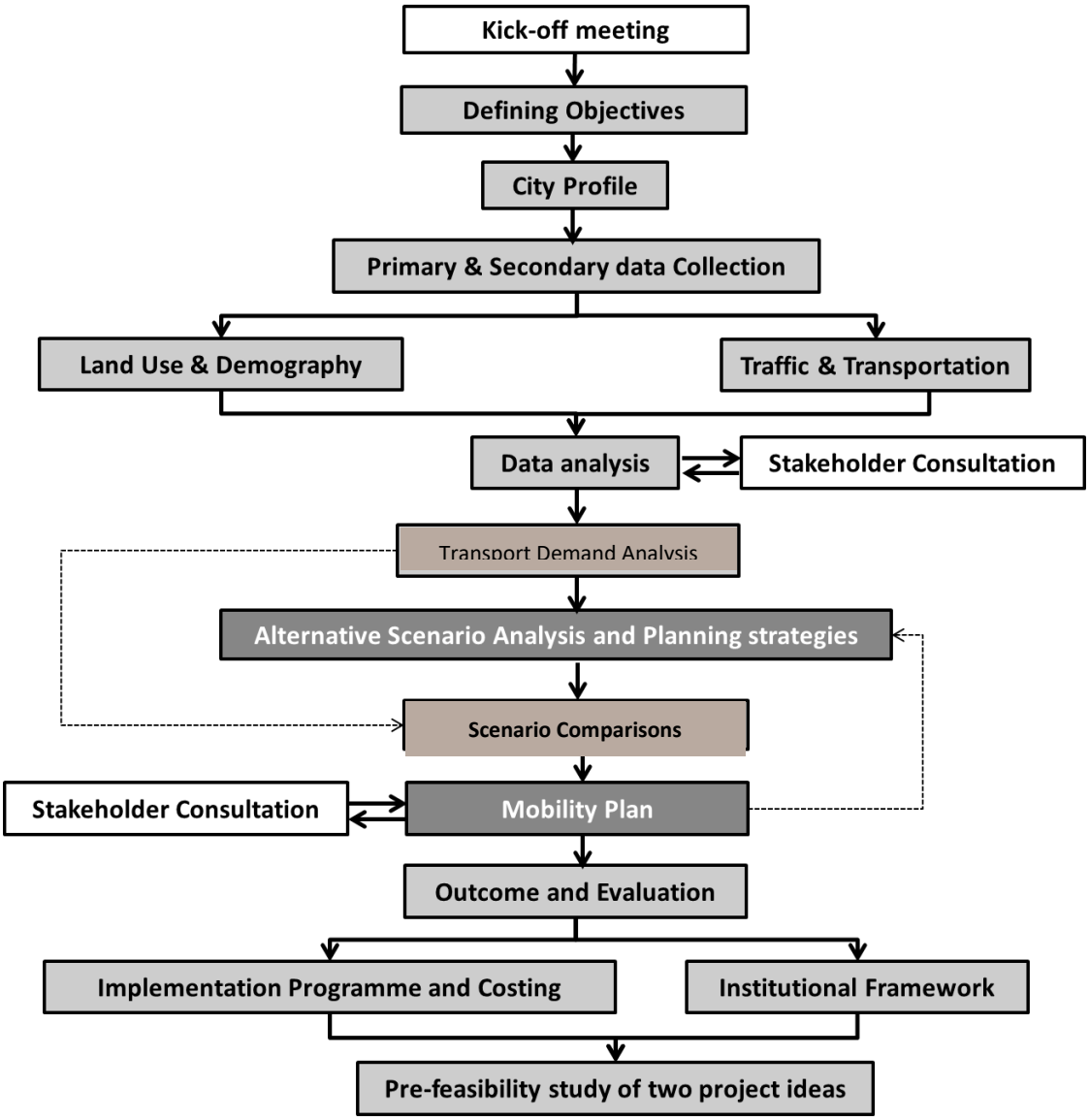


FIGURE 1.6-1 METHODOLOGY

The major tasks that cover the scope of work of the LCMP, are listed below. They have been discussed elaborately in subsequent sections.

Task 1 Delineate the planning area and the planning horizon

Task 2 Analyse the existing situation

Task 3 Develop Business as Usual(BAU) scenarios

Task 4 Develop and analyse for alternate scenarios

Task 5 Develop Indicators for BAU and Alternate Scenarios and Evaluate all Scenarios

Task 6 Prepare the Implementation Program - propose policy measures, projects and financial requirements to achieve the low carbon scenario

1.6.1 TASK-1: DELINEATE PLANNING AREA AND PLANNING HORIZONS

1.6.1.1 DELINEATE THE PLANNING AREA

The study area for the Low Carbon Mobility Plan is the Ongole Municipal Corporation area consisting of 50 administrative wards. These wards have been as delineated traffic analysis zones as depicted in Chapter 2 and 3.

1.6.1.2 DETERMINE PLANNING HORIZONS

It has been ascertained that the overall goal of LCMP can be realised over a long-term horizon period of 20 years. A long term planning horizon of 20 years has been envisioned to attain the goals of LCMP. This timeframe has been divided into four time horizons. The four horizon periods are defined as follows:

1. **Immediate Term:** The Immediate-term time horizon will last up to two years. It will focus on Immediate-term planning measures that include enforcement measures, lane markings, street furniture and lighting facilities, improvement in pedestrian facilities, traffic management and calming measures, parking plans etc. The overall emphasis will remain on improving the safety and accessibility standards.
2. **Short-term:** The short-term time horizon will last two to five years. It will focus on short-term planning measures that include intersection improvements, signalisation of intersections, Improvement of non-motorized transport, improvement in pedestrian facilities, traffic circulation plans, parking plans etc. The overall emphasis will remain on improving the safety and accessibility standards.
3. **Medium-term:** The time-period for this horizon will last for five to ten years. The focus will be on medium-term planning projects such as NMT corridors, city bus networks and public transport and NMT networks. The objective of medium term planning is to arrest the current trend of heavy dependence on private vehicles and set ground for higher PT and NMT usage in the future.
4. **Long-term:** This is a 20-year long period, with a long-term vision of achieving overall low-carbon mobility goals.

1.6.2 TASK -2 ANALYSE EXISTING SITUATION

1.6.2.1 REVIEW OF STUDY AREA PROFILE

The aspects which define the profile of the study area were studied in this task.

- Location of the study area
- Population and other demographic details like employment, income groups.

- Land area of the urban agglomerated area of the study area.
- Regional linkages with other major towns of Andhra Pradesh
- Socio-economic data, since this plays a major role in the travel patterns of people.
- Tourism activities in and around Ongole, which attract tourists from across the world.

1.6.2.2 REVIEW OF LAND-USE PATTERNS

- 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 areas.
- Densities of each type of land-use i.e. population density, employment density (number of employment opportunities per commercial land area used) etc.

1.6.2.3 REVIEW OF EXISTING TRANSPORT SYSTEM

This task focuses on current transport network with respect to private, public and para-transit systems. Demand patterns and travel characteristics. Previous studies and relevant reports were collected and reviewed for this purpose. It is assessed through the in the following steps which are as discussed in Chapter 2:

- Reviewing of previous studies for Ongole
- Review of Existing Transport Infrastructure for Ongole
- Review of Public Transport System in the study area
- Review of Traffic Safety and its enforcement in the study area

1.6.2.4 TRAVEL DEMAND SURVEY

Base year travel patterns and demand is very important input to the overall planning for the future horizon period. In this regard, various primary surveys were conducted to gather the base year data. The details about the primary surveys and the detailed methodology for estimating the base year travel demand is as discussed in Chapter 3.

1.6.2.5 BENCHMARKING THE TRANSPORT SYSTEMS

The existing transportation system is benchmarked with respect to the 11 Service Level Benchmarks issued by Ministry of Urban Development-Urban Transport as shown in Chapter 4, wherein the gaps for gaps for improving the existing transportation system are identified.

1.6.3 TASK-3 DEVELOP BUSINESS AS USUAL (BAU) SCENARIO

1.6.3.1 DEVELOP A SOCIO-ECONOMIC PROFILE FOR FUTURE

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

- **Population growth:** It will be projected, based on trends available from studies conducted in the past and the Census data.
- **Economic growth:** The overall economic growth of the city will be projected, based on growth trends of Per Capita Income and the Gross Domestic Product (GDP). The income growth with the increase in vehicle ownership may be a 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 Authority (RTA) in Ongole.

1.6.4 TASK-4: DEVELOP AND ANALYSE ALTERNATE SCENARIOS

The study develops two alternate scenarios for the horizon years, based on the strategies that have been identified in the Terms of Reference to the BAU scenario. The alternative scenario will be analysed to project the likely deviations from the BAU scenarios considering public transport and non-motorised transport improvements.

1.6.4.1 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:

- **City-Wide Bus Transport System:** A comprehensive citywide bus network will be developed to meet the travel demand. This network shall be evaluated against emissions and low carbon objectives.
- **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.

- **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 built around these major corridors by providing feeder services to them. The development along the mass transit corridors will triggered by designing various strategies like, increasing the FSI and etc.
- **Combination of Transport Modes:** A combination of the afore-mentioned three strategies will be adopted.

1.6.4.2 ALTERNATE SCENARIO WITH IMPROVEMENTS IN NON-MOTORISED TRANSPORT

Improving non-motorized transport (NMT) 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 motorised to non-motorised modes by providing a combination of these infrastructure items will be analysed:

- Footpaths along all arterial and sub arterial roads
- Exclusive cycle lanes along all arterial and sub arterial roads
- Traffic calming measures in residential zones
- Adequate street furniture to promote NMT modes and spaces for street hawkers and vendors
- Public bicycling and bicycling schemes

1.6.4.3 ALTERNATE SCENARIO WITH ADVANCEMENTS IN VEHICLE TECHNOLOGY

The urban transport scenario can be improved by the following improvements in technology:

- Use of Intelligent Transport Systems (ITS) to manage all modes of traffic in an efficient and better way.
- 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.

An analysis and comparison of the alternate scenarios will be conducted and the best scenario will be identified. The selection will be based on the following considerations:

i. It should be the best scenario for promoting the goals of the plan
ii. It should be declared acceptable following a consultation and consent from the various stakeholders.

1.6.5 TASK-5: DEVELOP INDICATORS FOR BAU AND ALTERNATE SCENARIOS AND EVALUATE ALL SCENARIOS

The various indicators will be calculated for each scenario, including BAU and alternate scenarios, based on the list that has been already developed. As is already mentioned in the previous section, the best scenario based on a comparison of these indicators will be selected for adoption. A detailed travel demand analysis will be developed for this scenario following the four-step approach, which is detailed under Task 3. An important aspect of this analysis exercise will be the quantification of CO_2 emissions that will be produced for each horizon period. Long-term national CO_2 goals will be compared against the forecasted emissions through the back-casting approach for short and medium horizon periods. Based on this comparison, mitigation measures will be proposed in order to meet the national CO_2 goals.

1.6.6 TASK 6: PRIORITIZATION OF PROJECT IDEAS

The following critera 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.

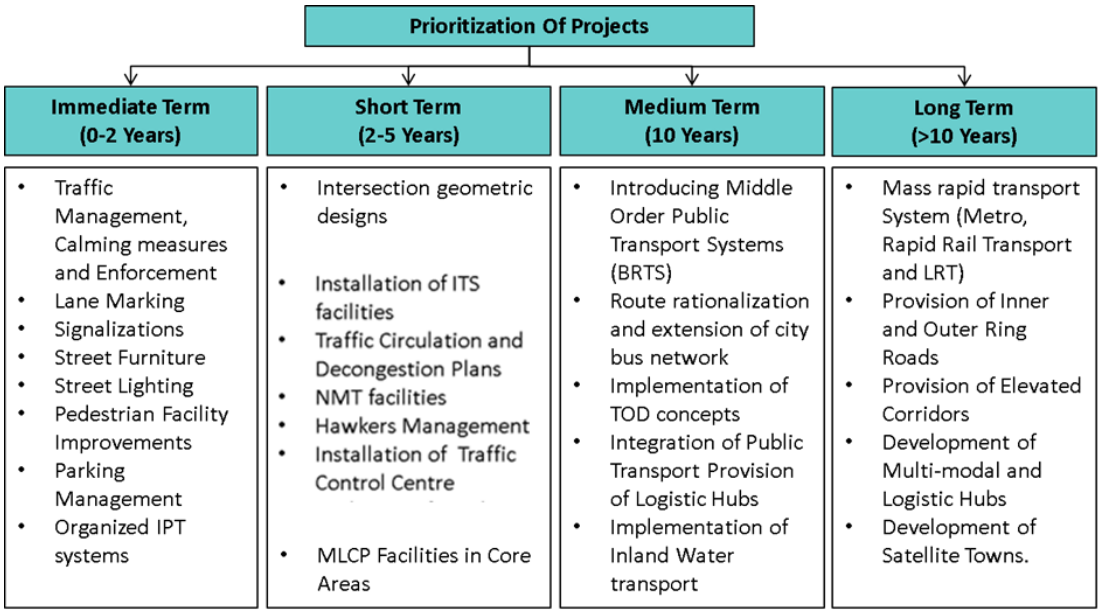


FIGURE 1-6.2: PRIORITIZATION OF IMPLEMENTATION PROGRAM

Chapter 2

CITY PROFILE

2. ONGOLE CITY PROFILE

2.1 INTRODUCTION

Ongole is a city in Prakasam district of the Indian state of Andhra Pradesh. The city is one of the 13 municipal corporations in the state and also the headquarters of Prakasham district. It is the 13th largest city in the state by means of population.

FIGURE 2.1-1 ONGOLE CITY VIEW

2.2 LOCATION AND REGIONAL LINKAGES

Ongole is located in the eastern portion of the Prakasam District at 15.5°N 80.05°E. It has an average elevation of 10 m (33 ft). It is situated on the South Central Railway Grand Trunk line connecting Howrah and Chennai. It is located on the National Highway No.5 connecting Kolkatta with Chennai cities and State High Way connecting Kurnool via Nandyala. City is 328 Km long from Hyderabad, 496 Km from Visakhapatnam, 305 KM from Chennai, 506 Km from Bengaluru.

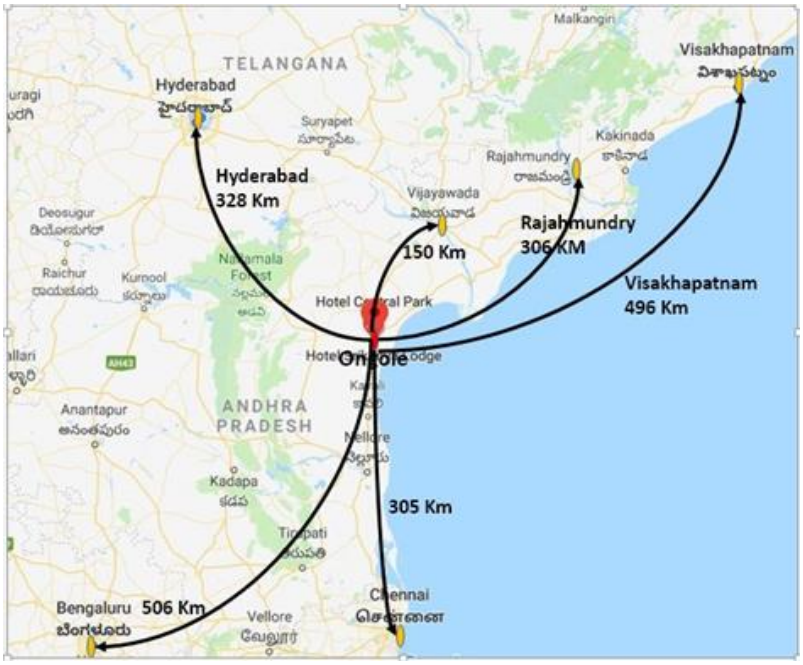


FIGURE 2.2-1 LOCATION AND REGIONAL CONNECTIVITY OF ONGOLE

2.3 ADMINISTRATION

Ongole Municipal Corporation is the civic body governing Ongole. The Municipality was formed in the year 1876 and was upgraded to Municipal Corporation on 25.01.2012. The corporation is spread over an area of 132.45 square kilometre. It has 50 electoral wards which are represented in Figure 2.3-1

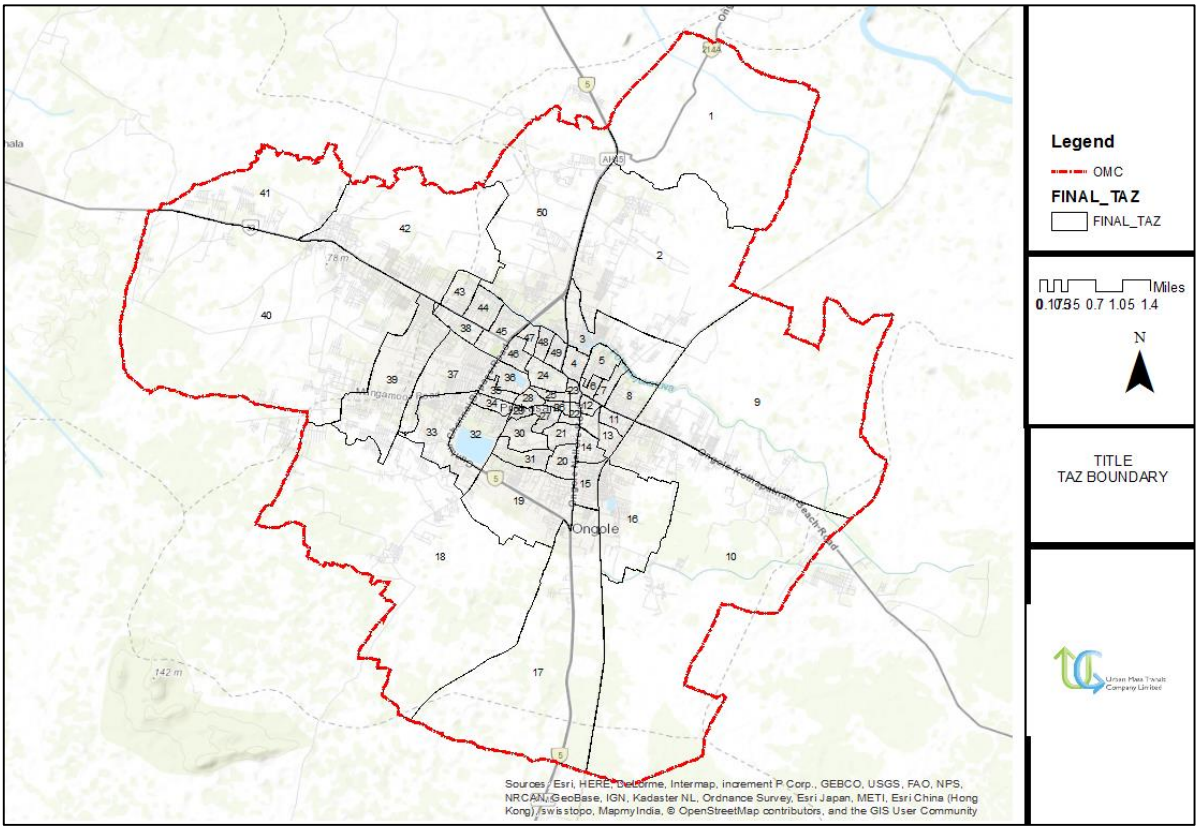


FIGURE 2.3-1 ONGOLE MUNICIPAL CORPORATION (OMC) ADMINISTRATIVE BOUNDARY

2.4 GROWTH PATTERN

The growth pattern of the town is observed to around the centre of Ongole city. The urban major growth is observed spreading along the NH 5 and towards SH 53. The initial growth is observed between South Central Railway Grand Trunk line, NH 5 Trunk line and NH 5. Cheemakurty, which is 20 Kms away from Ongole Town, is famous for Granite Industry, which is of superior quality, and being exported to other countries. But, other Industries such as Industrial Estates, Agricultural Marketing yard for encouraging Industrial and Agricultural growth around the town. The figure 2.4.1 depicts the growth pattern of Ongole over last 23 years.

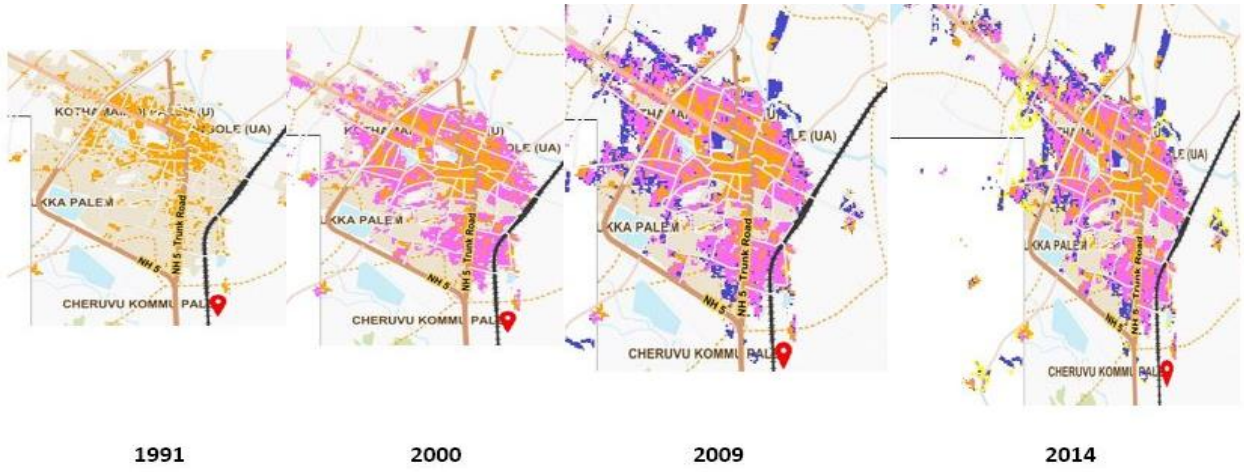


FIGURE 2.4-1 GROWTH PATTERN OF ONGOLE CITY

2.5 LANDUSE

The proposed land use as per the Ongole Master Plan 2031 is represented in the Figure 2.5-1 and Figure 2.5-2. As per the proposed master plan 2031, the major land use is residential accounting to 40.83%, followed 15% transport infrastructure. The proposed master plan identifies 22.3% of the land that is about 964Ha for future urbanization.

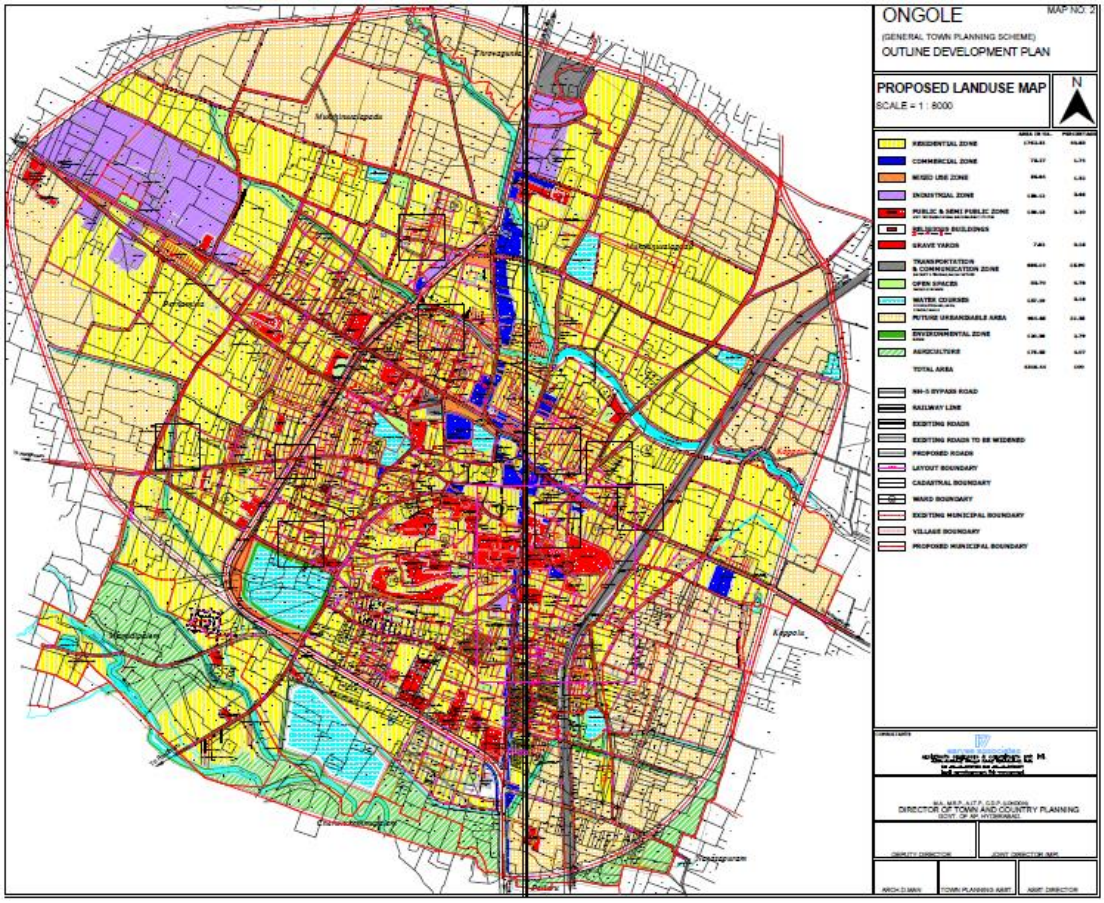


FIGURE 2.5-1 ONGOLE PROPOSED LAND USE MAP

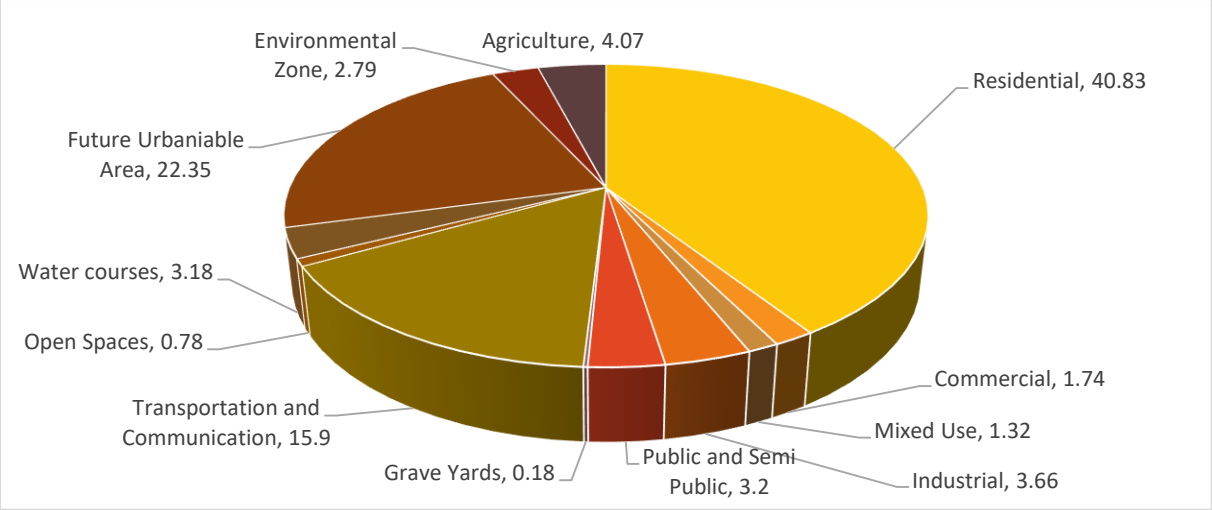


FIGURE 2.5-2 ONGOLE PROPOSED LAND USE STRUCTURE FOR 2031

2.6 DEMOGRAPHIC PROFILE

2.6.1 POPULATION

As of 2011 Census of India, Ongole had a population of 202,826. The total population constitute 101,728males and 101,098females with a sex ratio of 994 female per 1000 males, higher than the national average of 940 per 1000. In education section, total literates in Ongole city are 153,888 of which 82,322 are males while 71,566 are females. Average literacy rate of Ongole city is 83.57 percent of which male and female literacy was 89.41 and 77.72 percent. The growth rate over the last decade is observed to be 17.25%.

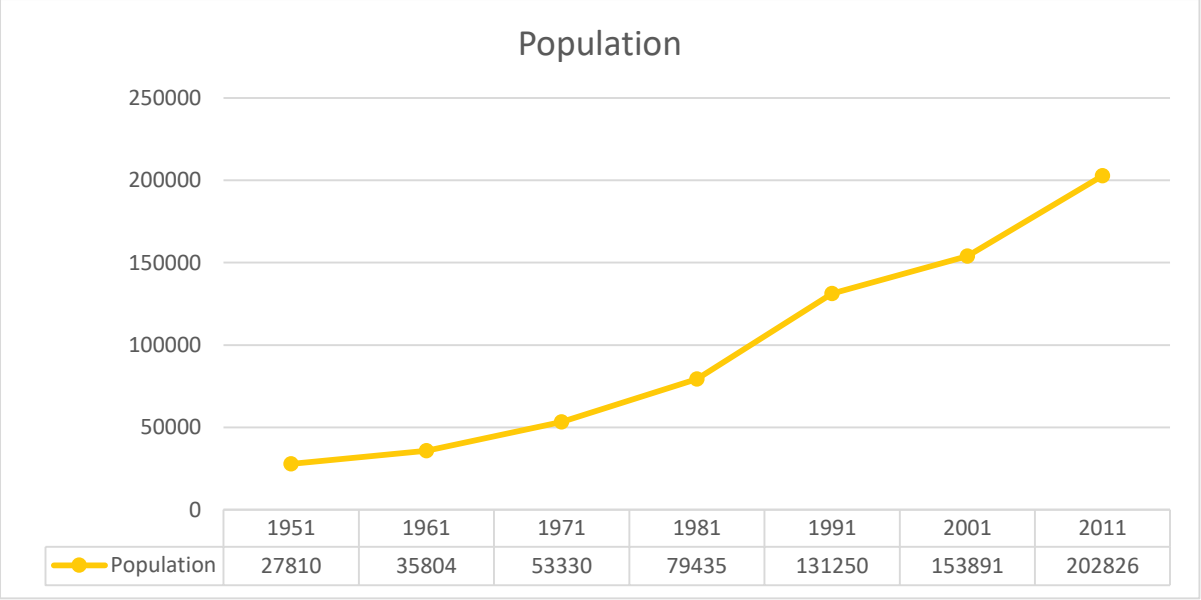


FIGURE 2.6-1 POPULATION OF ONGOLE

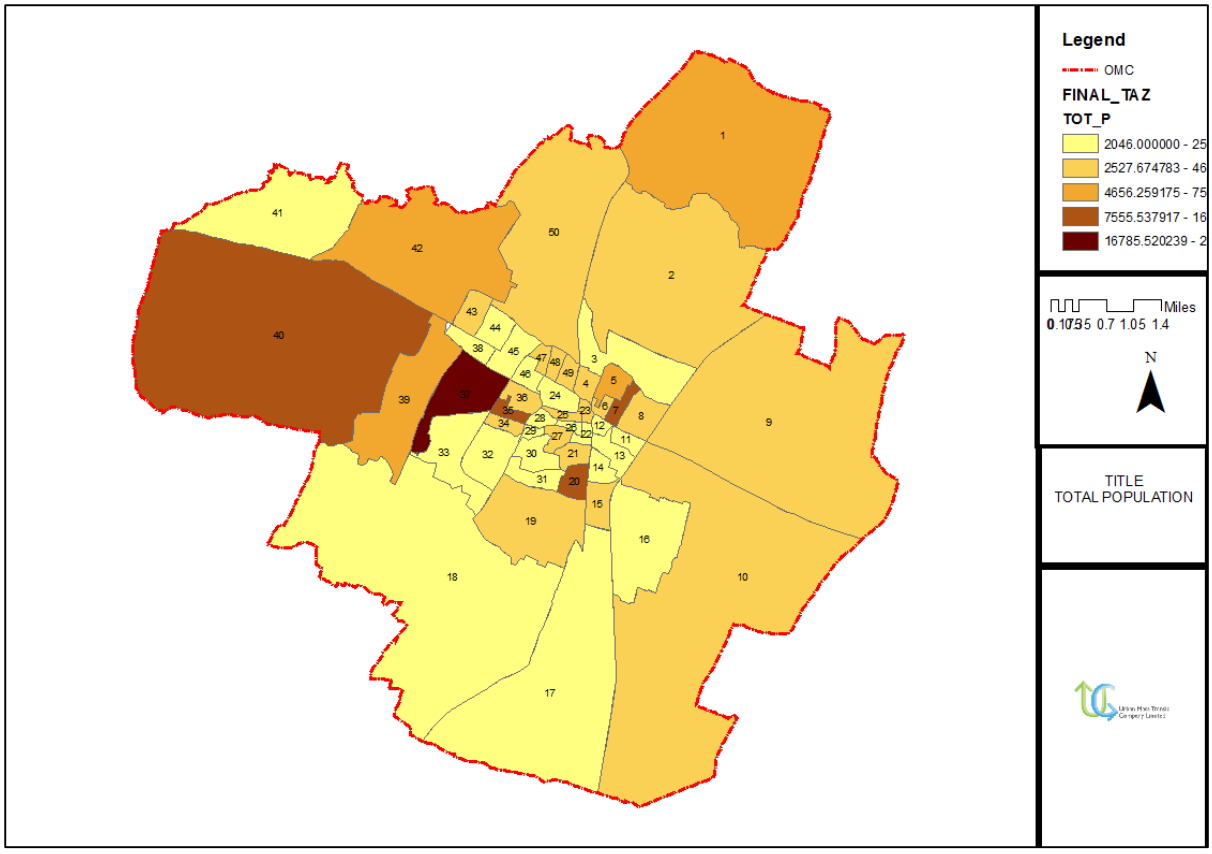


FIGURE 2.6-2 SPATIAL REPRESENTATION OF POPULATION IN ONGOLE

The Figure 2.6.3 represent the spatial distribution of population. The total number of households in Ongole are 1,39,692. The average household size in the city is 3.9. The Figure 2.6.3 represents the house hold distribution in the city. The density in the city accounts to 1,536 per square km. The average population density in the city accounts to 15 persons per hectare.

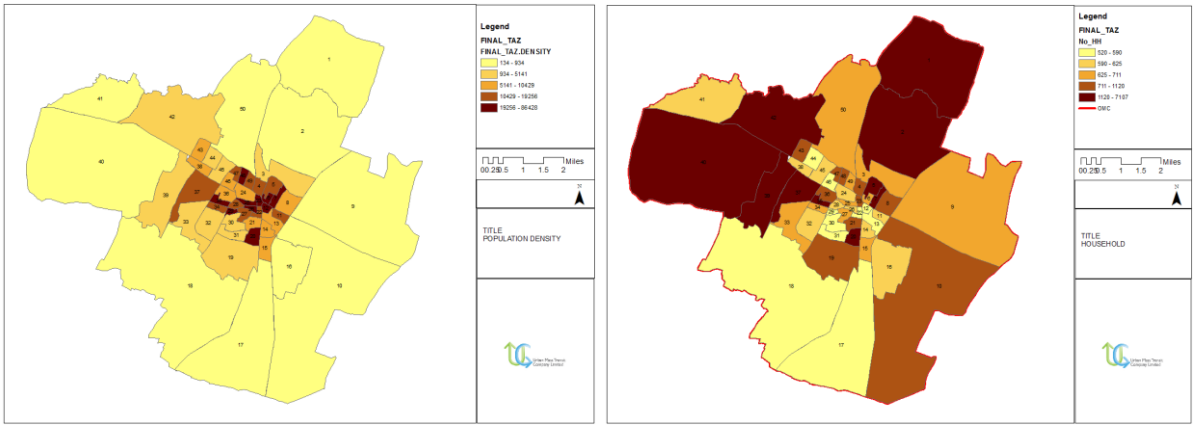


FIGURE 2.6-3 HH DISTRIBUTION (LEFT) & POPULATION DENSITY (RIGHT) ONGOLE

2.7 ECONOMIC PROFILE

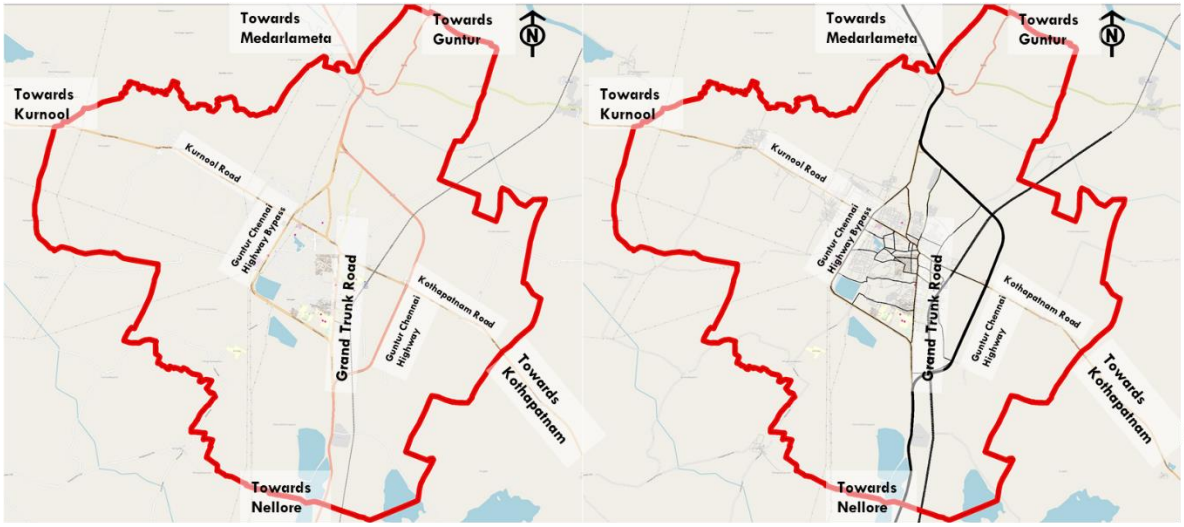
Ongole is a prominent commercial Centre in Prakasam District. Tobacco, Aqua culture, Granite polishing factories, PVC pipe factories, Milk projects, Salt production of the main important commercial activities. Because of its strategic location on both the National High way No.5 and Railway main line from Kolkata to Chennai there is a significant development in business and commerce like cash crops, Aqua and Granite products. Further Ongole is famous and proud of its indigenous Bull called Ongole Bull. The semen of the Ongole Bull is being preserved and exported to some of the western countries. The town service as on outlet for marketing the producers of its hinterland. The Town is surrounded by agriculturally developed villages and a big marketing centre. The existence of the Industries like Granite Industries and huge milk project, PVC pipe factories, Tobacco factories and Aqua culture has contributed to its Industrial and Economic growth.

FIGURE 2.7-1 GRANITE INDUSTRY AND TOBACCO FACTORIES IN ONGOLE

2.8 TRANSPORTATION PROFILE

2.8.1 ROAD NETWORK:

The city is connected by road to major destinations. National Highway 16, a part of Golden Quadrilateral highway network, bypasses the city. National Highway 216 connects the city with Kathipudi. The total length of the national highways and state highways is 15.76 kms, while city has a total road network in Ongole city is 329.64 kms. The road network structure of Ongole is Radial in nature, which is represented in the Figure



2.8.2 RAIL CONNECTIVITY

Railways connect Ongole to all major locations in the country. Ongole railway station is an A–category station located on the Howrah-Chennai main line and administered under Vijayawada railway division of South Central Railway zone. More than 200 Trains pass through this station connecting all most all major cities and most parts of the country.

2.8.3 AIR CONNECTIVITY

A new Greenfield airport was approved for Ongole in February 2014.

2.8.4 PUBLIC TRANPORT:

Being the District Head Quarters, it is connected with all the major towns and rural areas by a good network of bus services. Ongole bus station is owned and operated by Andhra Pradesh State Road Transport Corporation. The station is also equipped with a bus depot for storage and maintenance of buses. The Passengers delight project was implemented at the bus station for improving cleanliness and modernizing it, the total road length 329.64 Km developed under Ongole[1]. The bus services in the city are suburban services and inter city services. The absences of formal public transportation has led to the drastic growth in the private vehicles resulting in traffic congestions in various parts of the city.

2.8.5 INTERMEDIATE PUBLIC TRANSPORT:

Auto rickshaws provide inter-city travel to the Ongole residents. The auto rickshaws, rule the roost in the absence of city bus services.

[1] Murali, S (7 January 2016). "RTC on 'passengers' delight' mission". The Hindu. Ongole. Retrieved 15 March 2016

2.9 VEHICLE REGISTRATION

The annual growth of registered vehicles in Ongole is observed to be 12%. Two-wheelers constitute the highest share of registered vehicles accounting to 74% of the total composition.

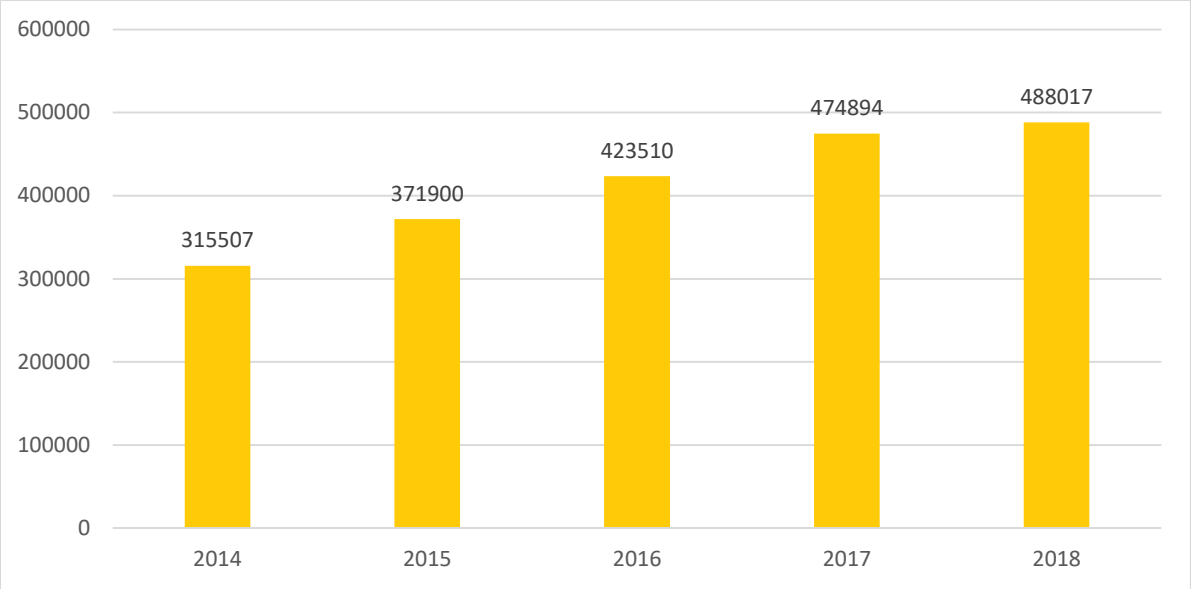


FIGURE 2.9-1 VEHICLE REGISTRATION IN ONGOLE CITY

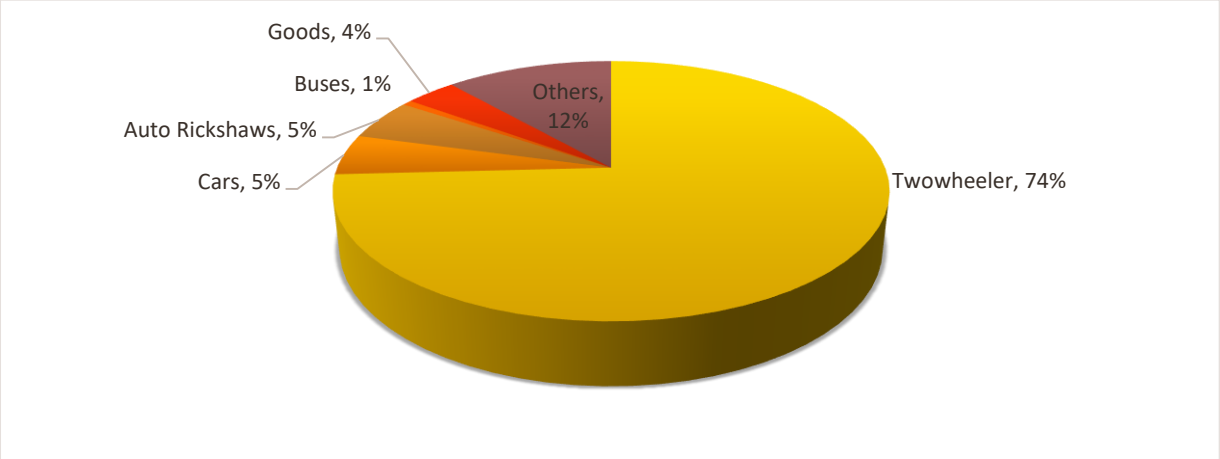


FIGURE 2.9-2 REGISTERED VEHICLES COMPOSITION IN ONGOLE

2.10 ENIRONMENTAL QUALITY

The air quality measure at air pollution monitoring station is as shown in the Table 2.10-1. It indicates that the PM10 value is within the permissible levels.

TABLE 2.10-1 AIR POLLUTION VALUES (PCB MANUAL AIR STATION)

Monitoring Station Name	Parameter Name	Current value	Standard
Public	NH3	30 ug/m3	400 ug/m3
Public	NOx	24.8 ug/m3	80 ug/m3
Public	PM10	60 ug/m3	100 ug/m3
Public	SO2	5 ug/m3	80 ug/m3

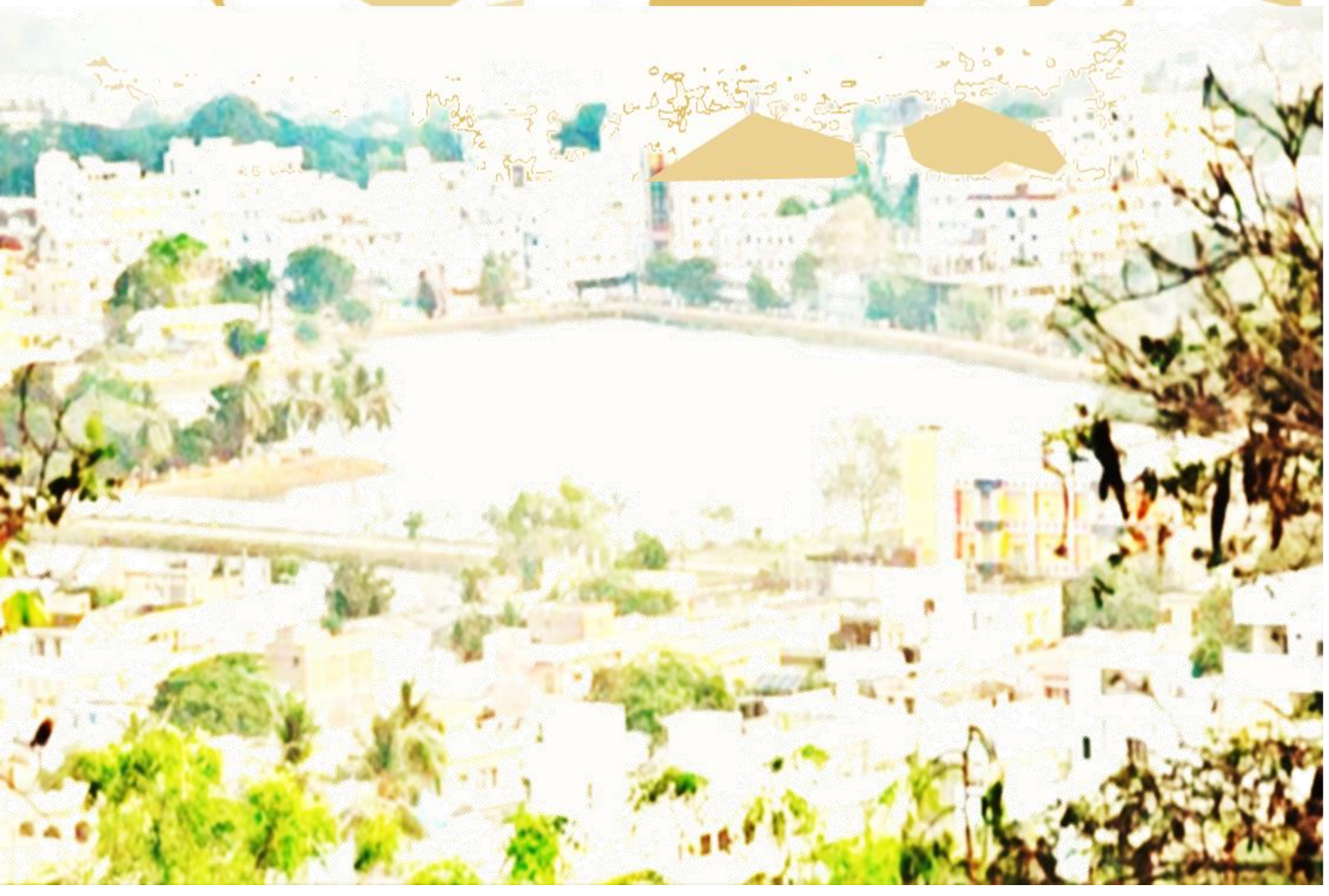
2.11 OBSERVATIONS

The major observations made through the reconnaissance survey are as follows,

1. Lack of cycle track and pedestrian infrastructure
2. Lack of NMT safety measures
3. Significant share of two-wheeler and auto rickshaws strength in the city.
4. Lack of formal public transportation modes in the city.

Chapter 3

EXISTING TRAVEL AND TRAFFIC SCENARIO IN ONGOLE



3. EXISTING TRAVEL AND TRAFFIC SCENARIO IN ONGOLE

3.1 INTRODUCTION

As part of the current study for Ongole town, primary traffic surveys were conducted to analyse in detail the traffic volumes and travel characteristics in the city. In case of Ongole, the following primary surveys have been conducted as represented in Table 3.1-1

TABLE 3.1-1 PRIMARY SURVEYS LIST FOR ONGOLE LCMP

Sl.No	ITEMS
1	Road Network Inventory (km)
2	Classified Turning Movement Count Survey - 16hrs
3	Classified Volume Count Surveys (SL) - 16 hrs
4	Classified Volume Count Surveys (OC) - 24 hrs
5	Vehicle Occupancy Survey – 16 hrs
6	On-Street Parking Surveys (Km) - 16hrs
7	Off-Street Parking Surveys - 16 hrs
8	Road Side Passenger -Goods OD Survey (OC) - 24 hrs
9	Speed Delay Survey-Cars (km) GPS Based
10	Terminal Count Survey - 16hrs
11	Terminal OD Survey - 16hrs
12	Bus Stop Boarding Alighting Survey - 16hrs
13	Pedestrian Volume Count Survey - 16hrs
14	Stated Preference Survey
15	IPT Commuter Survey
16	Goods Operator Survey
17	Household Survey
18	Passenger Opinion Survey

In order to analyse the data and ease the data collection the city is delineated in small Traffic Analysis Zones (TAZ). Considering the population and the density of Ongole the existing 50 wards are considered as the TAZ boundaries. The TAZ boundaries and TAZ list is represented in the Table in Annexure 1 and in Figure 3.1-1.

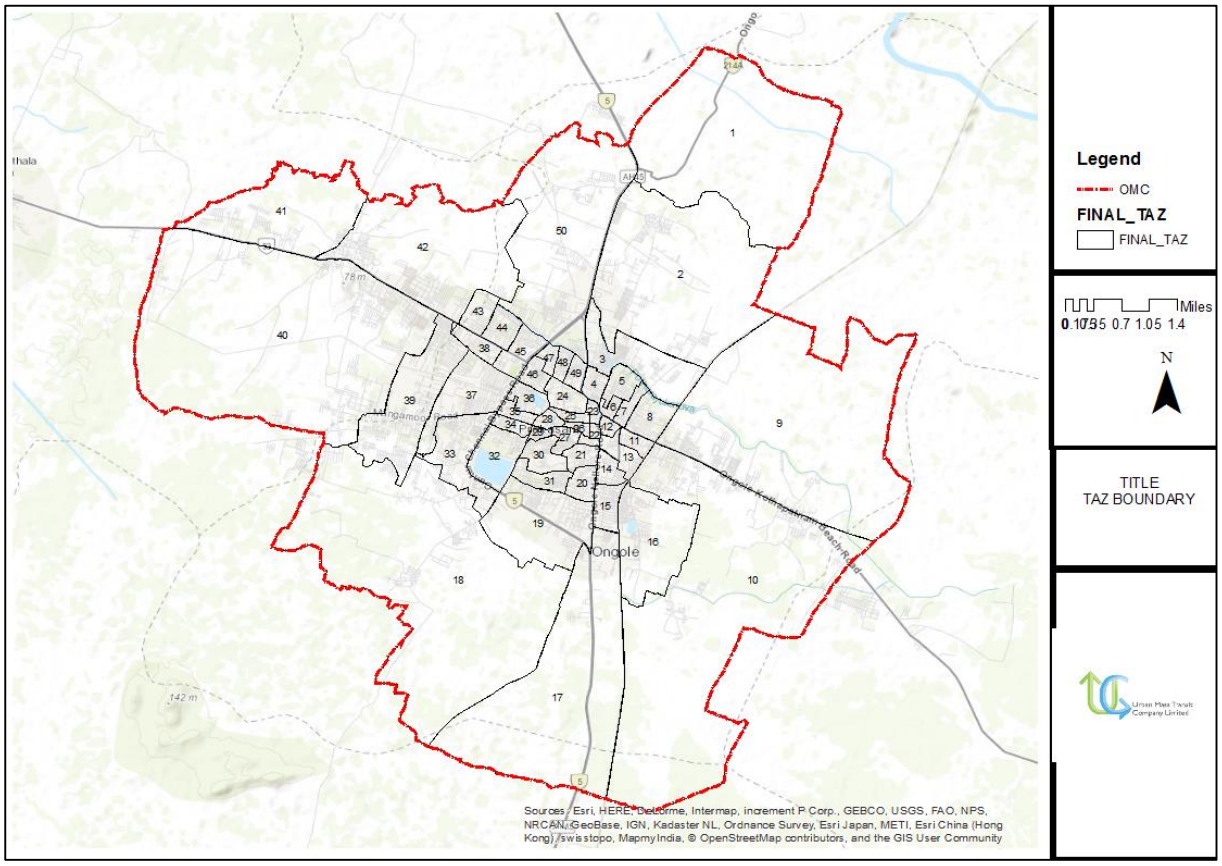


FIGURE 3.1-1 ONGOLE TRAFFIC ANALYSIS ZONE (TAZ) BOUNDARIES

3.2 TRAVEL AND TRAFFIC CHARACTERISTICES

The above mentioned surveys were carried out and analysed to assess existing scenario of travel and identify the issues for mobility of people and goods within the study area. The detailed analysis is as discussed in Annexure A. The key inferences from the primary and secondary survey analysis are as follows,

1. The network structure in the city is largely inorganic with two major radials connecting the sub-urban places around the city. The National Highways by-passing the city from an external ring, while there is no clear structure within the city.
2. The network is observed to be dense on the south-western side of the city indicating inequity in the urban spread and growth.
3. Major parking activities are observed along RTC Bus stand, Kurnool Road and Trunk Road.
4. The average journey speed along the network is observed to 20kmph. The delays in travel speeds are caused largely due to traffic and delay at intersections.
5. The outer cordon locations OC-1, OC-3 and OC-4 have highest traffic volume as these highways connect Kurnool and Vijayawada (via Guntur) and Chennai (Via Nellore).

6. The screen line location SL-3 and SL-4 have highest traffic volume due to the connectivity to a larger share of urban growth which is towards the south west. Two-wheelers constitute the highest share in modal composition at all the screen line locations.
7. The average occupancy of two wheelers is observed to be 1.5. The average occupancy of 3 seated auto rickshaw was observed to be 2.9, while the average occupancy of shared auto rickshaw (7seater) is observed to be 3.3.
8. Highest traffic volume is observed at Kolkata-Chennai Highway (NH5) Circle due is interaction with the Highway and Chimakurthy Road, connecting important activity nodes of the city.
9. The passenger volume at bus terminals is observed to be higher when compared to the rail terminal. This is due to availability of buses at higher frequency compared to the trains. Thus, indicating that bus is the major mode of travel for external connectivity.
10. The sub-urban bus services are provide the inter-city and intra city services in Ongole.
11. Auto rickshaws are used as the major mode of a dispersal and access at the terminals.
12. Shared auto-rickshaws are observed to provide end to end connectivity ply on all major routes.
13. 38% of the IPT commuter trips are work based trips, followed by educational trips. The work based daily trips are made within a distance of 6.3km indicating interactions between Ongole and its immediate out growths.
14. It is analysed that Kolkata-Chennai Highway Circle requires immediate attention in terms of pedestrian crossing infrastructure facilities to improve the pedestrian safety.
15. The average number of trips made by the goods vehicle is observed to be 10 trips per month. Food grains contribute to the highest share (20%) in commodity type in goods trips, followed by consumer goods.
16. The Per Capita Trip Rate (PCTR) for Ongole was observed to be 1.24 including the walk trips and 1.04 excluding the walk trips. The PCTR for motorised trips is about 1.01.
17. The major modes of travel in Ongole are observed to be two wheelers with a model share of 41% respectively.
18. The Non-Motorised Transport comprises about 19% including 15% of walk trips.
19. The average trip length in the Ongole is observed to be 4.6km including the walk trips and 5.1km excluding the walk trips.
20. Variations were observed in supply and demand gap at surveyed on and off parking locations. The off street parking places were observed to be underutilized when compared to the off street parking demand.

21. The users prefer over 25% reduction in travel time and cost to favour the use of new and improved public transit system and the waiting time is observed to be negotiated over the total travel time and cost as in case of Ongole.
22. The survey analysis indicates the need for improved traffic and travel management along with strategies to refrain increasing the usage of private modes over the public transit modes.
23. The majority of the responders are inclined towards indirect funding such as vehicle costs and registration charges, high compounding fee or high penalty for the traffic violators to promote travel and traffic fund.
24. 19.50% of the users perceive the overall experience of road traffic conditions reasonably good, while 80.50% of the users perceive it somewhat congested.

3.3 SERVICE LEVEL BENCHMARKING

Benchmarking is a tool used by public agencies to make more informed decisions regarding the performance, make comparisons internally and with other organizations and continuously improve performance using the lessons learned through this comparison process. Benchmarking allows public agencies to direct limited resources to the program. Benchmarking helps to establish baseline measures of performance, and helps monitor the agency's individual performance over time, and also how it compares with the other organizations, and also improving performance by sharing of lessons learnt from different entities.

3.3.1 NEED FOR BENCHMARKING

The National Urban Transport policy (NUTP) 2006 highlights the crucial link between transport demand and land use planning and the need to develop an integrated mobility plan for each city. Accordingly, each city should develop comprehensive mobility plan during the 12th five year plan with focus on accessibility, mobility and traffic flow (in that order). Rather than the present approach of "predict and provide" it has to be "Planning for the desirables". Urban agencies in India currently do not have any system for measuring performance of urban transport activities, assessing impacts of projects and taking further action on them. The service level benchmarks (SLB) issued by MOUD specify parameters to measure the effectiveness of existing land use-transport planning in Ongole and set benchmarks for achieving the same.

3.3.2 PERFORMANCE BENCH MARKS FOR URBAN TRANSPORT

The SLBs describe the levels of transport performance like safety and access, pollution, accidents, congestion etc. in the study area. The parameters identified by the Ministry of Urban Development (MoUD) are as follows:

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 major corridors
6. Availability of parking spaces
7. Road safety
8. Pollution levels
9. Integrated land use transport system

3.3.3 COMPUTATION OF INDICES

The consolidated benchmarking of the existing scenario of the study area is as shown in Table 3.3-1. The Level of Service (LOS) is given on a scale of 4 wherein 1 indicates "Good-To be Maintain" and 4 indicates "Needs immediate improvement".

TABLE 3.3-1: OVERALL LOS CALCULATED FOR STUDY AREA

S. No	BENCH MARK	OVERALL LOS	INFERENCE AS PER MOUD GUIDELINES
1	Public Transport Facilities	4	The city has no dedicated city based public transport system which needs to planned and improvements in terms of supply of buses/coaches and coverage as most part of the city is not served by the existing sub-urban buses.
2	Pedestrian infrastructure facilities	4	The city has minimal pedestrian facilities which need immediate improvements especially at intersections and unobstructed footpaths it.
3	Non-Motorized Transport Facilities	3	The city lacks adequate NMT facilities.
4	Level of usage of Intelligent Transport System(ITS) Facilities	4	The city lacks adequate ITS facilities.
5	Travel speed (Motorized and Mass transit)	2	The city has considerable travel speeds for the existing but with small increase in flow may cause substantial increases in approach delay and hence decrease in arterial speed in the horizon years.
6	Availability of Parking places	4	The city authorities need to initiate immediate actions with respect of providing paid parking spaces and demand management for parking.
7	Road safety	2	Need considerable improvements in road design and available road infrastructure, traffic management and other such reasons which contribute significantly to road safety**.**
8	Pollution levels	2	Level of pollution in a city is very low, the quality can be

S. No	BENCH MARK	OVERALL LOS	INFERENCE AS PER MOUD GUIDELINES
			adopted by encouraging and introduction the usage of public modes rather than the private modes.
9	Integrated land use Transport system	3	Faint coherence between study area structure and public transport system.

Chapter 4

ENVISIONING ONGOLE

4. ENVISIONING ONGOLE

Low Carbon Mobility Plan is a long term vision for the development of transport in Ongole and ideally should follow or guide the land-use planning for the region. The Transport Plan seeks to develop a most optimal transport road map keeping in view the National Urban Transport Policy which strongly suggests that if transport has to be sustainable, a radical shift must be made towards public transport supply and non-motorized transport modes.

The goals and objectives set for the transportation needs of Ongole can be achieved by formulating a series of strategies as per NUTP guidelines. Each of the strategies will be evaluated to see their suitability and applicability for Ongole.

4.1 VISION AND GOALS

As stated earlier, the LCMP is a long term vision for desirable accessibility and mobility pattern for people and goods in Ongole. The four major elements identified to outline the city's vision are:

- **Sustainability**: The transportation system of the City shall be conducive to lower consumption of fossil fuels. It shall be based on managing the travel demand itself, rather than trying to provide for whatever demand exists and allowing demand to grow in an unplanned way.
- **Equity**: Transportation in the City shall be accessible to all demographic sections of society. The City shall provide "Mobility for all", meaning any person above a certain age should be able to travel independently. Special attention shall be paid to school students, senior citizens, people from financially weaker sections, women - especially pregnant women, physically challenged persons.
- **Convenience**: Not only residents of the City, but also visitors should also be able to figure their way around the city very easily.
- **Safety**: Rates of fatal and serious traffic accidents should be at par with the best in the world. The City shall have low rates of respiratory issues, spine injuries and other such ailments related to traffic.

Based on above outlined elements the vision of Low Carbon Mobility Plan for Ongole is defined as:

"To attain a People Centric Urban Transport System with an integrated, efficient, liveable and sustainable transport system by providing safe and convenient mobility to people of all abilities and goods"

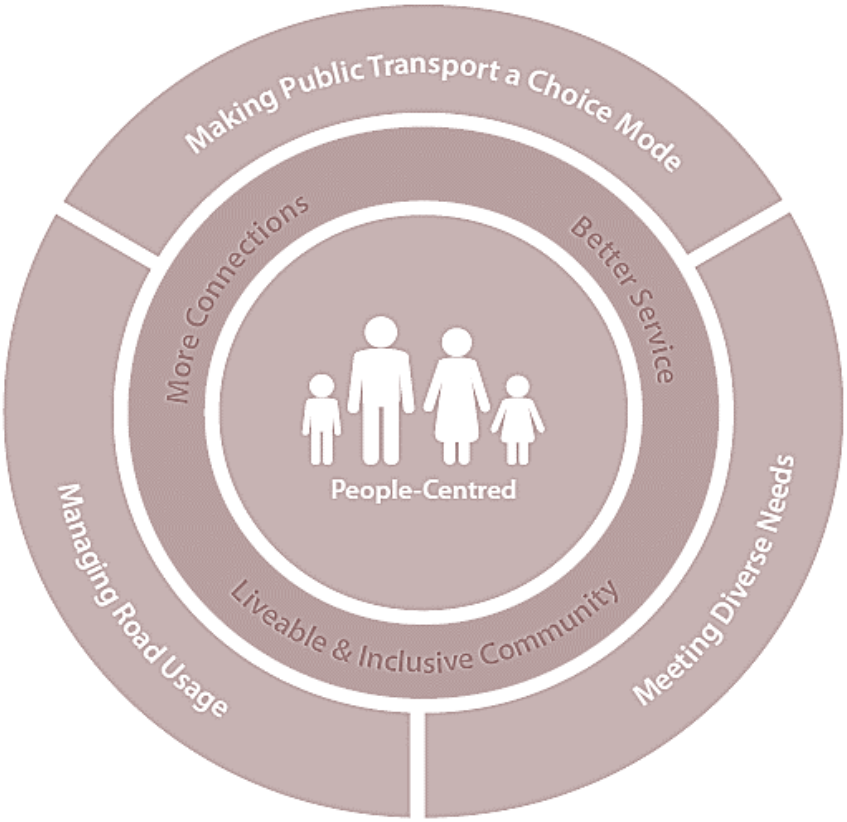


FIGURE 4.1-1 PEOPLE CENTRIC VISION AS ENVISAGED FOR ONGOLE

Based on the vision, various goals have been targeted for the horizon year under certain scenarios. A Master Plan was prepared for Ongole was prepared for the year 2031 considering the future developments. Hence, for the purpose of study, Master Plan was considered along with consultations to assess future development directions and required transport network. Based on which 2 scenarios for horizon years were established on land use and sustainable transportation strategies, which are as follows:

1. Business As Usual (BAU) Scenario
2. Sustainable Urban Transport (SUT) Scenario

Table 4.2-1 shows the goals set to be achieved in the horizon year by implementing all the proposals recommended in this study.

Table 4.1-1: ENVISAGED GOALS

Name of the Impact	Base Year (2018)	BAU Scenario (2038)	SUT Scenario (2038) – Target
Non-Motorised Trips	18.4%	12.1%	>20%
Private Transport (PVT) Trips	58.4%	74.4%	<40%
Public Transport Trips	23.2%	13.5%	>15%
Avg. Network Speed (kmph)	25.7	20.2	>30
% of city covered with Footpaths (Arterial and Sub-Arterial)	12%	12%	100%
% of city covered with Cycle Tracks (Arterial and Sub-Arterial)	0%	0%	>50%
Local Emissions (Tonnes/day)	10.8	14.3	Reduce by 50%
GHG Emissions (Tonnes/day)	264.9	513.3	Reduce by 50%
% households with access to high quality public transport	20%	20%	>75%
Vehicle-km travelled (PVT) in Thousands	1739	3710	Reduce by 30%

Each goal can be achieved by meeting the following objectives:

- Improve the public transport system by provision of dedicated lanes/ROW and good quality of service.
- Improve the Public Transport (PT) accessibility by densification along major public transport corridors and integration with feeder services. This reduces the need for travel to daily needs and increase the usage of sustainable modes.
- Ensure safety and mobility of Pedestrians and cyclists by designing streets and areas that make a more desirable, livable city for residents and visitors and support the public transport system.
- Encourage low carbon emission modes by providing Public Bicycle Sharing schemes and disincentive and taxation for highly polluted private vehicles.
- Develop a Parking Policy that reduces the demand for parking and need for private mode of transport and also facilitate organized parking for various types of vehicles.

4.2 FUTURE PROJECTIONS

The population and employments projections for horizon year for various scenarios are derived on the basis of proposed land use from the Master Plan, assessing the current growth pattern of the city and location of the further growth centres. The same is discussed in succeeding sections.

4.2.1 LANDUSE

The proposed land use as per Master plan document for 2031 is as shown in Table 4.3-1. The land use under transportation is marginally below the URDPFI guidelines. The growth pattern of the city is

largely envisaged towards the eastern side and western side as shown in the Figure 4.3-1. Based on this the land use structure for the BAU and SUT scenarios have been developed.

Table 4.2-1: LANDUSE BY CATEGORIES

Category	URDPFI Guidelines	Proposed (2031)
Residential	36-38%	40.83%
Commercial	5-6%	1.74%
Industrial	7-8%	3.66%
Public & Semi Public	10-12%	3.20%
Recreational	14-16%	0.78%
Transportation	12-14%	15.90%

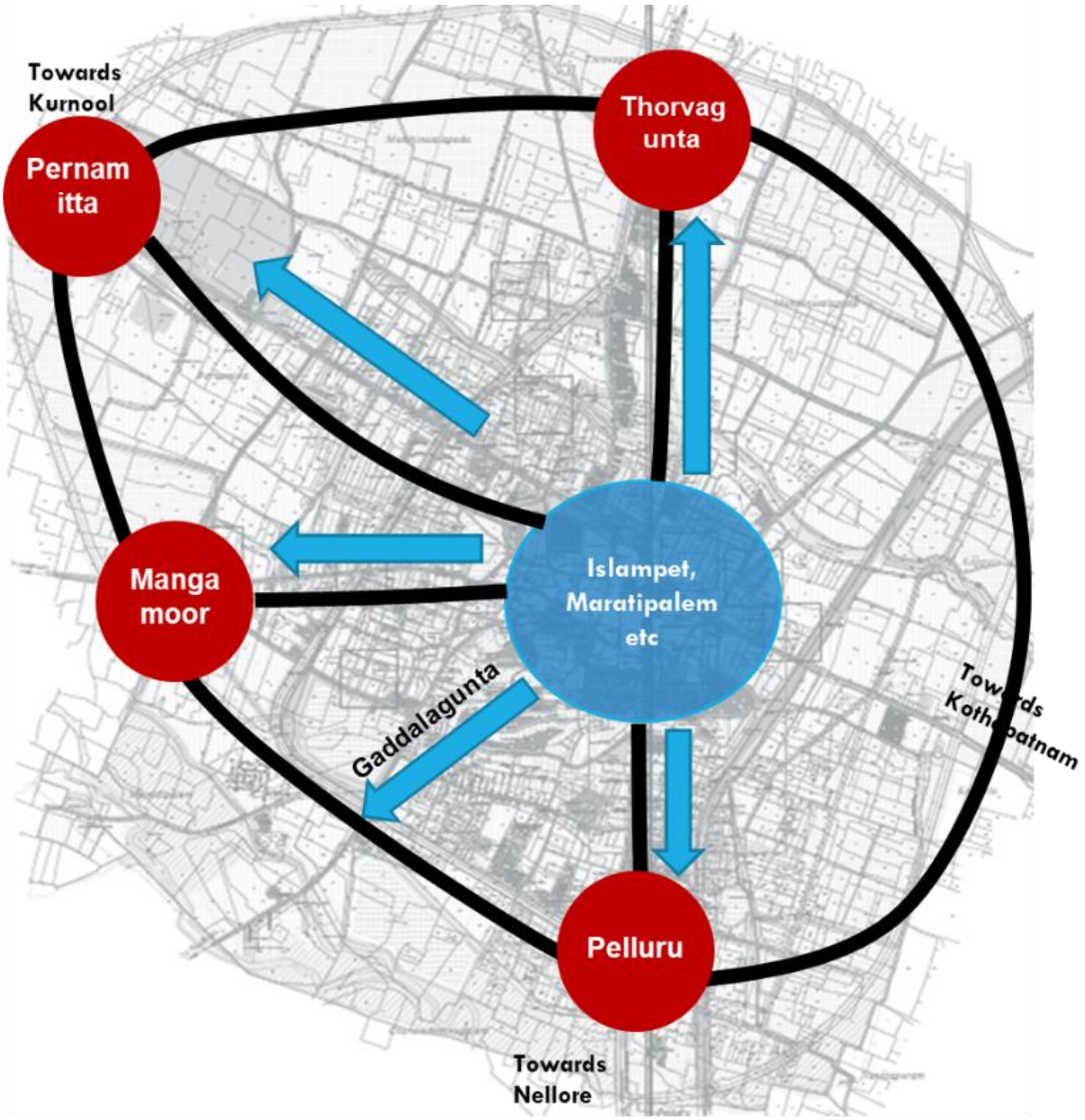


FIGURE 4.2-1: LAND USE WITHIN KMC AND GROWTH PATTERN

4.2.1.1 BUSINESS AS USUAL (BAU) SCENARIO

The Business as Usual 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 mitigations. According to the proposed draft development plan, higher growth is expected towards north and West i.e. near Thorvagunta along National Highway i.e Guntur Chennai Highway and near Pernamitta along the Kurnool road and medium growth towards East and South. i.e towards Kothapatnam and towards Nellore. Thus, similar land use and growth structure is adopted in BAU scenario.

4.2.1.2 SUSTAINABLE URBAN TRANSPORT (SUT) SCENARIO

As per Ministry of Urban Development guidelines and RFP, a sustainable scenario has to be considered to reduce congestion and pollution, while conserving resources like urban space and capital expenditure. Hence, a scenario has been developed that achieves the goals stated in the earlier chapter in line with LCMP vision. The Sustainable Urban Transport scenario considerers the outputs of BAU scenario and secondary reports while prioritizes interventions based on Transit Oriented Development along mobility corridors, Development of Public transit corridors, Augmentation of buses, Network Development (i.e. missing links, Hierarchy road system, part of public transit corridor).

Thus, in SUT scenario, mixed land use development is considered along identified mobility corridors. Additional population and employment will be achieved by densification (i.e. allowing higher FSI) along the mobility corridors which is termed as Transit Oriented Development (TOD). Corridors considered for transit-oriented development are as discussed under Section 5.1.2.

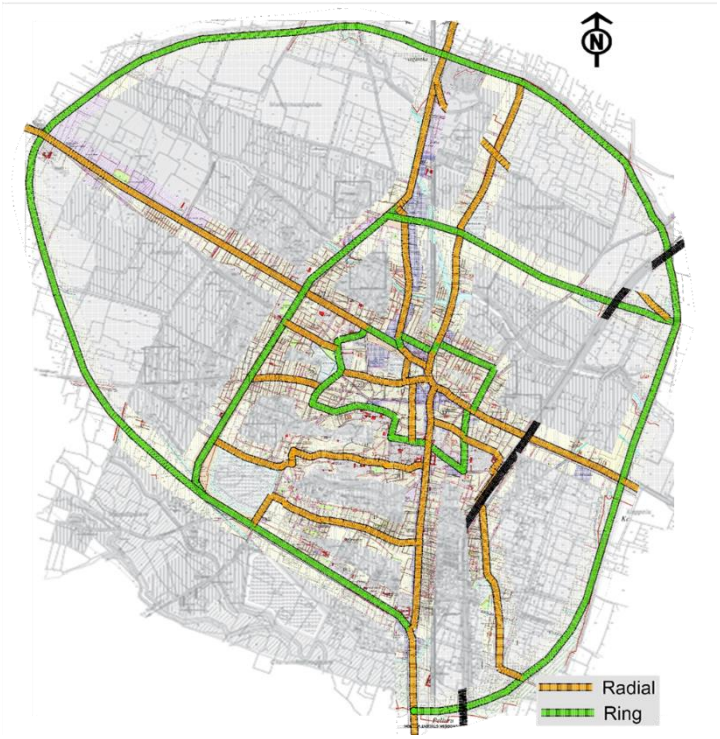


FIGURE 4.2-2: MOBILITY CORRIDORS FOR DENSIFICATION IN ONGOLE

4.2.2 POPULATION & EMPLOYMENT PROJECTIONS

4.2.2.1 POPULATION PROJECTIONS

According to the census the population since 2001 to 2011 is increased at growth of around 30%. 1991 to 2001 the actual population was increased from 1,31,250 to 1,53,891. The population projection methods namely, arithmetic progression, geometric progression and incremental increase method have been consider to forecast the future population. Due to the decrease in percentage (%age) growth of population; Geometric Progression Method was not suitable. As per Integrated Solid Waste Management Report (Sep.2016[2]) the projected population is 4,37,599 for 2031 which was projected in the year 2016. After examining the available methods for projecting the population in Ongole and considering the present stature of OMC, future developments, the Incremental Increase Method has been taken into consideration. The details of Population projection are as shown in Table 4.2-2 and Figure 4.2-3.

TABLE 4.2-2: POPULATION PROJECTIONS[3]

Year	Incremental Increase Method
2011	2.52,739
2018	2,89,793
2028	3,58,172
2038	4,44,721

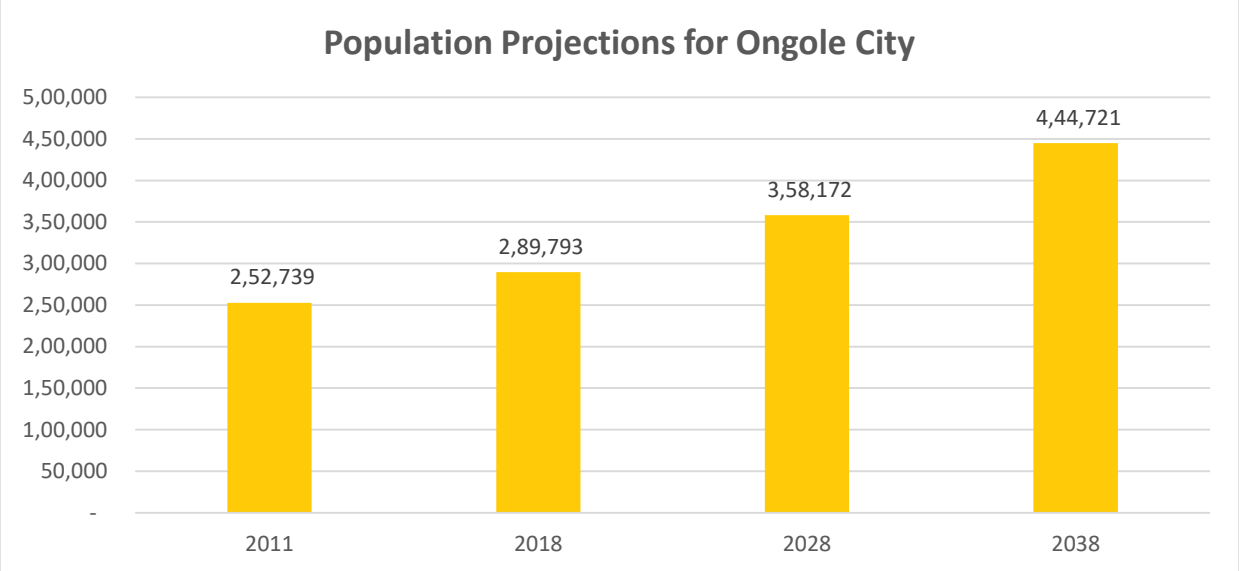


FIGURE 4.2-3 PROJECTED POPULATION FOR ONGOLE CITY

[2] Preparation of Detailed Project Reports for Implementation of Municipal Solid Waste Management in ULBs in Andhra Pradesh for Zone-II Under East and West Godavari, APUFIDC , Sep- 2016

[3] Source: Census of India and UMTC Projections

The land along the identified mobility corridor has potential to be developed as Transit Oriented Development and is also considered for population projections in SUT scenario, while the population and employment for the entire study area is considered same as in BAU scenario. The distribution of population within the study for BAU and SUT scenario are as shown in Figure 4.2-4 and Figure 4.2-5.

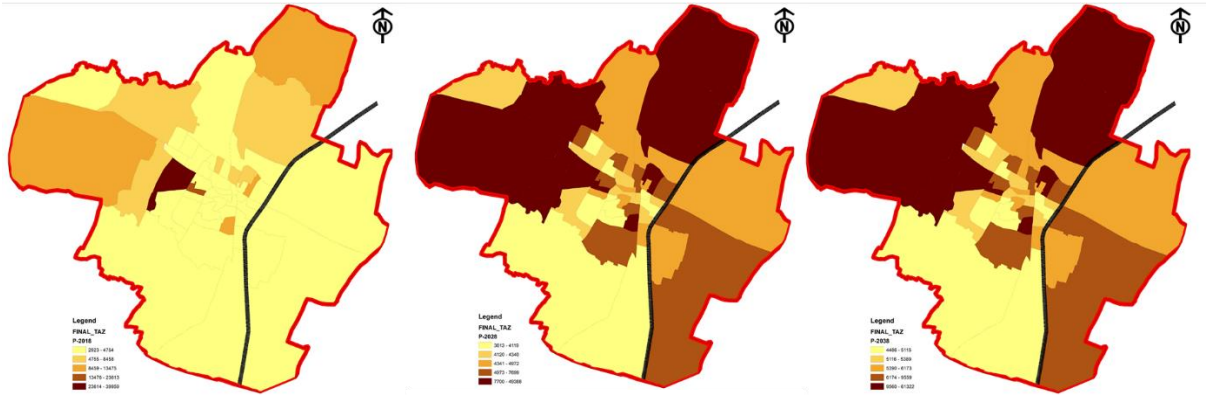


FIGURE 4.2-4: POPULATION PROJECTIONS FOR 2018, 2028, 2038

4.2.2.2 EMPLOYMENT PROJECTIONS

Ongole is a prominent commercial Centre in Prakasam District. Tobacco, Aqua culture, Granite polishing factories, PVC pipe factories, Milk projects, Salt production of the main important commercial activities. Because of its strategic location on both the National High way No.5 and Railway main line from Kolkata to Chennai there is a significant development in business and commerce like cash crops, Aqua and Granite products. Further Ongole is famous and proud of its indigenous Bull called Ongole Bull. The semen of the Ongole Bull is being preserved and exported to some of the western countries. The town service as on outlet for marketing the producers of its hinterland. The Town is surrounded by agriculturally developed villages and a big marketing centre. The existence of the Industries like Granite Industries and huge milk project, PVC pipe factories, Tobacco factories and Aqua culture has contributed to its Industrial and Economic growth. As per the Master Plan, Thorvagunta and Pernamitta areas have been planned for future industrial developments. Taking this into consideration, the proposals to strength the economic growth and accessing the current growth patterns the employment was forecasted which is as shown in Table 4.2-3.

TABLE 4.2-3: POPULATION AND EMPLOYMENT FOR HORIZON YEARS (2018-2038)[4]

Year	Population	Employment
2011	2.52,739	85,374
2018	2,89,793	1,21,980
2028	3,58,172	1,50,762

[4] Source: Census of India and UMTC Projections

Year	Population	Employment
2038	4,44,721	1,87,192

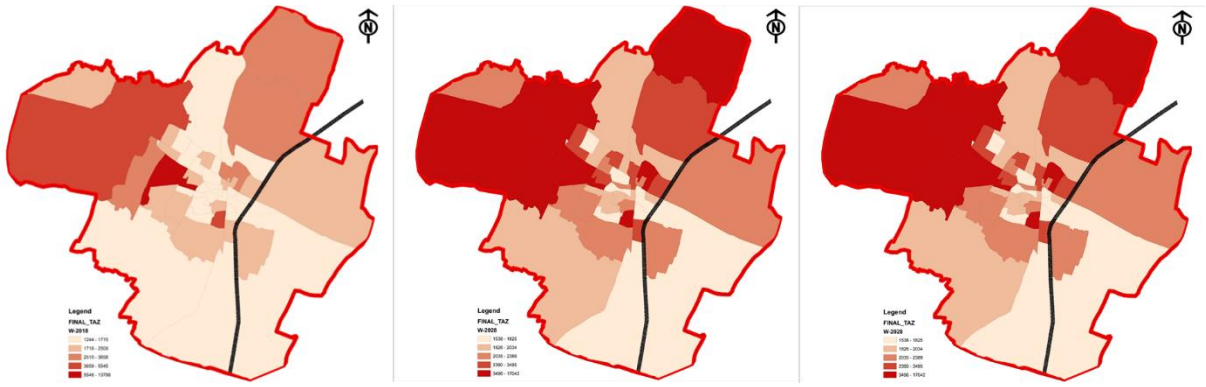


FIGURE 4.2-5: WORKER POPULATION PROJECTIONS FOR 2018, 2028, 2038

4.3 TRAVEL DEMAND CHARACTERISTICES

Based on the various traffic surveys conducted the intercity travel demand and its characteristics were assessed. Using the zonal expansion factors, O-D trip matrices have been generated for the intra-city and inter-city trips by mode using the data source as presented in

TABLE 4.3-1: DATA SOURCES FOR GENERATION OF O-D PERSON TRIP MATRICES

Intra/Intercity Trips	Category	Data Source
Intra-city Trips	Home based trips	HIS
	Non-home based trips	HIS (Supplemented by O-D surveys at terminals)
Inter-city Trips	Internal – External	Outer Cordon O-D surveys (Supplemented by HIS and O-D surveys at Terminals)
	External – Internal	Outer Cordon O-D surveys (Supplemented by HIS and O-D surveys at Terminals)
	External – External	Outer Cordon O-D surveys

The trips obtained were validated with the outer cordon and screen line counts. Table 4.3-2 summarizes the trips obtained from the matrices.

TABLE 4.3-2: SUMMARY OF BASE YEAR PASSENGER TRIPS

MODE	I-I	I-E & E-I	E-E	Total
2W	78%	16%	6%	100%
Car	27%	48%	25%	100%
IPT	52%	34%	14%	100%
PT	49%	44%	7%	100%
NMV	100%	0%	0%	100%
Walk	99%	1%	0%	100%

TABLE 4.3-3: SUMMARY OF BASE YEAR PASSENGER TRIPS

MODE	I-I	I-E & E-I	E-E
2W	41%	20%	25%
Car	4%	15%	25%
IPT	13%	18%	25%
PT	23%	46%	25%

MODE	I-I	I-E & E-I	E-E
NMV	3%	0%	0%
Walk	16%	0%	0%
Total	100%	100%	100%

The trip interactions of various modes were assessed based on the intercity and intra-city movements.

4.3 COMPARISION OF SCENARIOS

The master plan was considered to assess future development directions and required transport network. Considering the various transportation improvements at two scenarios for horizon year were modelled. They are:

1. Business As Usual (Current Scenario+ Committed Projects) Scenario
2. Sustainable (BAU + Proposed Projects + Transit Oriented Development) Scenario

The BAU scenario extrapolates existing trends and assumes no radical policy interventions for sustainable development and emission mitigations. Future transport demand is based on the preferences of different socio- economic groups in the base year. In terms of passenger transport, the BAU Scenario predicts increased car ownership and higher demand for motorization.

While in the Sustainable Urban Transport scenario, following interventions have been prioritized and considered based on the outputs of BAU and secondary reports. These proposals have been evaluated in the calibrated travel demand model.

- Transit Oriented Development along mobility corridors
- Augmentation of buses
- Development of Public transit corridors
- Completion of inner ring road and outer ring road (Network Completion)
- Development of other roads that have been identified based on specific purpose (i.e. missing links, Hierarchy road system, part of public transit corridor)

The assessed outputs for each of the scenarios are discussed under the following heads,

1. Network Characteristics
2. V/C Ratio and PT PHPDT
3. Public Transit Ridership for Improved System

4.3.1 NETWORK CHARACTERISTICS

A comparison of traffic and travel characteristics in Business As Usual Scenario and Sustainable Urban Transport Scenario is presented in Table 4.5-2

TABLE 4.3-1: SUMMARY OF BASE YEAR PASSENGER TRIPS

Network Characteristics	Base Year (2018)	BAU Scenario (2038)	SUT Scenario (2038)
Walk	15.9%	10.4%	30.3%
Car	3.6%	4.6%	3.6%
Two wheeler	41.4%	52.8%	15.5%
Auto Rickshaw	32.6%	17.1%	14.2%
Public Transport	4%	13.5%	30.1%
NMV (Cycle +Cycle Rickshaw)	2.5%	1.56%	6.4%
Avg. Network Speed (kmph)	25.7	20.2	27.8
Avg. Volume-Capacity (V/C) Ratio	0.92	1.40	0.87

It is observed that the share of Public Transport in Sustainable Urban Transport scenario has increased 1.5 times when compared to Business as Usual Scenario. Also, average V/C ratio has reduced by 15% and average network speed has increased by 25% in Sustainable scenario. Sustainable scenario is selected for proposing various transport improvement proposals.

4.3.2 V/C RATIO AND PT PHPDT

V/C ratios along with PT PHPDT on major roads for horizon year 2038 is compiled and presented in Table 4.3-2

TABLE 4.3-2: V/C AND PT PHPDT ON MAJOR ROADS FOR HORIZON YEAR 2038

S.No.	ROAD NAME	V/C			PHPDT		
		BAU	SUT	% Change	BAU	SUT	% Change
1	Vijayawada Chennai Road	1.45	1.37	-5.9%	2379	8612	72.4%
2	Kothapatnam Road	0.99	0.93	-5.9%	732	1039	29.5%
3	Nellore Road	1.40	1.32	-5.9%	2232	3168	29.5%
4	Kurnool Road	2.58	2.44	-5.9%	1208	1714	29.5%
5	CHIRALA-ONGOLE NEAR ENUSHALEM CHURCH	0.61	0.58	-5.9%	37	972	96.2%
6	TRUNK ROAD, NEAR KP COMPLEX	2.29	2.17	-5.9%	2928	4155	29.5%
7	KP BUS STAND FLYOVER ROAD, NEAR CENTRAL CRIME STATION	2.48	2.34	-5.9%	842	5012	83.2%
8	KURNOOL ROAD NEAR ONGOLE ELECTRICITY OFFICE	3.06	2.89	-5.9%	37	52	29.5%
9	Kurnool Road	1.57	1.48	-5.9%	1192	6966	82.9%
10	Chirala Road	0.37	0.35	-5.9%	63	89	29.5%
11	Nellore Road	0.69	0.66	-5.9%	229	2617	91.2%
12	Veeracheruvu Road	0.11	0.10	-5.9%	0	375	100.0%
13	RTC complex road	3.60	3.40	-5.9%	1005	1426	29.5%
14	Kothapatnam Road	1.49	1.41	0.0%	0	0	0.0%
15	Nellore Bus Stand	2.85	2.69	-5.9%	786	1115	29.5%
16	Towards Addanki Bus Stand	1.95	1.85	-5.9%	6098	8655	29.5%
17	Towards Ongole	2.58	2.44	-5.9%	10958	15553	29.5%
18	Towards Nellore	1.53	1.45	-5.9%	4648	12974	64.2%
19	Towards Podhili	4.13	3.90	-5.9%	2969	10986	73.0%

S.No.	ROAD NAME	V/C			PHPDT		
		BAU	SUT	% Change	BAU	SUT	% Change
20	Towards Jayapark	1.11	1.04	-5.9%	63	1356	95.4%
21	Towards Ongole Bus Stand	2.47	2.33	-5.9%	177	3231	94.5%
22	Towards Nellore Bus Stand	2.41	2.28	-5.9%	351	3404	89.7%
23	Minor road	0.62	0.58	-5.9%	45	64	29.5%

The V/C ratio on major roads has reduced by 5.6 % in SUT scenario compared to BAU. PHPDT on major roads has increased by 52% in SUT scenario compared to BAU.

4.3.3 RIDERSHIP FOR IMPROVED PUBLIC TRANSIT SYSTEM

The PHPDT of the public transport corridors were arrived at using the travel demand and and has been summarized in Table 4.3-3. Based on traffic pattern of the city and ridership evaluation, the below listed corridors are eligible for exclusive PT lanes. However, a feasibility study is required to evaluate these corridors for various options.

TABLE 4.3-3: PHPDT FOR PUBLIC TRANSPORT FOR THE BASE YEAR (2018) AND HORIZON YEAR (2038)

S.No.	ROAD NAME	PHPDT			Improved System PHPDT
		Base (2018)	BAU (2038)	SUT (2038)	
1	Ongole Bus Stand to Santhanuthalapadu	1122	2821	6494	3479
2	Ongole Bus Stand to Vellampalli	259	650	3272	1393
3	Ongole Bus Stand to Naguluppalapadu	259	650	3272	1393
4	Ongole Bus Stand to Kothapatnam	214	539	2071	941
5	Ongole Bus Stand to Surareddipalem	373	937	2212	1174
6	Ongole Bus Stand to Ongole Bus Stand via Nellore Bypass Road	946	2378	4997	2774

The major public transport mobility corridors identified are as represented in the Table 4.3-4.

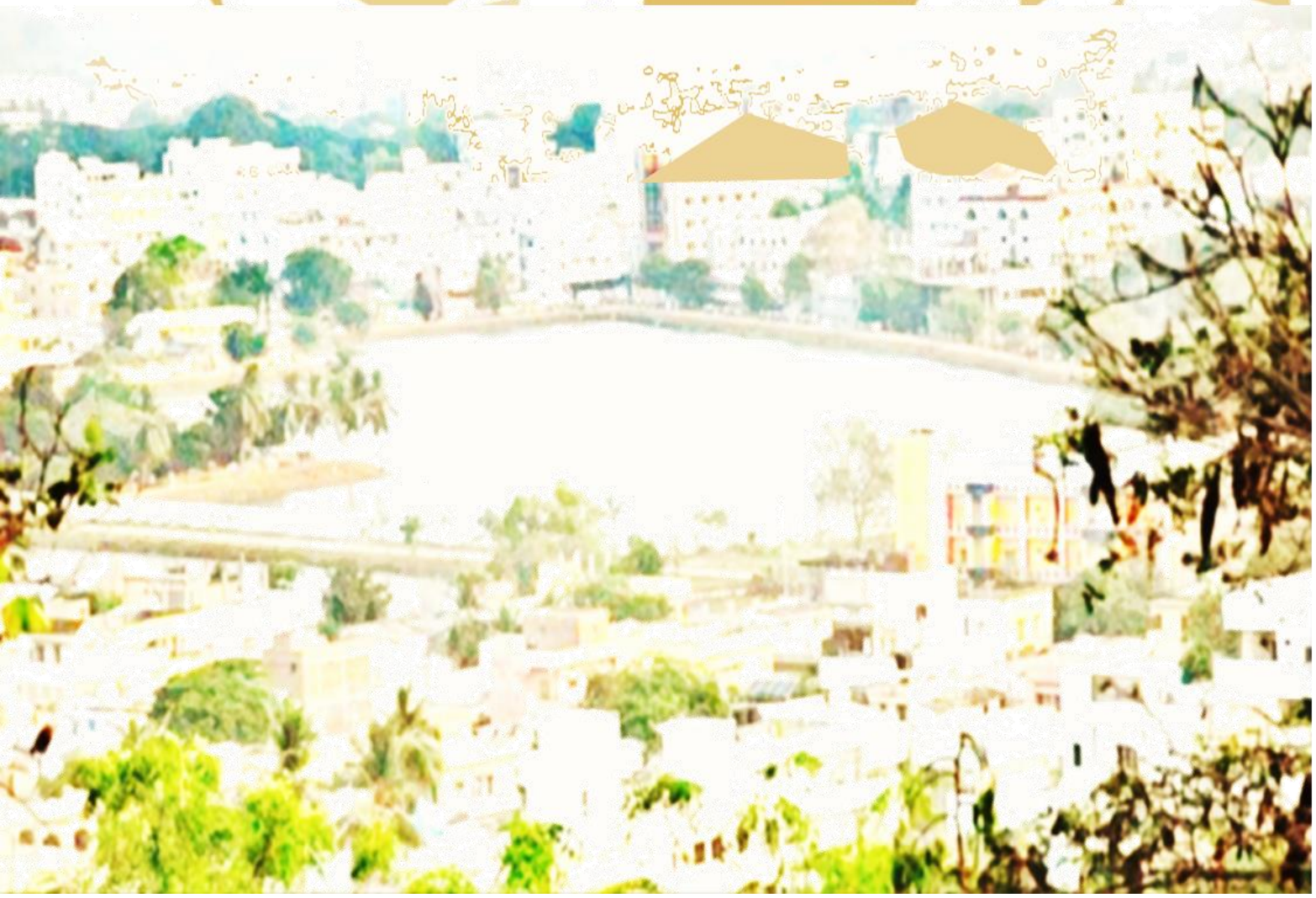
TABLE 4.3-4: MAJOR PT MOBILITY CORRIDORS IN ONGOLE

S.No.	ROAD NAME	BASE (2018)	BAU (2038)	SUT (2038)
1	Vijayawada Chennai Road	946	2379	8612
2	Kothapatnam Road	291	732	1039
3	Nellore Road	888	2232	3168
4	Kurnool Road	480	1208	1714
5	CHIRALA-ONGOLE NEAR ENUSHALEM CHURCH	15	37	972
6	TRUNK ROAD, NEAR KP COMPLEX	1165	2928	4155
7	KP BUS STAND FLYOVER ROAD, NEAR CENTRAL CRIME STATION	335	842	5012

S.No.	ROAD NAME	BASE (2018)	BAU (2038)	SUT (2038)
8	KURNOOL ROAD NEAR ONGOLE ELECTRICITY OFFICE	15	37	52
9	Kurnool Road	474	1192	6966
10	Chirala Road	25	63	89
11	Nellore Road	91	229	2617
12	Veeracheruvu Road	0	0	375
13	RTC complex road	400	1005	1426
14	Kothapatnam Road	0	0	0
15	Nellore Bus Stand	313	786	1115
16	Towards Addanki Bus Stand	2426	6098	8655
17	Towards Ongole	4360	10958	15553
18	Towards Nellore	1849	4648	12974
19	Towards Podhili	1181	2969	10986
20	Towards Jayapark	25	63	1356
21	Towards Ongole Bus Stand	71	177	3231
22	Towards Nellore Bus Stand	140	351	3404
23	Minor road	18	45	64

Chapter 5

URBAN MOBILITY PLAN



5. URBAN MOBILITY PLAN

The mobility goals for Ongole have been addressed through a multipronged approach. Solutions for complex transport improvements cannot be achieved by a single strategy. The following strategies have been adopted in tandem to meet the various goals set for Ongole.

1. Land Use and Transport Strategy
2. Public Transit Improvement Strategy
3. Road Network Development Strategy
4. Non-Motorized Transport Strategy
5. Freight Management Strategy
6. Traffic Engineering and Traffic Management Strategy
7. Travel Demand Management Strategy
8. Technological Strategy

It is important to note that each of the above strategies are equally important and the order of listing does not imply priority. Each of the broad strategies includes sub strategies of immense importance. The strategies when implemented through specific projects shall fulfil the goals and objectives of the LCMP. The sections below discuss these strategies.

5.1 LAND USE AND TRANSPORT PLAN

The transport network of city is dependent on its land use. Land use and the transport network strategy development must go hand in hand. Connectivity helps in the realization of the land use planned. The land-use transport strategy developed focuses on accessibility, connectivity, and mixed land use developments to minimize private vehicle trips, encourage transit-oriented development. In the long term, the transport strategy should be based on the urban growth envisaged for the city. Transport network strategy, therefore, enables the city to take an urban form that best suits the geographical constraints of its location and also one that best supports the key social and economic activities of its residents. Integrated land use and transport development promotes balanced regional growth in line with regional development strategies, with the objective of:

- Promoting balanced spatial growth
- Minimizing land requirements for private transport
- Promoting transit-oriented growth
- Reducing the need to travel
- Encouraging walkable/ cycleable neighbourhoods

The land use transport strategies adopted for Ongole are as follows,

1) Multi- Nodal Transit Network
2) Transit Oriented Development

5.1.1 NETWORK STRUCTURE-MULTI NODAL TRANSIT CONCEPT

The urban form and its spatial structure are articulated by two structural elements, Nodes and Linkages.

5.1.1.1 NODES

Nodes are reflected in the centrality of urban activities - can be related to the spatial accumulation of economic activities or to the accessibility to the transport system. Terminals, such as bus stations, rail yards, and airports, are important nodes around which activities agglomerate at the local or regional level. Nodes have a hierarchy related to their importance and contribution to urban functions, such as production, management, retailing and distribution. The lowest level of linkages includes streets, which are the defining elements of the urban spatial structure.

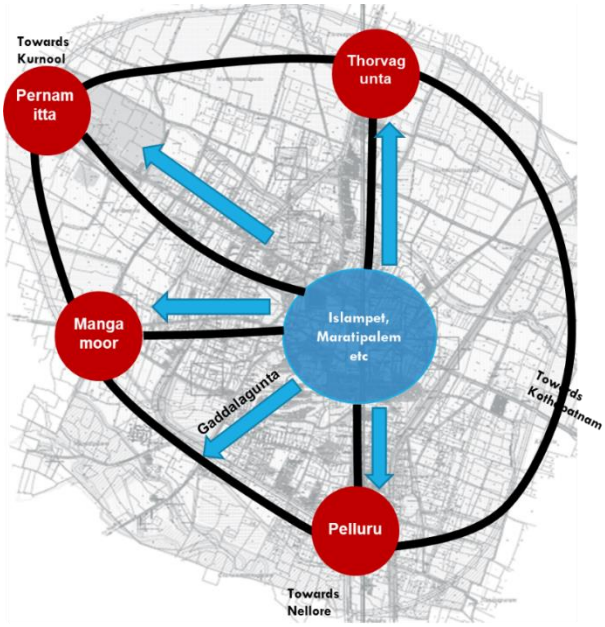


FIGURE 5.1-1: ACTIVITY/ECONOMIC NODES IN ONGOLE

The spread of activities in Ongole shows a multi-nodal model of development. Major Economic Nodes in Ongole are,

- The commercial area of the city mainly lies within the core area of the city. It includes the GT Road covering Marati Palem, CUMBU, Islampet, Kurnool Road upto Pandaripuram, Kothapatnam Road. The recent developments are observed along the Kurnool Road, GT Road and Kothapatnam Road.
- The industrial zone is mainly located in the exteriors of the city. Thoravagunta area in the northern side houses the industries, and Pernamitta area in the Western Side of the city houses industries, whereas in the Eastern Side towards Kothapatnam, Fisheries and allied activities along with tourism prospects are visualized.

Master Plan for Ongole 2031 recommends for a ring and radial road network, ensuring the linkages to these nodes with the City Core area. The National highway 5 is the major spine strengthen the movement along the nodes. The Figure 5.1-1 represents the distribution of activity nodes in and around the city.

5.1.1.2 LINKAGES

Various transit network concepts are developed world wide and have been implemented across the world. The Multi nodal transit network is one such concept where the major transit corridors and economic activity nodes are dispersed around the main city centre. Another concept is the compact development observed in cities like Barcelona, Curitiba where the development of the city region is restricted up to certain limits and a hybrid concept is a combination of dispersed (Mutli nodal) and compact development. The Figure 5.2-1 represents the conceptual mobility corridor patterns.

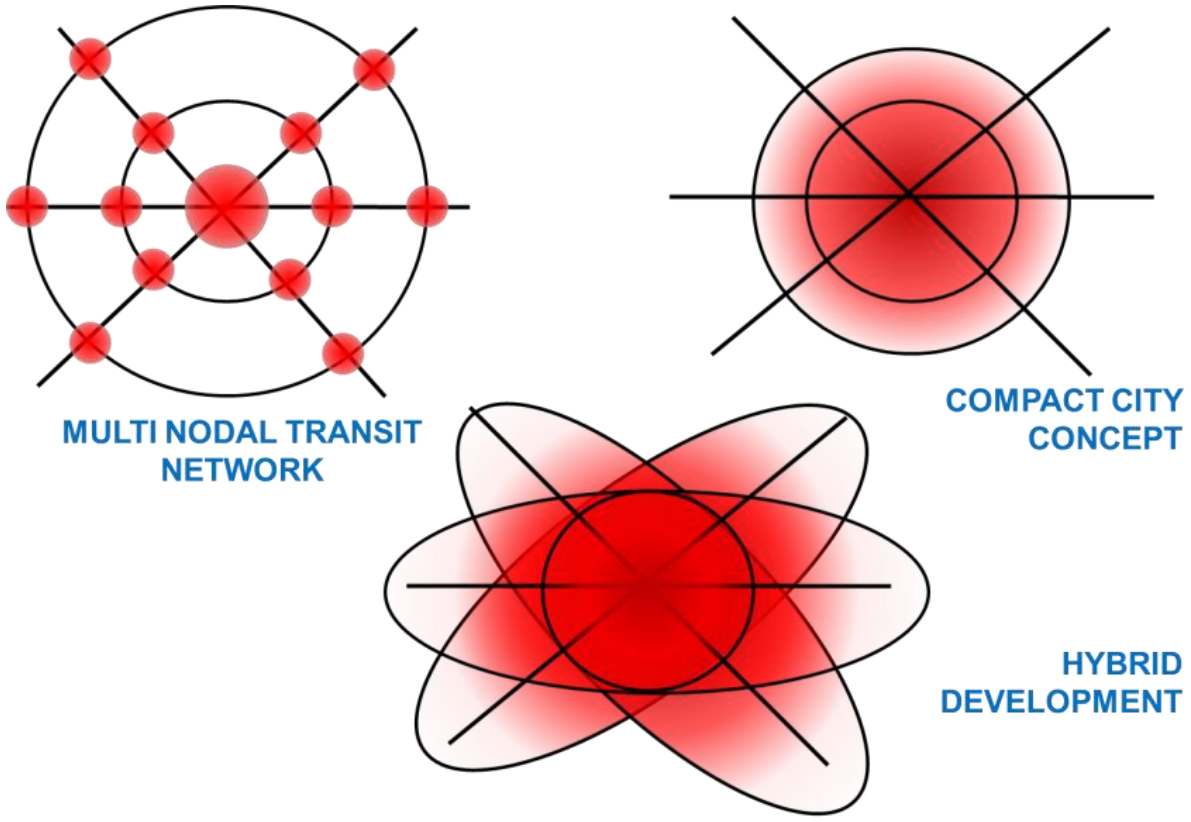


FIGURE 5.1-2 MOBILITY CORRIDOR PATTERNS CONCEPT

At present, the concentration of activities is observed at Marati Palem, Islampet, CUMBU and other areas, which fall along the Grand Trunk Road. As per the Master Plan, multiple nuclei with different nodes around the city is recommended, which are Thorvagunta, Pernamitta, Mangamoor, Pelluru and Kothapatnam. The transport infrastructure in the smaller nodes should substantiate the land use development and should complement the development. Ongole Core area is the major node in

the city. Thorvagunta and Pernamitta Industrial Areas are the major nodes around Ongole, whereas Mangamoor, Pelluru and Kothapatnam are the minor nodes. In order to decongest the core city area and for efficient and equitable distribution of transport demand throughout the city, it is imperative to develop sub-city center in different places of the city. The LCMP has proposed the development of sub-city centres at the areas where different transport modes intersect with each other (Figure 5.1-3).

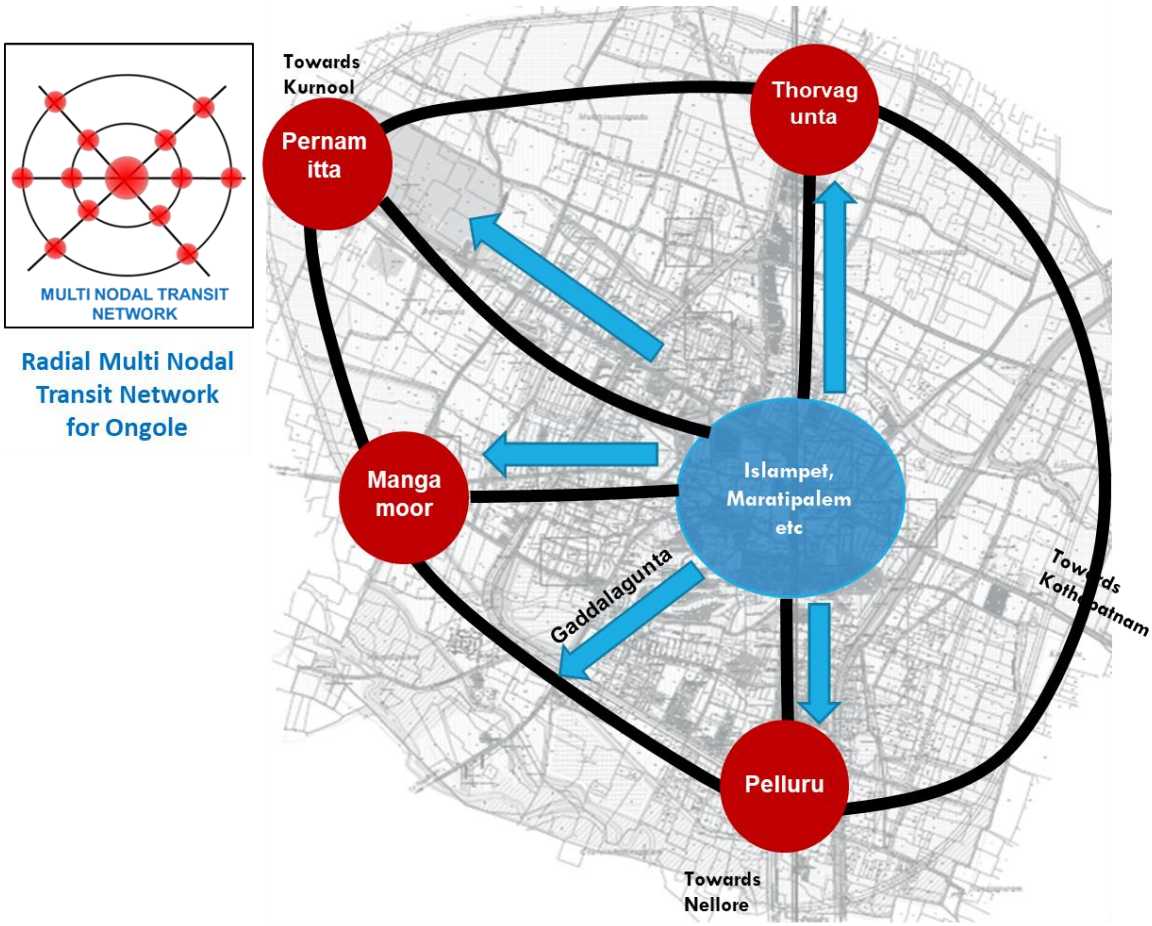


FIGURE 5.1-3 ONGOLE MULTI NODAL TRANSIT NETWORK CONCEPT

Thus, the ideal network pattern for Ongole is Radial Multi Nodal Transit Network. The city network structure is radial with complete ring, however, the future developments is anticipated to grow beyond the existing ring road. Hence, with the augmentation of the existing ring road along with the improved connectivity to the major and minor nodes of the city has been envisaged in the Master Plan. The core area can be the main city center. The sub centers can be divided based on the proximity to the main city center, i.e within immediate proximity (along inner ring road), medium proximity (between IRR and ORR) and Low proximity (along outer ring road).

TABLE 5.1-1: PROXIMITY OF CORE AND SUB CENTERS

Core Area & Immediate Proximity (Within Inner ring road)	Medium Proximity & Low Proximity (b/w IRR and along ORR)
Nehru Nagar, Bharath Nagar, Islampet, CUMBU, Pokala Colony, Maratipalem, Lawyerpet, Lawyerpet Extension, Devuni Cheruvu, Gaddalagunta, Bhagya Nagar, Ram Nagar, Brundavan Nagar, Railpeta and Kammapalem,	Thorvagunta, Gudimelapadu, Mukthinuthalapadu, Pernamitta, Mamidipalem, Vengamukkapalem, Cheruvukommupalem, Pelluru, Narasapuram and Koppolu

All major nodes should consider a transport development strategy in accordance with the overall vision of the city, which is represented in the Figure 5.1-4. For example, major nodes near Islampet covering, Pokkala Colony, Vegetable Market, APSRTC Bus Stand, Anjaiah Road and Gandhi road can be developed as a Non Motorized Zone, to enhance the NMT User Movements along the commercial area under the restricted motorised vehicular movements and supported Public transport plan so that the node is well connected for inter node travel as well as intra node travel.

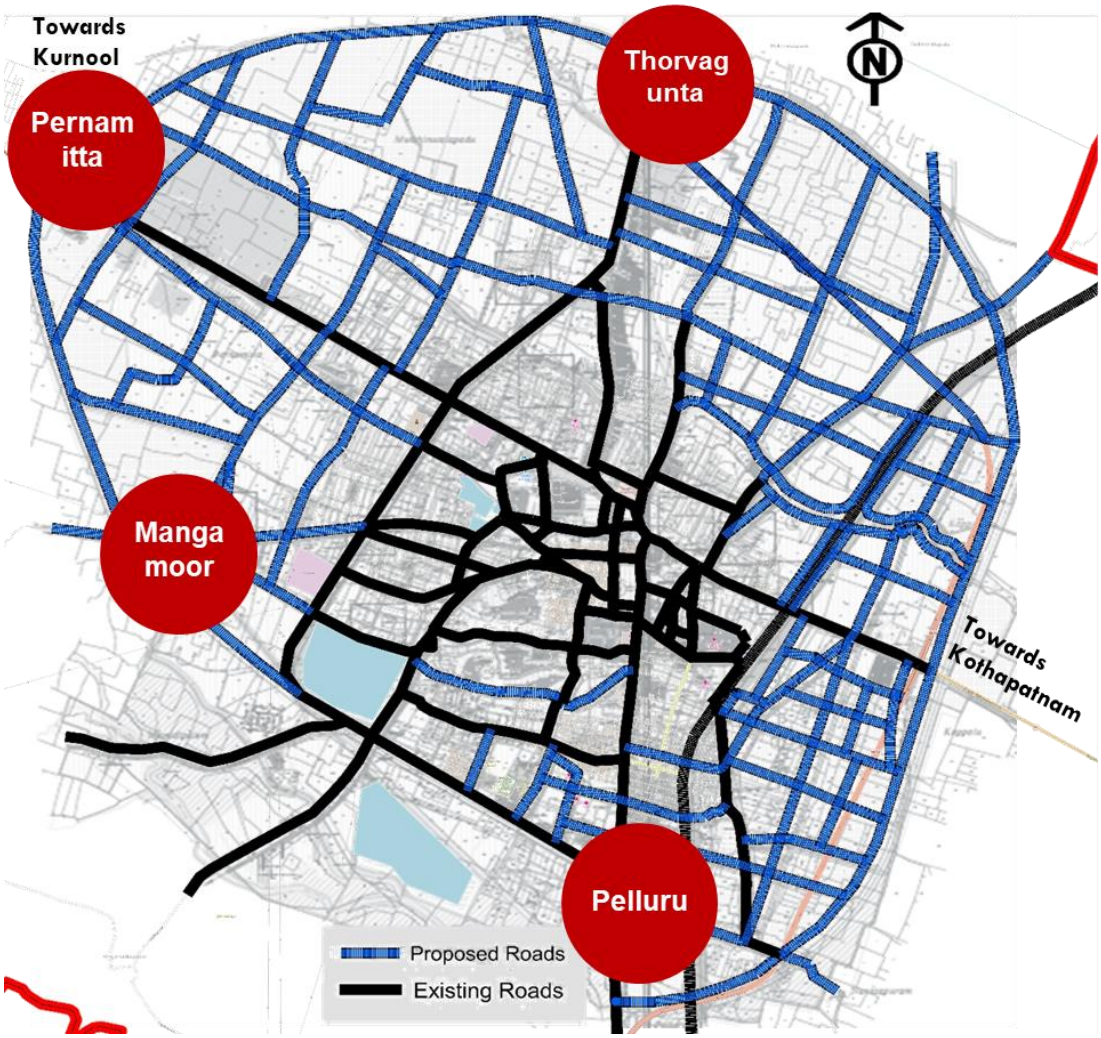


FIGURE 5.1-4 ROAD NETWORK DEVELOPMENT VS ECONOMIC DEVELOPMENT OF THE ONGOLE CITY

5.1.2 TRANSIT ORIENTED DEVELOPMENT

The ring-radial network is designated as the structure for mobility corridors. To maximize the passenger throughput, these corridors should be developed on the concepts of transit oriented development. Mixed use development that is cognizant of the low income users of the transit system is important. It is necessary to create environments where walking and transit are viable transportation options by making it easier to go from one transportation mode to another, the connection between community and development is enhanced ensuring that a community is accessible to all. Resilient neighbourhoods will provide the needs of daily living, within walking distance (1/2 to 1 km radius) as shown in Figure 5.1-5.

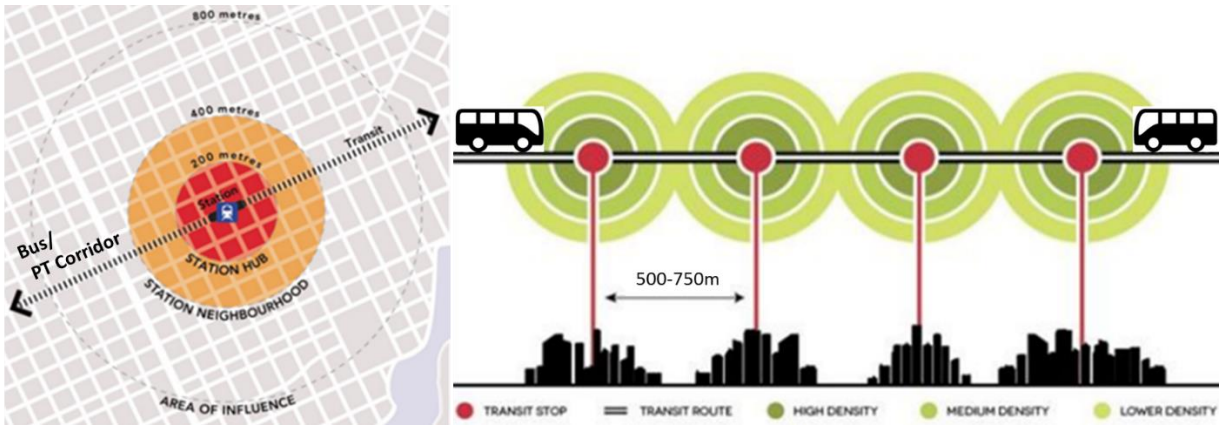


FIGURE 5.1-5 CONCEPT OF TRANSIT ORIENTED DEVELOPMENT[5]

The TOD planning process includes:

1) **Travel Connections**: Convenient and direct pedestrian connections, pedestrian scale blocks, interconnected street network including bicycle circulation and parking.
2) **Building Scale and Orientation**: Building placement is a powerful tool in reinforcing streets as public amenities. The quality of "out of vehicle" experiences is influenced by the placement of buildings in relation to the street and other buildings, as well as their height and scale (**Error! eference source not found.**).
3) **Public Spaces**: This would include pedestrian-friendly streets including adoption of traffic calming measures, parks and Plazas as community gathering spaces to enable social interaction, quality facilities for transit users
4) **Parking**: Parking structures/shared parking lots are two ways to reduce the amount of space occupied by parking facilities.

[5] *www. Wordpress.org accessed on 27th September 2016*

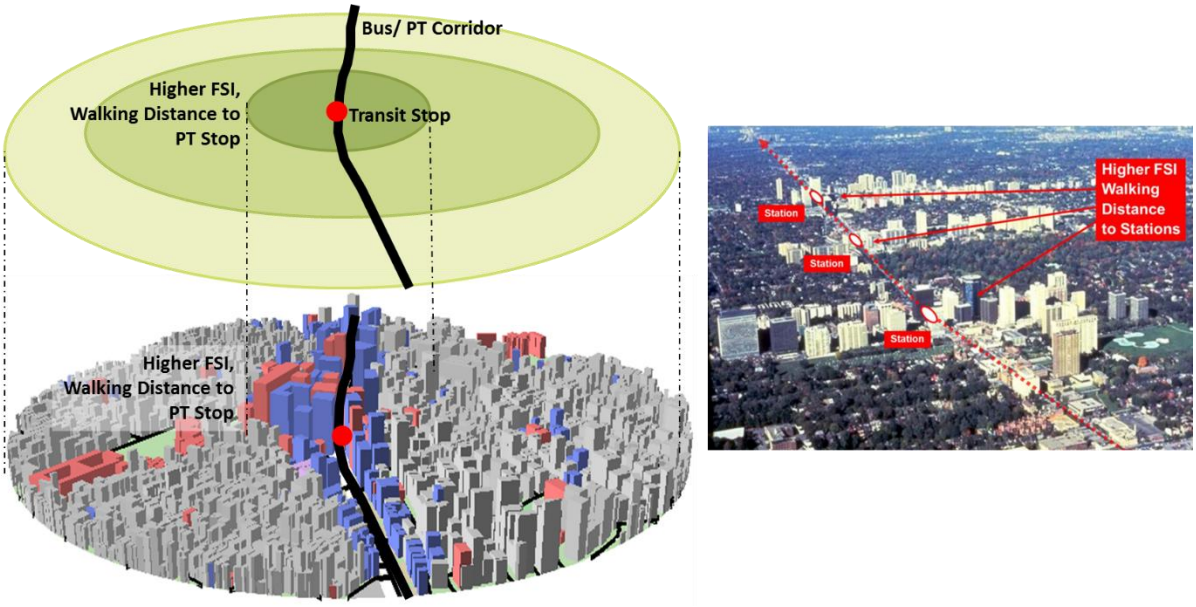


FIGURE 5.1-6 BUILDING HEIGHT AND SCALE IN TOD

As Ongole is 13th largest city in the state and has the potential to adopt TOD principles to retain as well as enhance the Non-Motorised Transport (NMT) share and would strength the usage of proposed Public Transport (PT) systems. Following corridors are considered for transit-oriented development (i.e. increase in population density by increasing FSI) and are shown in

Within the Inner ring:

1. Rangarayadu Road
2. CSR Sarma College Road
3. Bhagyanagar 4th Lane
4. Railway Station Road
5. Bharath Nagar Road.

Along the Inner Ring Road

1. North Bypass
2. South Bypass
3. New Bypass

Radials

1. Kurnool Road
2. Kothapatnam Road
3. Vijayawada Guntur Road
4. Grand Trunk Road,
5. Nellore Road.

Further, a detailed Transit Oriented Development (TOD) study need to be carried out for understanding the consumed Floor Space Index (FSI) and potential for Densification along the high mobility public transit corridors.

5.2 PUBLIC TRANSPORT IMPROVEMENT PLAN

Public transport is a shared passenger transport service which is available for use by the general public, as distinct from modes such as taxicab, carpooling or hired buses which are not shared by strangers without private arrangement. Improving public transport includes NMT also as any public transport trip includes a component of access and egress which will be covered under NMT Strategy. Improving public transport includes improvements in bus service and mass rapid transit with compatible pedestrian and bicycle infrastructure.

Public transport strategy includes following action plans:

1. Proposal for transit corridors with NMT access facilities.
2. Rationalization of existing city bus routes.
3. Phased expansion of bus fleet.
4. Creation of adequate infrastructure in the form of depot, terminals, bus queue shelters and signage.
5. The intermediate public transport (IPT) system comprising shared and private auto-rickshaws, which currently cater to a major part of overall trips in the city have to be integrated with proposed public transport system for the city. The following strategies are proposed in this regard:
    i) Restructuring of corridors to allow plying of IPT modes so as to reduce overlap of routes between them and the city bus system. This shall ensure that the IPT modes work as a feeder system to the PT system and both the systems are financially viable.
    ii) Creation of signage to demarcate the IPT stops to reduce the chaos occurring on the streets due to erratic stoppages of IPT modes.
    iii) Creation of adequate spaces for parking of IPT vehicles in the city away from the traffic junctions.
    iv) Integrate the multiple modes of transport to provide single journey experience.

At present, sub-urban bus transport is the sole public transport system in operation in Ongole. APSRTC (Andhra Pradesh State Road Transport Corporation) provides the public transport services. At present, the Ongole Depot operates with a fleet of 153, providing services from Ongole to nearby

towns and cities. Ongole has no designated city bus services. The sub-urban services provide certain level on intra city connectivity. The major stops within the city are as follows;

1. Guntur Bypass Road Bus Stop
2. Pandaripuram Bus Stop
3. RTC Bus Stand
4. Kaapu Kalyana Mandapam Center Bus Stop
5. Rangarayudu Cheruvu Bus Stop
6. Addanki Bus Stop
7. Bandlamitta Center Bus Stop
8. Kothapatnam Bus Stop
9. Tata Building Bus Stop
10. Nellore Bus Stop
11. K P Bus Stand Flyover
12. Konjedu Bus Stop

These bus stops are mainly located along the GT Road, Anjaiah Road, Rangarayudu Cheruvu Road, Guntur Bypass, Raja Panagal Road and Kothpatnam Road indicating the intercity/town connectivity. The Figure 5.2-1 indicates the location of the bus stops.

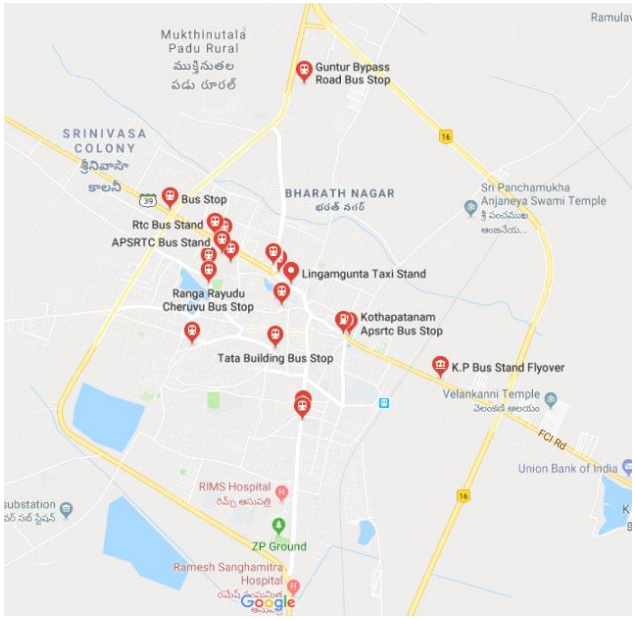


FIGURE 5.2-1 BUS STANDS AND BUS STOPS IN ONGOLE

The public transport system for Ongole should be convenient, efficient, affordable, reliable and integrated. Public transport system planning for Ongole will not only consider where terminal, routes and stops are placed but also whether they are accessible to all potential users. The proposals under public transport improvement plan for Ongole are:

1) Development of efficient bus based Public Transport systems.
2) Intermediate Public Transit/ Feeder System
3) Multi-modal integration in public transport
4) Providing adequate infrastructure facilities for public transport in terms of intermodal mobility hubs and bus stops
5) Implementation of ITS to improve the reliability of public transport systems
6) Promoting public participation and campaigning mass awareness programs

5.2.1 CITY BUS SYSTEMS

Based on the results of trip interactions obtained from various Origin and Destination (OD) surveys, the prominent trip patterns and trip generators were identified. The Desire line diagram of the motorised trips and public transport trips are show in Figure 5.2-2.

Further the demand on the mobility corridors was assess as discussed in Section 4.5.2 and Table 4.5-4 and the Bus routes shown in below figure were identified by as public transport corridors for augmentation of buses.

TABLE 5.2-1: PT PHPDT ON MOBILITY CORRIDORS IN ONGOLE

S.No.	ROAD NAME	BASE (2018)	BAU (2038)	SUT (2038)
1	Vijayawada Chennai Road	946	2379	8612
2	Kothapatnam Road	291	732	1039
3	Nellore Road	888	2232	3168
4	Kurnool Road	480	1208	1714
5	Chirala-Ongole Near Enushalem Church	15	37	972
6	Trunk Road, Near KP Complex	1165	2928	4155
7	Kp Bus Stand Flyover Road, Near Central Crime Station	335	842	5012
8	Kurnool Road Near Ongole Electricity Office	15	37	52
9	Kurnool Road	474	1192	6966
10	Chirala Road	25	63	89
11	Nellore Road	91	229	2617
12	Veeracheruvu Road	0	0	375
13	RTC complex road	400	1005	1426
14	Kothapatnam Road	0	0	0
15	Nellore Bus Stand	313	786	1115
16	Towards Addanki Bus Stand	2426	6098	8655
17	Towards Ongole	4360	10958	15553
18	Towards Nellore	1849	4648	12974
19	Towards Podhili	1181	2969	10986
20	Towards Jayapark	25	63	1356
21	Towards Ongole Bus Stand	71	177	3231
22	Towards Nellore Bus Stand	140	351	3404
23	Minor road	18	45	64

A fleet of about 54 buses have been estimated for implementation on above routes and their details are listed below.

TABLE 5.2-2 PROPOSED BUS ROUTES AND FLEET DETAILS FOR HORIZON YEAR 2038

S. No.	Name	Route Length (km)	Proposed Peak Hour Headway (min)	Proposed Fleet
1	Ongole Bus Stand to Santhanuthalapadu	8	8	8
2	Ongole Bus Stand to Vellampalli	10	10	10

S. No.	Name	Route Length (km)	Proposed Peak Hour Headway (min)	Proposed Fleet
3	Ongole Bus Stand to Naguluppalapadu	11	11	11
4	Ongole Bus Stand to Kothapatnam	10	10	10
5	Ongole Bus Stand to Surareddipalem	9	9	9
6	Ongole Bus Stand to Ongole Bus Stand via Nellore Bypass Road	7	7	7
All Routes				**54**

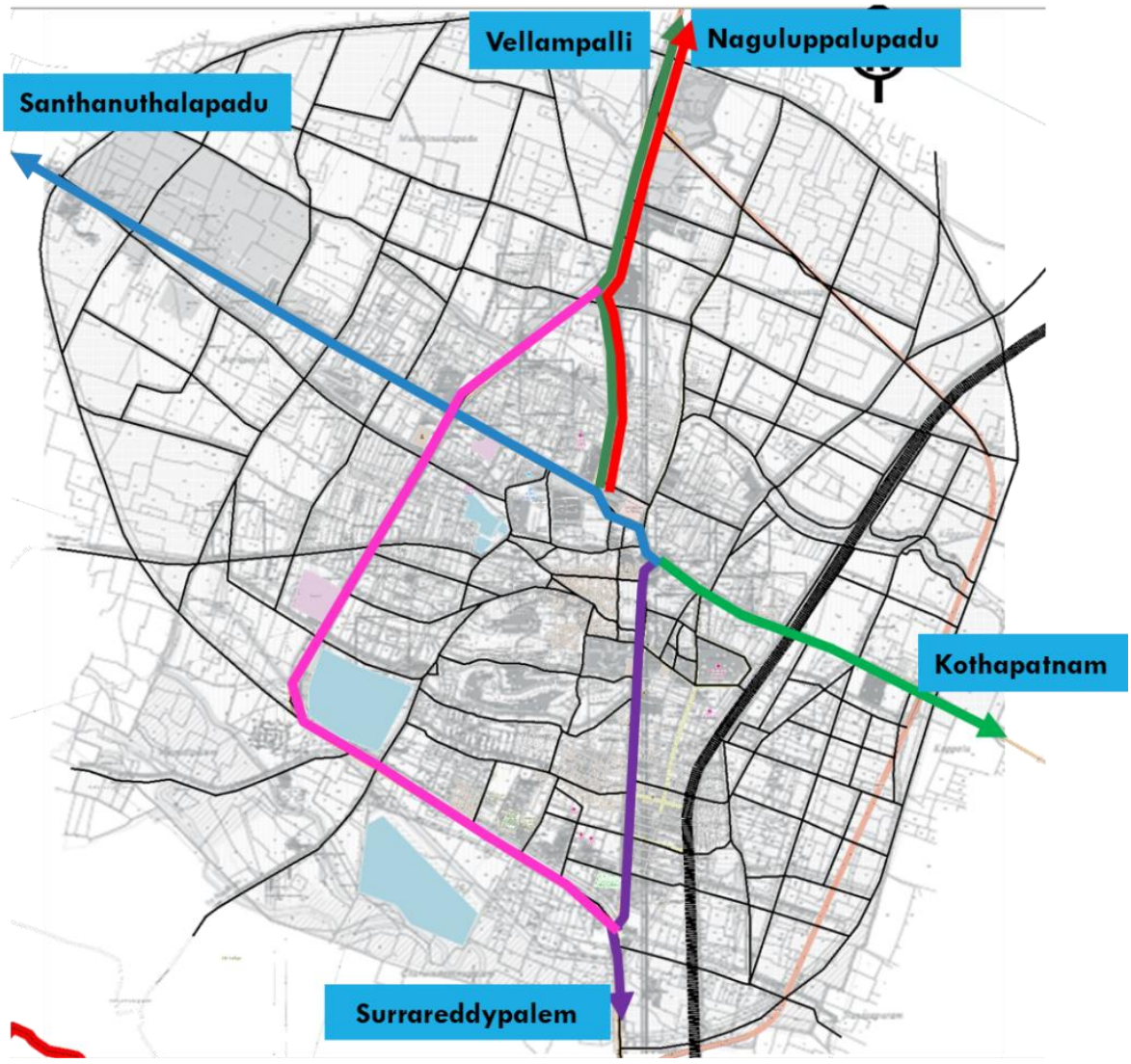


FIGURE 5.2-2 PT ROUTES IDENTIFIED FOR ONGOLE

5.2.2 PUBLIC TRANSPORT TERMINALS

5.2.2.1 BUS TERMINAL

The three main bus terminals in Ongole are as follows,

Sl. No.	Existing Terminals
1	Ongole Railway Station
2	Ongole APSRTC Bus Stand
3	Nellore Bus Stand
4	Addanki Bus Stand

Proposed Bus Terminals in Ongole are as follows;

Sl. No.	Proposed Terminals
5	Near Pandaripuram Jn. Along Kurnool Road
6	Along KP Road near NTR Colony
7	Near Venkateshwara Colony near Guntur Bypass
8	Near Ongole ZP office, along Nellore Raod

It is proposed to develop four bus terminals at Pandaripuram Junction along Kurnool Road, at KP Road near NTR Colony, near Venkateshwara Colony near Guntur Bypass and Near Ongole ZP Office, along the Nellore Road us terminals and terminate the inter-city buses plying to Ongole. A detailed feasibility study is needed for checking the viability of the projects.

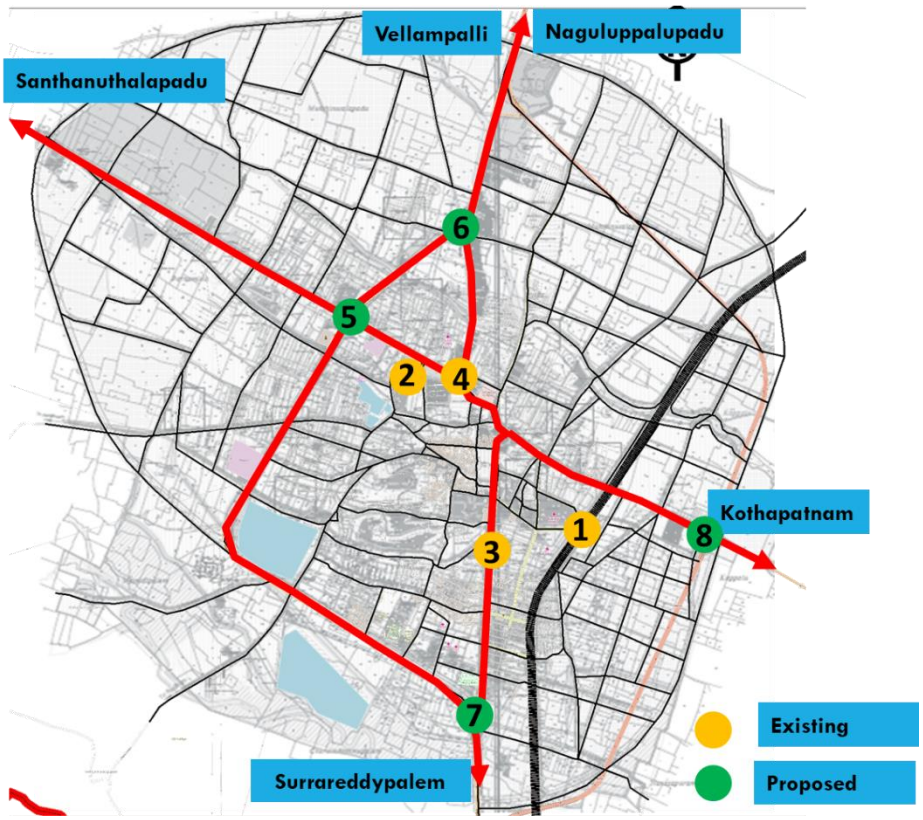


FIGURE 5.2-3 EXISTING AND PROPOSED BUS TERMINALS IN ONGOLE

5.2.2.2 RAIL TERMINAL

Ongole has one station. Average daily outflow if the passengers is represented in the Table (as collected from the Primary Survey for 16 hours).

TABLE 5.2-3 DAILY PASSENGERS AT RAIL TERMINALS

S. No.	Code	Name of the Terminal	Daily Passengers
1	TC_1	Ongole Railway Station	18409

As mentioned in the Table above, Ongole Railway Station witness 18,409 passengers in the base year during 16 hours. Summary of the peak hour passengers at the Railway Station is represented in the table below;

TABLE 5.2-4 PROJECTED PEAK HOUR PASSENGERS AT THE ONGOLE RAILWAY STATION

S. No.	Name of the Terminal	2018	2028	2038
1	Ongole railway station	1890	2326	2863

As per Indian Railway Manual-2009, allocated space per passenger for various components in the terminal area at Level of Service 'C' is used for station planning. Based on the forecasted demand, below table provides total required area for passengers using the terminal area. The current area is adequate to cater to the demand of the future years.

5.2.3 INTERMEDIATE PUBLIC TRANSPORT/ FEEDER SYSTEMS

Auto Rickshaw is the major mode of public transportation system in Ongole. In the absence of city bus services auto rickshaws provide end to end connectivity. Auto-rickshaws and cycle rickshaws can act as efficient feeder services for the proposed public transport systems. Thus, an integrated system will aid ease of access for users. They play a key role in improving sustainability for urban transport. There is a need to introduce new models of regulation and reforms that can be adopted for a more efficient and safer system that enable the rickshaw to have an optimal role in the transport mix.

Due to the restrictive policies, IPT providers largely operate informally

1. Drivers lack job security and benefits
2. They also do not have documentation of income, which limits access to credit to purchase their rickshaws
3. Drivers are often subjected to harassment and confiscation of vehicles
4. Negative environmental implications due to lack of regulation on emissions

Passenger service is also often poor

1. No regulation of fares

2. Little integration between modes due to lack of co-operation inconveniences passengers
3. Lack of safety regulations puts passengers at risk
4. Concern for safety due to mixed traffic flow driven by growth in private vehicles

Attempts need to be made to organize IPT

1. Provide better service to passengers
2. Transparency of fares and complaints hotline
3. Driver behaviour and road safety training
4. Dispatch services or "dial-a-rickshaw"
5. Include added features such as seatbelts, newspapers, etc.
6. Organize drivers and provide basic insurance, credit and allowances
7. Tea vendors can co-ordinate bookings and dispatch in return for rent-free space and a captive market of drivers
8. Medical and accident insurance and discounted medical facilities
9. Children's education allowance
10. Integrate with public transport
11. Feeder services for first and last mile connectivity - Cycle Rickshaws from railway station and bus stations to homes (Pre-paid services)
12. Promote sustainability: Cycle rickshaws, solar-powered rickshaw or rickshaws on CNG

Key Challenges

Competition of Auto-Rickshaw Services with Public Transport

Current trends in urban transport highlight the usage of IPT modes (i.e. auto-rickshaws and taxis) in cities for daily commute trips, because of the poor quality of public transport. Thus, improving public transport in cities would be a key strategy in ensuring that auto-rickshaw services fulfill their intended role as feeder services instead of competing with public transport for long-distance trips.

Challenges in Technology Implementation for Dispatch (Dial-A-Rickshaw) Services

Dispatch (dial-a-rickshaw) services in the auto-rickshaw sector would be important in making auto-rickshaw services an attractive door-to-door transport alternative to private motor vehicles for occasional and emergency trips. Fleet operations have been noted to be most effective at implementing the necessary technology for dial-a-rickshaw services (Schaller 2007). However, auto-rickshaw services in the majority of Indian cities are provided by individual owner-operators rather than by fleet companies. The lack of organization poses a barrier for the provision of dial-a-rickshaw services. Regulatory reforms that allow fleet-based operations with dispatch services to enter the auto-rickshaw sector could help address this issue.

In Ongole, the major IPT routes are operated along the commercial areas and along the transit stations. Majority of the auto-rickshaws provided end to end connectivity. The availability of auto rickshaws along the residential areas (eastern side) is observed to scarce when compared to core city area.

Although improving public transport in Ongole would be a key strategy, it is also important to ensure that auto-rickshaw services fulfil their intended role as feeder services and providing connectivity to areas which are not accessible by bus based public transport. The same is achieved by rationalizing their major routes to feed into the PT corridors, designating the routes, stops.

Auto-Rickshaws or updated E-Rickshaws can be rationalized to provided sustainable mobility solutions in the core city, especially along the Main Road.

The following IPT routes are proposed as major IPT corridors as shown in Figure 5.2-6. These IPT routes which will feed to the major trunk PT corridors. The major PT routes operate on the radials which are the arterial and sub-arterial corridors while IPT major routes form the rings connecting the PT corridors and providing access to area where PT services aren't available.

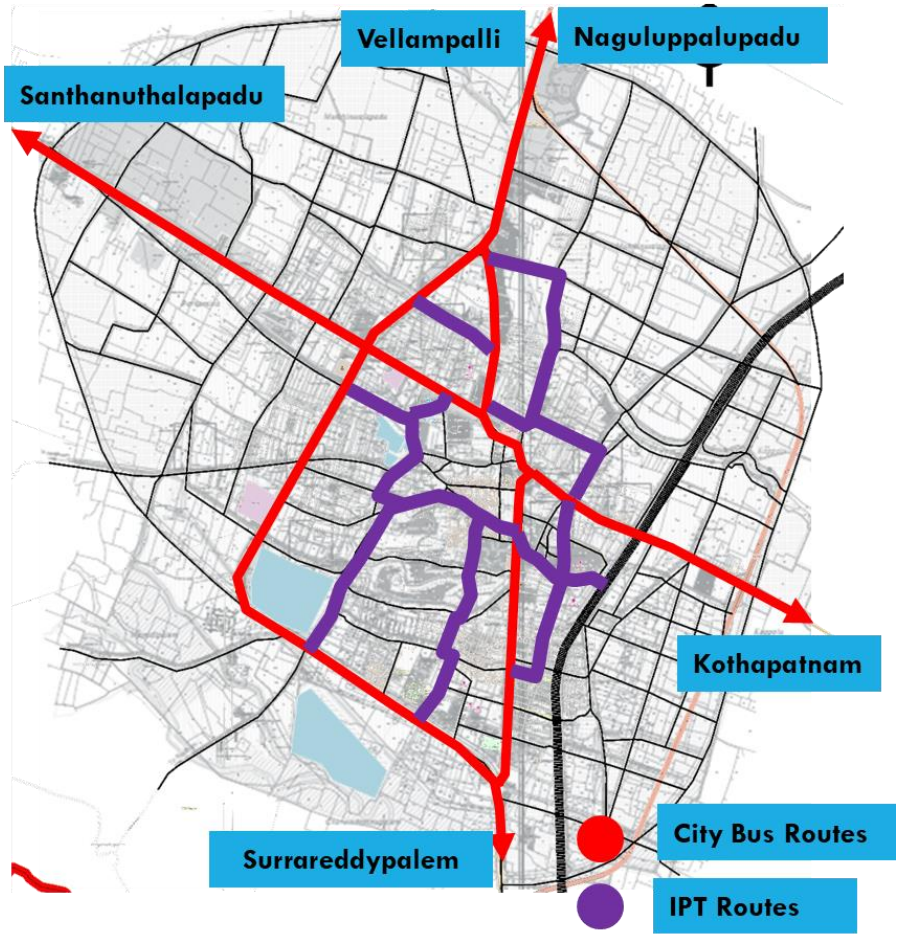


FIGURE 5.2-4 IPT ROUTES IN ONGOLE

In Ongole, the major IPT routes are operated along the commercial areas and along the transit stations. Majority of the auto-rickshaws provided end to end connectivity. The availability of auto rickshaws along the residential areas (eastern side) is observed to scarce when compared to core city area.

Although improving public transport in Ongole would be a key strategy, it is also important to ensure that auto-rickshaw services fulfil their intended role as feeder services and providing connectivity to areas which are not accessible by bus based public transport. The same is achieved by rationalizing their major routes to feed into the PT corridors, designating the routes, stops.

Auto-Rickshaws or updated E-Rickshaws can be rationalized to provide sustainable mobility solutions in the core city, especially along the Main Road.

The following IPT routes are proposed as major IPT corridors as shown in Figure 5.2-4. These IPT routes which will feed to the major trunk PT corridors. The major PT routes operate on the radials which are the arterial and sub-arterial corridors while IPT major routes form the rings connecting the PT corridors and providing access to area where PT services aren't available. A total network length of 41 km has been identified.

5.2.4 MULTI-MODAL INTEGRATION PROPOSALS

At the intersection of each mobility corridor/ transit corridor with the major road of the city, a transfer terminal should be facilitated. The transfer terminal is technically called as Transport and Traffic Management Centres (TTMC) or Multi-Modal Transit Hubs. The main objective of these are to provide Urban Transport Infrastructure with several amenities under one roof. Commuters can come from their places in personal vehicles to the public transport mode and make use of all the public amenities provided and return to their destinations. They get all their daily requirements at a single place. This will help the city to minimize congestion and also reduce the pollution hazards. This system can be integrated with other modes of transportation systems like metro, mono and express rail corridors. The proposed Multi-Modal Integration locations are given below and are shown in Figure 5.2-7.

TABLE 5.2-5 MULTI MODAL HUBS

S.NO.	LOCATION	TYPE	INTEGRATION
1	Ongole Railway Station	Major	Train Bus, IPT, NMT
2	Ongole APSRTC Bus Stand	Major	Bus, IPT, NMT
3	Nellore Bus Stand	Minor	Bus, IPT, NMT
4	Addanki Bus Stand	Minor	Bus, IPT, NMT
5	Near Pandaripuram Jn. Along Kurnool Road	Minor	Bus, IPT, NMT
6	Along KP Road near NTR Colony	Minor	Bus, IPT, NMT

S.NO.	LOCATION	TYPE	INTEGRATION
7	Near Venkateshwara Colony near Guntur Bypass	Minor	Bus, IPT, NMT
8	Near Ongole ZP office, along Nellore Raod	Minor	Bus, IPT, NMT

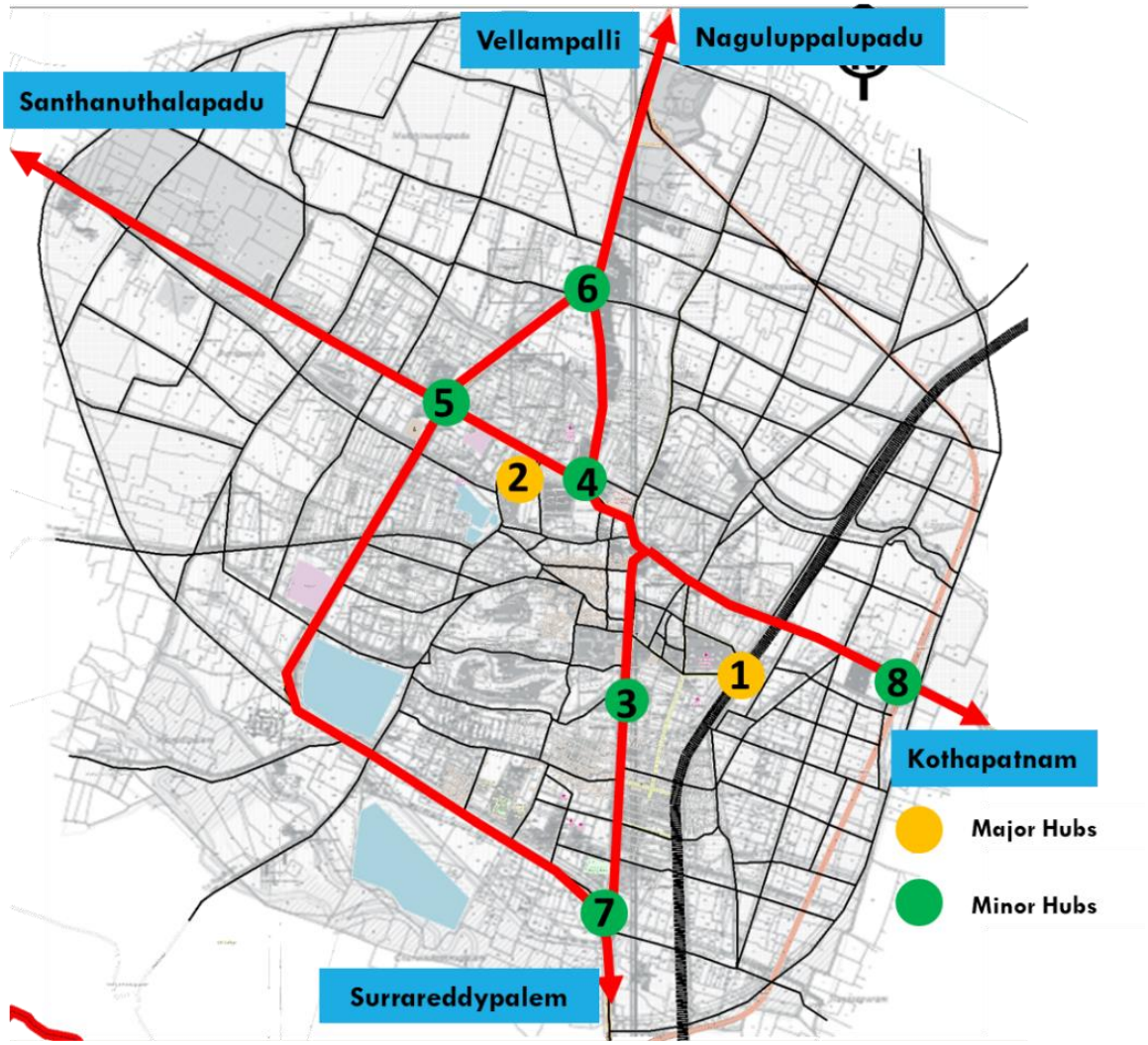


FIGURE 5.2-5 PROPOSED MULTI MODAL HUBS IN ONGOLE

5.2.5 PROMOTING PUBLIC TRANSPORT-OUTREACH PROGRAMMES

For successful implementation of the transit system, it is necessary to promote public awareness and create a sense of public ownership of the project. For this to happen effectively, it is necessary to evolve an outreach and education strategy for promoting the system.

The outreach and education goals need to be defined at the planning stage of the system itself to focus the efforts of the project implementation. The outreach and education goals as listed under UNDP Reference Guide for Public Transport are as follows:

a) Introduce the concept of the transit system, its purpose and the benefits to the various stakeholders
b) Create profile of the system as a big impact, with incremental steps for achieving the long term vision for mobility in the city
c) Enhance the understanding that mass transit projects positively impact economic health and environmental stability of the city
d) Introduce the concept of specific systems as an important strategy in making the best use of transportation resources
e) Establish communication channels for the public to receive information and interact with the implementing agencies

Following strategies can be adopted for an effective public outreach

1) Create a network of allies and provide platforms for them to actively participate as disseminators of project benefits
2) Use proactive and creative communication media to promote key messages. Communication media can be print, broadcasts, short films, event marketing etc.
3) Programmes can be conducted in schools and colleges advocating the need for public transport. Events like Car Free Day, Happy Streets, Cycle Day can also be promoted.

Further, an Integrated Public Transport study need to be carried out for detailed estimation of infrastructure and service requirement. This study will include both physical and service integration.

FIGURE 5.2-6 CAR FREE DAY AND CYCLE DAY INITIATIVES IN UP AND BANGLORE 6

5.3 ROAD NETWORK DEVELOPMENT STRATEGY

A well connected and planned road network is essential for the city. Road network development also includes improving the intersections to give equal emphasis to all road users. The road network development should add to the overall development strategy for the city. The network should have

[6] SOURCE: Getty Images and Citizen Matters

sufficient capacity to carry the vehicles. Road Network proposals are considered only if it is absolutely necessary. Provision of more flyovers and more widening will support more and more use private vehicles; hence those proposals are considered such that it will help in decongesting the junctions and can be helpful in improving the PT speeds and safer NMT movements. The proposals of improving road network include:

- Road Widening/Upgradation
- Development of Missing links/New Links/Ring Roads
- Road Infrastructure Development (River/Canal Bridges and ROBs)

5.3.1 ROAD WIDENING/UPGRADATION

Widening of roads is a must when the volume carried increases considerably compared to its capacity. All the roads identified for road widening shall be provided with median in between to reduce accidents and safety. The road widening has been discussed under the following section.

- Development of Mobility Corridors

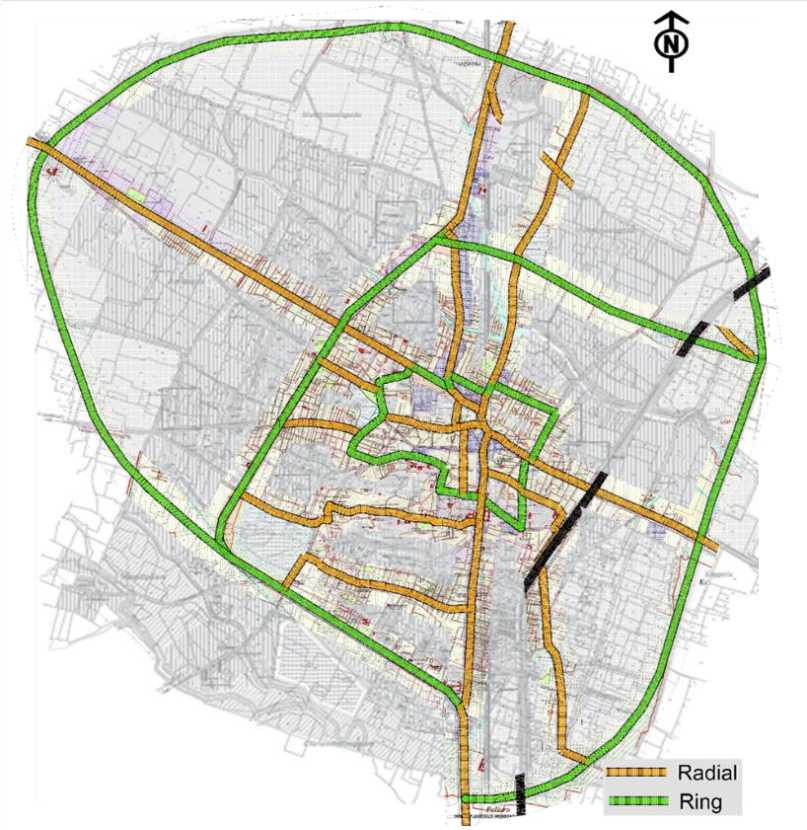
5.3.1.1 Development of Mobility Corridors (Ring and Radial Roads)

Ongole city clearly has a characteristic ring-radial network development. In Ongole, these major radials are either Bypass Roads/National Highways and are important mobility corridors. In addition, there is a possibility to develop rings which bind these radial roads together providing a ring radial pattern for the network.

The streets need to be classified into primary, secondary and tertiary so as to provide uniform standards of road geometry and public transit services. We can consider radial lines as primary transit network served by bus-based PT systems and rings as secondary transit network served by IPT based PT systems. These primary and secondary transit network together constitute the major mobility corridors for the city.

In essence, mobility corridors maximize throughput of people, focusing on public transport and non-motorized traffic, rather than vehicle traffic. These mobility corridors offer a strong network providing connectivity to major attraction centres in the city along with regional connectivity. These corridors should be considered for an augmented public transport system.

FIGURE 5.3-1 MOBILITY CORRIDORS IN ONGOLE



Within the Inner ring:

1. Rangarayadu Road
2. CSR Sarma College Road
3. Bhagyanagar 4th Lane
4. Railway Station Road
5. Bharath Nagar Road.

Along the Inner Ring Road

1. North Bypass
2. South Bypass
3. New Bypass

Radials

1. Kurnool Road
2. Kothapatnam Road
3. Vijayawada Guntur Road
4. Grand Trunk Road,
5. Nellore Road.

Since these corridors include all the major spines within Ongole, they should be designed based on the standards. Ongole can take up the project to develop such Street Design Standards, which can be further used for other streets as well. Some portions of these networks need to be widened to function as a mobility corridor. These corridors would be expected to have the following cross-sectional elements:

1. Continuous kerb, footpath and bi-cycle lanes
2. Service roads where feasible
3. Restriction or preferably prohibition of parking on the carriageway/shoulders

4. At-grade/grade-separated public transport systems as per the public transport/mass transport master plan

The following figures from Figure 5.3-2 to Figure 5.3-6 shows the indicative cross sections of various ROWs of roads to be followed for mobility corridors and other corridors.

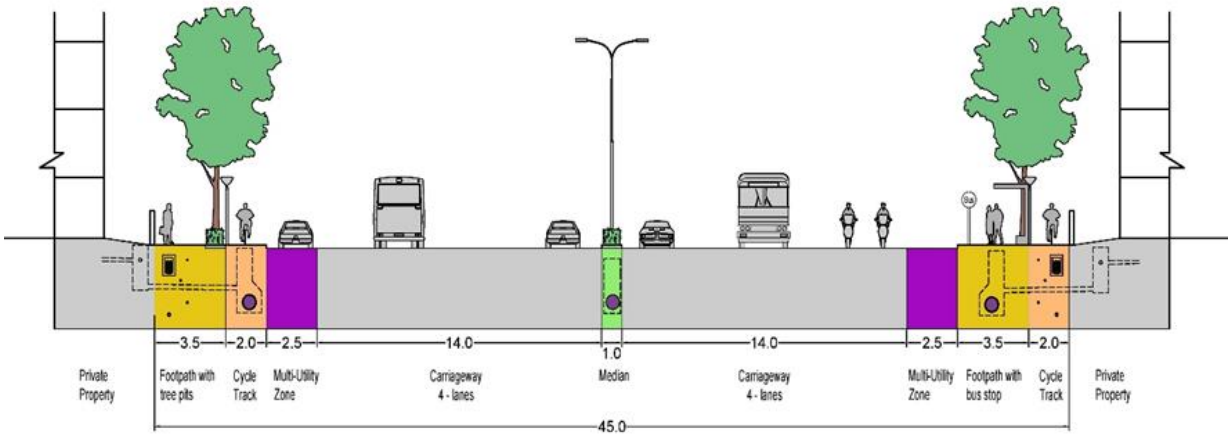


FIGURE 5.3-2 TYPICAL SECTION OF 45M WIDE ROAD

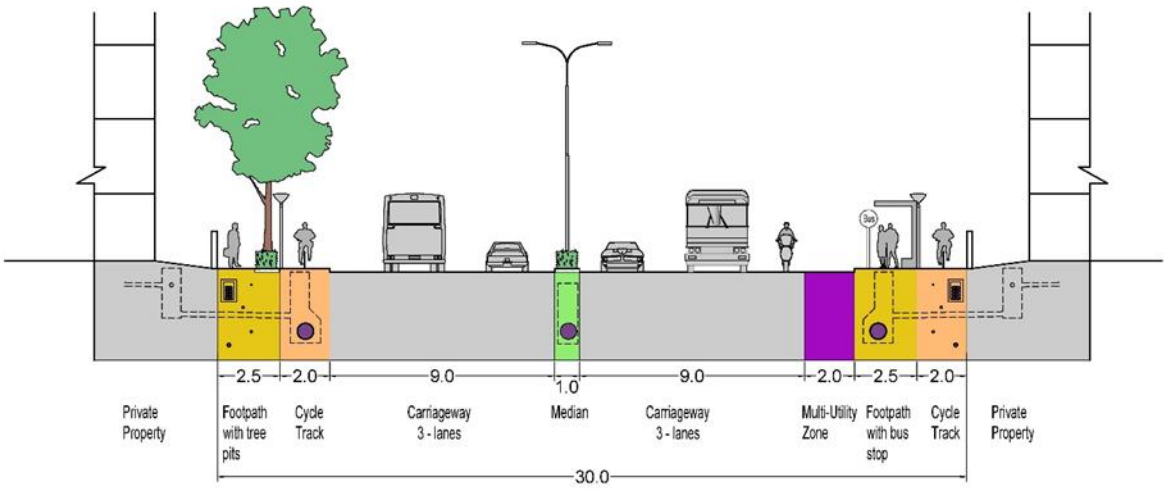


FIGURE 5.3-3 TYPICAL SECTION OF 30M WIDE ROAD

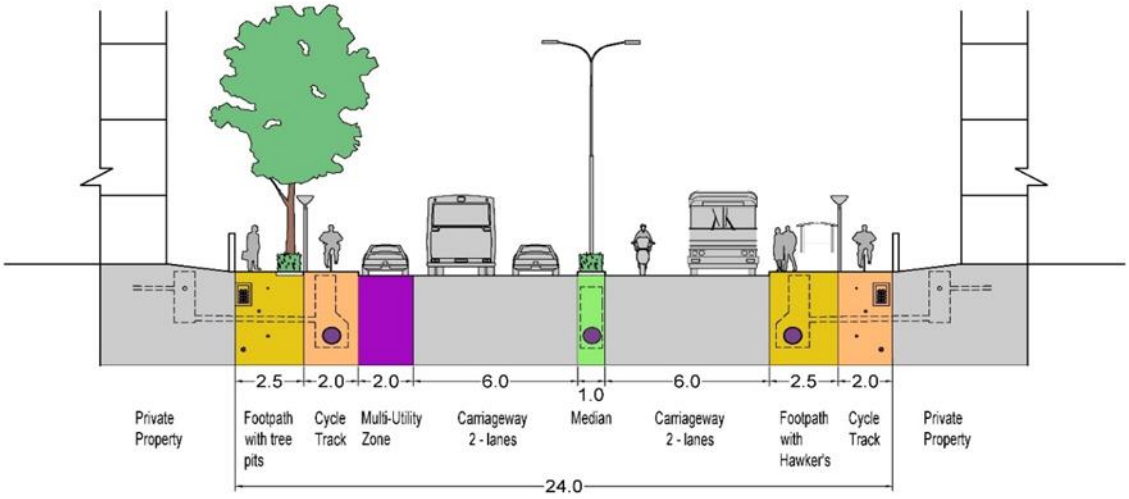


FIGURE 5.3-4 TYPICAL SECTION OF 24M WIDE ROAD

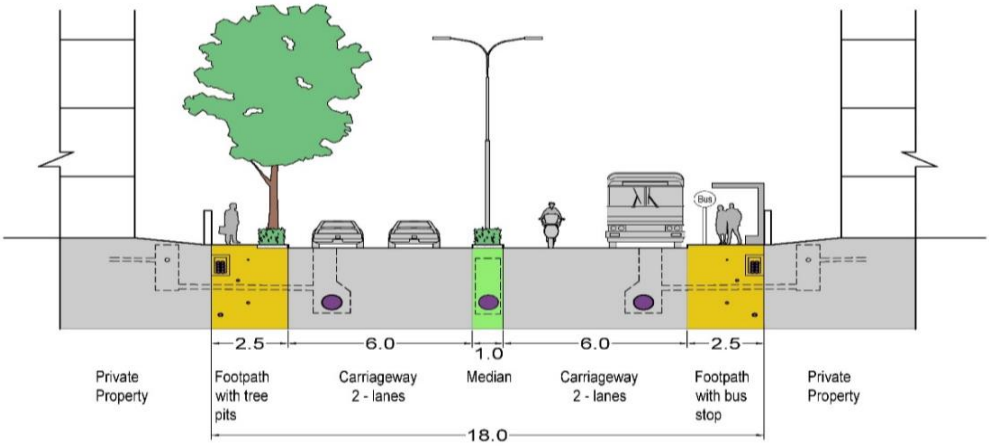


FIGURE 5.3-5 TYPICAL SECTION OF 18M WIDE ROAD

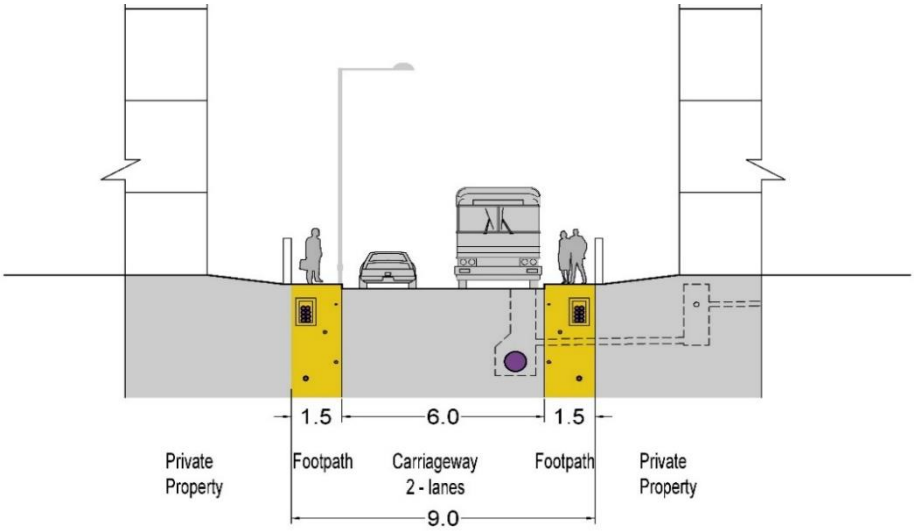


FIGURE 5.3-6 TYPICAL SECTION OF 9M WIDE ROAD

The road widening of mobility corridors is presented in Table 5.3-1.

TABLE 5.3-1 ROAD WIDENING REQUIRED FOR MOBILITY CORRIDORS

S.NO	NAME OF THE ROAD	LENGTH (KM)	BASE (2018)	SUT (2038)
1	Vijayawada Chennai Road	8.75	4	6
2	Kothapatnam Road	1.42	3	3
3	Nellore Road	8.79	5	6
4	Kurnool Road	2.53	4	5
5	Chirala-Ongole Near Enushalem Church	1.24	2	3
6	Trunk Road, Near KP Complex	2.35	4	8
7	KP Bus Stand Flyover Road, Near Central Crime Station	0.43	3	5
8	Kurnool Road Near Ongole Electricity Office	1.03	6	8
9	Kurnool Road	0.52	4	6
10	Chirala Road	0.28	4	4
11	Nellore Road	0.19	4	4
12	Veeracheruvu Road	0.12	4	4
13	RTC complex road	0.21	4	8
14	Kothapatnam Road	0.31	2	4
15	Nellore Bus Stand	0.18	4	6
16	Towards Addanki Bus Stand	0.17	4	6
17	Towards Ongole	0.17	4	8
18	Towards Nellore	0.24	4	6
19	Towards Podhili	0.30	4	8
20	Towards Jayapark	0.18	2	2
21	Towards Ongole Bus Stand	0.14	2	4
22	Towards Nellore Bus Stand	0.15	2	4
23	Minor road	0.19	2	4

5.3.2 DEVELOPMENT OF MISSING LINKS/NEW LINKS/RING ROADS

The city's network structure has well established radials while, the structure of the rings remains unclear and unestablished. Various missing links have been assessed and identified to establish a clear structure and decongest the radials. The links to developed are as shown in Figure 5.3-7.

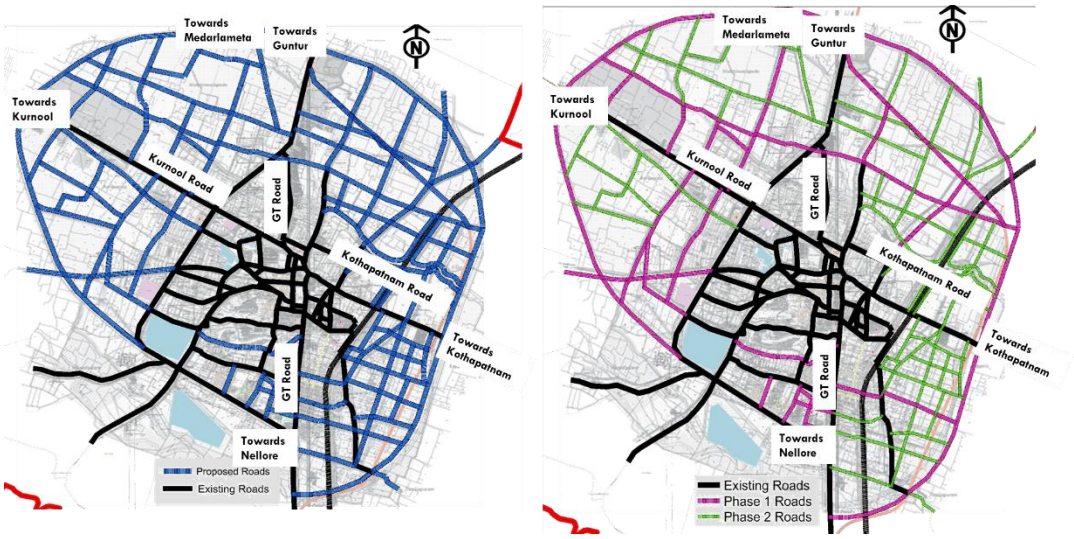


FIGURE 5.3-7 IDENTIFIED ADDITIONAL ROAD NETWORK LINKS (AS PER MASTER PLAN)

A feasibility study needs to be carried for fixing the alignment of Proposed Road Network such that it directs the growth of the city.

5.3.3 ROAD INFRASTRUCTURE DEVELOPMENT (RIVER/CANAL BRIDGES AND ROBS)

Adequate and properly maintained road infrastructure is always necessary to support smooth flow of passengers. More efficient infrastructure will enable better mobility for people and goods as well as provide better connection between regions.

The study, recognizes that there is a need for Rail Over Bridge at the rail, road intersection along the Chennai – Nellore Highway to facilitate the creation of an internal ring for the city. **Error! Reference source not found.** shows the proposed bridge location.

FIGURE 5.3-8 : PROPOSED RAIL OVER BRIDGES (ROB)/RAIL UNDER BRIDGES (RUB) LOCATIONS

5.4 NON-MOTORIZED TRANSPORT (NMT) PLAN

The LCMP envisions an environment where people are encouraged to walk and cycle in Ongole through equitable allocation of public space and infrastructure; and access to opportunities and

mobility for all residents. Ongole Municipal Corporation (OMC) should aim to increase the use of cycling and walking by creating a safe and pleasant NMT network of footpaths, cycle tracks, greenways, and other facilities to serve all citizens. The design of the streets in the city must be consistent with best practices in pedestrian-oriented, multi-modal street design. They will also incorporate appropriate environmental planning and water management techniques. Together, these measures will achieve the following:

1. Improved access and mobility for all residents.
2. Social and economic empowerment through the provision of improved low-cost mobility.
3. Gender equity through the provision of NMT facilities that are safe for women to use.
4. Social inclusion in creating NMT facilities that follow principles of universal design and are usable to the greatest extent possible by everyone, regardless of his or her age, ability, or status in life.
5. Reduced local and global environmental impacts of Ongole transport system through expanded use of zero pollution modes.
6. A changed culture that accepts the use of cycling and walking as acceptable and aspirational means to move around in the city.
7. Participation of local residents, businesses, and other stakeholders in the preparation of designs and standards in order to foster the community's active use and sense of ownership of these spaces.

The proposals under Non-Motorized Transport (NMT) Plan are:

- Development of Footpath facilities.
- Development of Cyclist-Friendly streets

5.4.1 DEVELOPMENT OF FOOTPATHS

Pedestrian trips are generally short trips and can be observed everywhere in a city. And hence, ideally pedestrian walkways should be provided on all major roads and streets in the city. However, special consideration for pedestrians should be given near junctions (dangerous intersections), major activity nodes (like schools, colleges, etc.).

A good share of students use non-motorised mode to commute to school in case Ongole, hence it is crucial to develop strategies to enhance the safeguard these trips. On such strategy is Safe Routes to School.

5.4.1.1 IMPROVEMENTS OF LOCAL STREET

This program aims to make it safe, convenient, and fun for children, to bicycle and walk to school. Many cities worldwide have taken initiative and have implemented such projects to improve the quality of travel for children in their cities. The main components of this strategy are as follows:

a) Identify safe routes connecting the institutions and residential areas.
b) Provide required infrastructure facilities for walking and bicycling.
c) Educate the students, schools and parents to use SRTS.
d) Encourage the schools to be a part of the program by incentivising them through grades, ranks, etc.

Some of the routes identified for the NMT infrastructure improvements are discussed in the later sections.

5.4.1.2 IMPROVEMENT OF LOCAL STREETS

The smaller local streets/residential streets may not have sufficient width to provide a segregated pedestrian walkway. But these residential streets should also provide safe route to pedestrians. This can be achieved by

a) Installation of speed limits
b) Installing speed breakers at frequent intervals
c) Providing table top crossings etc.

FIGURE 5.4-1 IMAGES SHOWING CONCEPTS OF LOCAL STREET DESIGNS

5.4.1.3 FOOTPATH DEVELOPMENT-NETWORK

Low Carbon Mobility Plan for Ongole has identified all the major spines of the city for immediate need of footpaths. All the major junctions should be immediately designed with due consideration for pedestrians. The crucial junctions which require immediate pedestrian infrastructure improvements is represented in the Figure below;

The footpath design should be uniform across the city. Depending on the volume of pedestrians, the area requires footpaths with minimum width of 1.8m and maximum height of 150mm from the finished road surface. In certain cases, where the available road ROW makes it difficult to provide 1.8 m barrier free space for footpaths, the widths should not be less than 1.2 m. However, the maximum height of 150 mm cannot be compromised in any circumstance. Increasing the footpath height to more than 150 mm makes them unusable by pedestrians, thereby defeating the purpose of providing the footpaths. A sample design of footpath is shown in Figure 5.4-2.

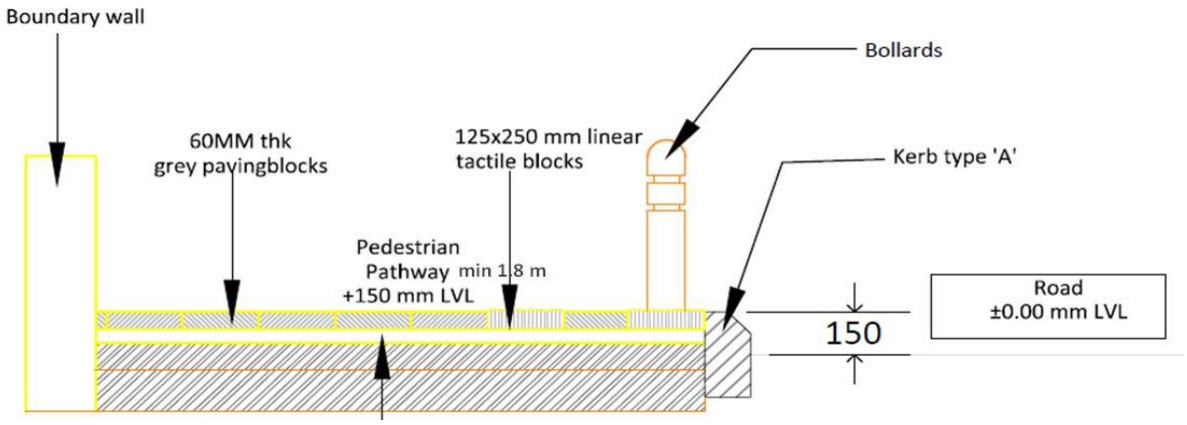


FIGURE 5.4-2 DETAILED CROSS SECTION OF FOOTPATH DESIGN

Accordingly, LCMP has identified about 67 km of roads within OMC where the footpaths have to be built immediately or the existing footpath should be reconstructed according to the design standards. The new footpaths is given in and shown in Figure 5.4-4. In addition, local authorities should develop the footpaths in all other streets following the development of footpaths in the priority streets. Similarly, the core area has been identified for rejuvenation where in major spines shall act as NMT and PT only corridors for certain hours of the day (for instance, market hours 10am to 9pm). The corridor identified for NMT and PT only corridors are as shown in Figure 5.4-4. The Figure 5.4-3 depicts examples NMT and PT only streets.

FIGURE 5.4-3 EXAMPLES OF NMT ONLY AND NMT AND PT ONLY STREETS7

[7] Source: http://en.qdnd.vn/social-affairs/news/more-pedestrian-only-streets-coming-in-hanoi-482149,

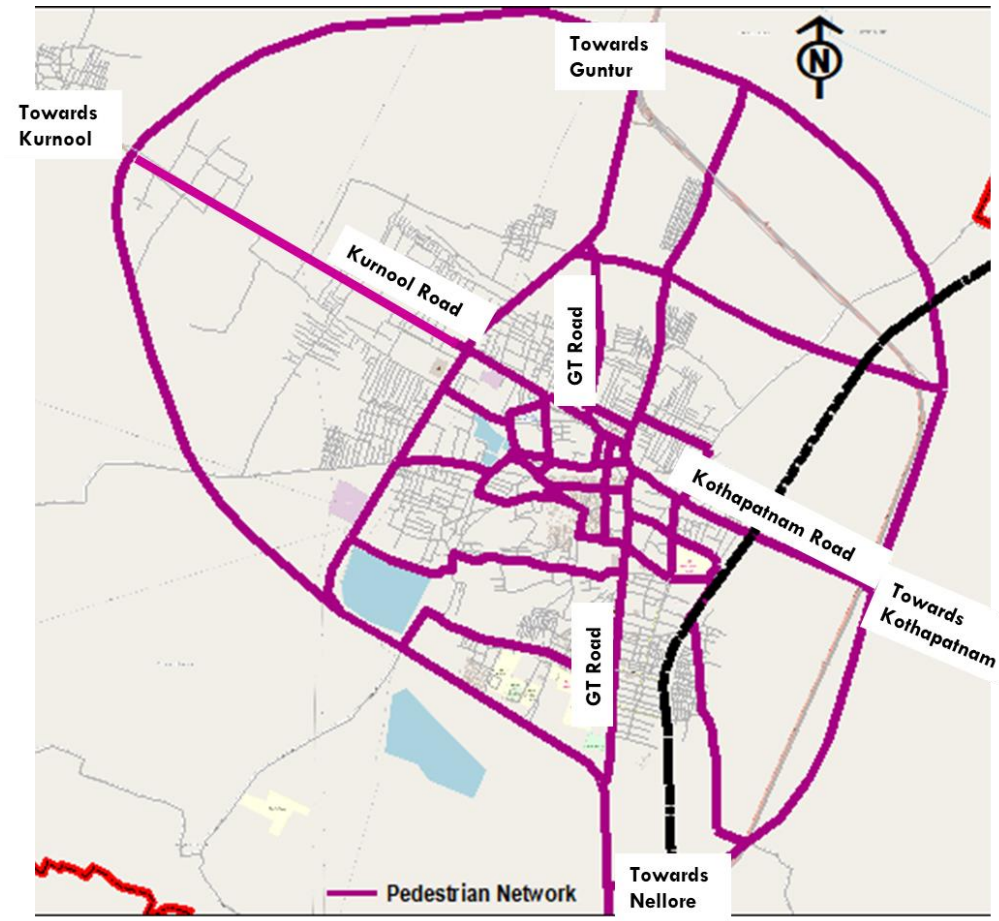


FIGURE 5.4-4 EXAMPLES OF NMT ONLY AND NMT AND PT ONLY STREETS8

The identified streets are connecting streets with an average length of 0.5m connecting the Main Road and proposed mobility corridors. In addition, the adjoining land use is commercial creating possibility to act as pedestrian friendly streets.

5.4.2 DEVELOPMENT OF CYCLIST-FRIENDLY STREETS

Cycling is increasingly recognized as a clean, sustainable mode of transport and an essential part of an inter-modal plan for sustainable urban travel. More cycling in place of car use could contribute to less energy consumption from travel activity and reduced congestion. Increasing cycling could be a promising way to contribute to the reduction of greenhouse and other emissions. More than capturing the captive users to use the cycles for movement, the development of cycle tracks should attract more uninterested citizens to use cycles. Ongole has a good share of existing bicycle uses compared to other cities, hence it becomes important it safeguard the interests of these users.

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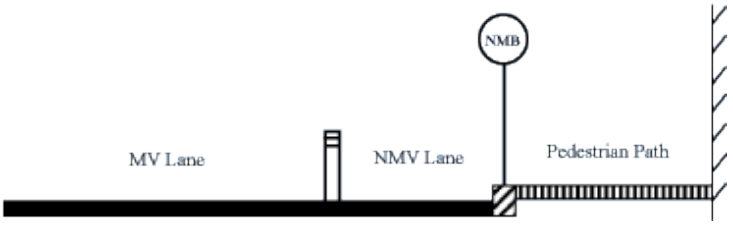
https://temporarilylost.com/2011/08/13/landing-in-dublin-ireland/one-of-many-pedestrian-only-streets-in-dublin/

[8] Source: http://en.qdnd.vn/social-affairs/news/more-pedestrian-only-streets-coming-in-hanoi-482149,
https://temporarilylost.com/2011/08/13/landing-in-dublin-ireland/one-of-many-pedestrian-only-streets-in-dublin/

5.4.2.1 DESIGN APPROPRIATE MEASURES

Most cities worldwide tend to adopt and develop their own detailed design guidelines; however the following section provides guidance on the basic design of common measures and can be used as advisory design notes. Non-Motorized Vehicles (NMV) lanes can generally be classified into four main categories and are listed in Table 5.4-3.

TABLE 5.4-1 TYPES OF NMV LANES

S.No	Type of NMV Lane	Cross Section
1	NMV lanes shared with MVs and designated by signs	
2	NMV lanes designated by lane markings (e.g. striping) and within the highway right-of-way	
3	NMV-exclusive lanes physically separated from MVs by barriers (e.g. concrete blocks, steel railing, raised curb) and within the highway right-of-way	
4	NMV-exclusive lanes within an independent right-of-way (often referred to as NMV paths)	

5.4.2.2 Non-Motorized Vehicles (NMV) lanes for ONGOLE

LCMP suggests to have Type 3 NMV lanes (**Dedicated Bicycle Tracks)** along major mobility corridors with higher ROW, whereas Type 2 NMV lanes **(Shared Bicycle Tracks**) on other identified roads in Ongole.

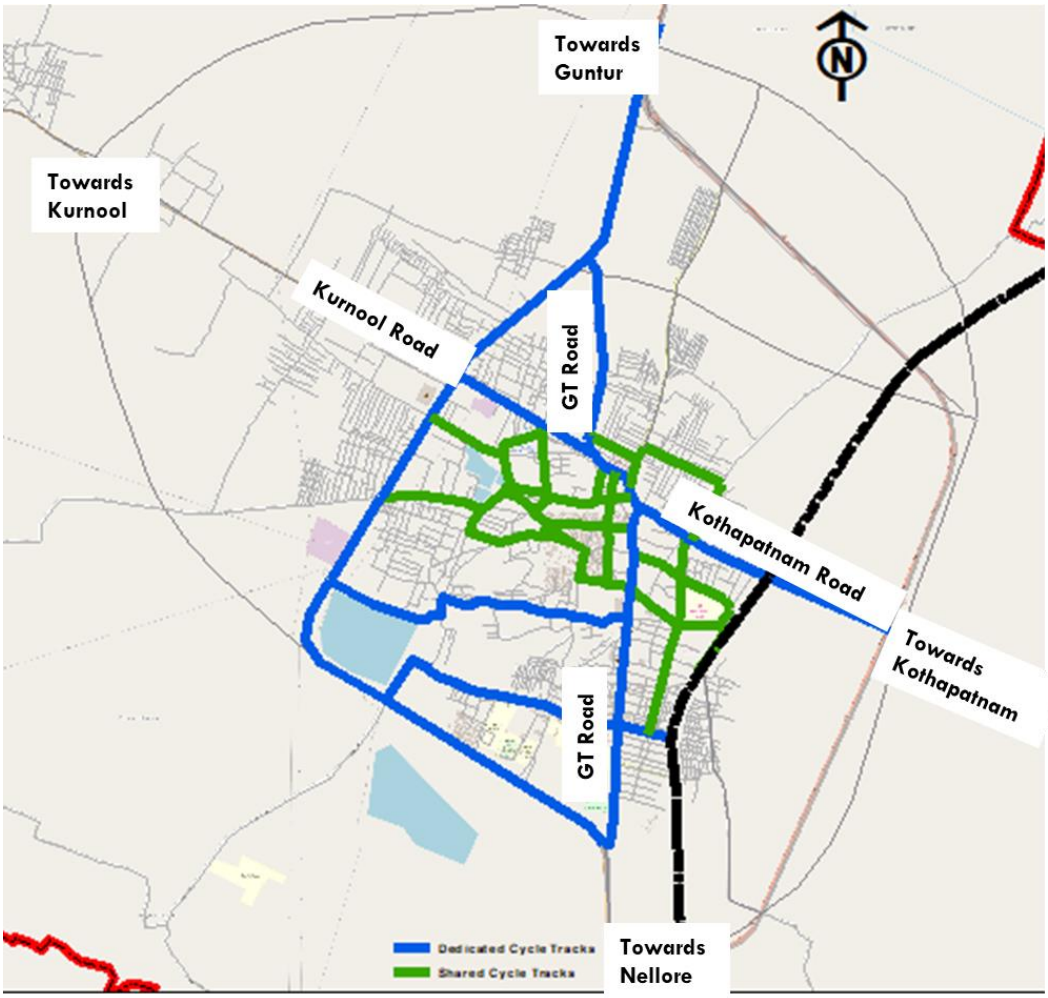


FIGURE 5.4-5: PROPOSED BICYCLE NETWORK FOR ONGOLE

A total of **22.52 km dedicated bicycle tracks** along with **14.56 km of shared NMT routes** are proposed in the plan connecting important activity centres and trip attractors and are shown in Figure 5.4-5. Ongole needs to improve the infrastructure to create a safe environment for its cyclists.

5.5 FREIGHT MANAGEMENT PLAN

A safe, reliable and efficient movement of freight and servicing trips to, from, within and through Ongole in balance with the needs of other transport users to support the overall economy is necessary.

The overall aim of freight management plan is to

- Ensure that the Ongole road network allows efficient and reliable handling and distribution of goods vehicles
- Minimize the impact of congestion
- Minimize the impact of pollution
- Shift gradually to more sustainable freight movement.

Ongole with its growing economy also has many retail market bases scattered across the area and considerable share of freight movement is observed along certain roads within the city. Thus, under the freight management strategy, freight policy and truck terminals are proposed.

5.5.1 FREIGHT POLICY

Freight has always remained as an unnoticed transportation policy. The word "FREIGHT" should be considered in all the planning and policy documents to give considerable recognition to its management. For an efficient management of freight within the city, periodic stakeholder consultations should be held. The freight policy will be aimed at the overarching aim of efficient and reliable handling and distribution of goods and services. Freight policy principles adopted for Ongole are:

a) Manage the heavy demands placed on the regional infrastructure, by balancing the needs of freight and passenger traffic
b) Improve the array of transportation options available to regional freight users
c) Restrict the heavy vehicles entering the city during day time.
d) Develop truck terminals near cordon points and distribute the goods in the city through LCV/sustainable transport choices
e) By pass the external freight traffic passing through the city.
f) It is advisable to develop a Freight Operator Recognition Scheme. A tiered set of membership levels can be given to frequent operators coming to the city.
g) Develop a freight information portal i.e. a single interface is available for information on the freight movement.

5.5.2 FREIGHT TERMINALS

A freight terminal is a processing node for freight. Freight terminals are required for the efficient movement of freight vehicles within the city so that congestion is very limited. Freight Terminals need to be provided near various sensitive areas in the city which attract heavy vehicles and also in the outskirts.

Ongole is known for its contribution in textile, paper and tobacco industries along with agro products and industries. About 30% of total freight transport in Ongole consists of food and agro-based products and 33% consists of construction materials.

TABLE 5.5-1 SHARE OF GOODS COMMODITIES

Commodity	Share In Freight Transport
Sand/ Brick/Cement/Steel/Aggregate	33.58%

Commodity	Share In Freight Transport
Vegetable/Fruit/Milk/Fish	27.92%
Food Grains (Rice/Wheat/Jowar Etc)	9.43%

Presence of Thorvagunta and Pernimitta contribute freight movement along the NH 5 and along the Kurnool Road. The hubs can result in certain inflow of freight traffic through the city. To reduce the conflict with city traffic and decrease the congestion during peak hours, freight traffic should be restricted in the city. The freight traffic should not be allowed in the city between 8am to 9pm, stopping most of carries outside city boundaries.

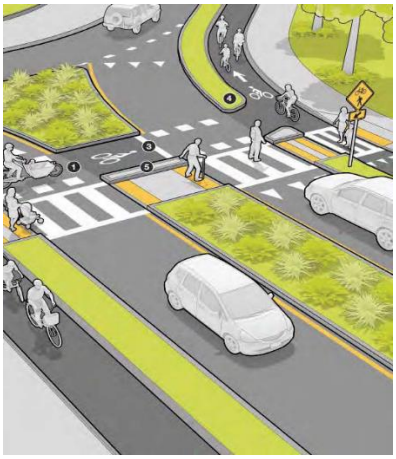
At present, there is only no existing truck terminal in Ongole and one terminal is proposed for upgradation. The freight terminals in Ongole are not yet developed for functioning. Facilities like shops, offices, dormitories and parking are provided at the terminal.

In addition to these, two new truck terminals are proposed near Thorvagunta and Perminamitta villages based on goods traffic demand.

The freight terminal is proposed at Thorvagunta village so that the heavy vehicles coming to the city for loading and unloading could be parked during day time and if necessary smaller commercial vehicles could help for transition of the goods. The details of land plots (owned by Government) as identified from Development Plan (2016).

5.6 TRAFFIC ENGINEERING AND MANAGEMENT MEASURES

Traffic engineering aims at achieving safe and efficient movement of people and goods on roadways. It focusses on road geometry, sidewalks, crosswalks, cycling infrastructure, traffic signs, road surface markings, traffic signals etc. Traffic management includes various strategies adopted to efficiently manage the movement of vehicles like one-way systems, no parking zones, etc.



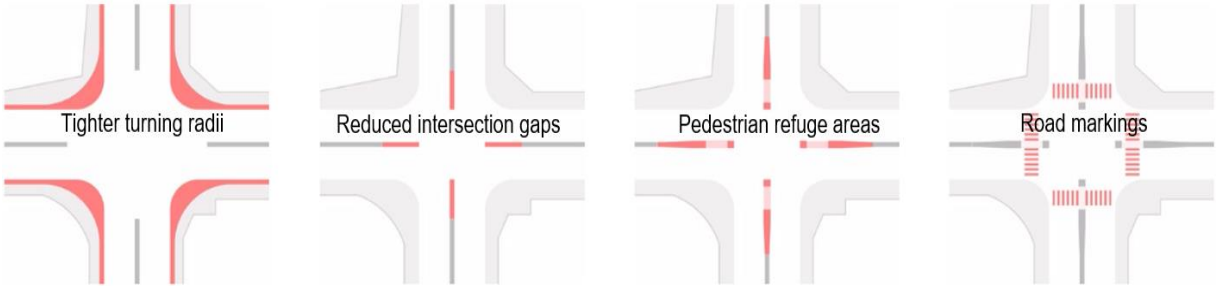
These measures generally qualify as short term measures for bringing in immediate relief from traffic problems. A combination of several measures can prove to be effective mean of problem solving. These measures are not very capital intensive and give instant results.

5.6.1 JUNCTION IMPROVEMENTS

It is noticed that traffic accident rates are usually higher at intersections. Many factors affect accident occurrence at intersections, including traffic volume, traffic control, and frequency of access points, the number of arms, the speed limit, the median type and width, the number of traffic lanes, the existing turn lanes and the lighting level. Junction improvement essentially involves the combination of the following elements:

- Closure of medians at certain intersections, while providing well designated mid-block crossings for pedestrians.
- Prohibition of free right turns
- Provision of adequate sight distance
- Providing adequate corner radii
- Providing sufficient turning radii
- Flaring approaches towards intersections
- Providing channelizers/division islands
- Providing pedestrian and cyclist crossing facilities such as zebra crossings, pelican signals, refuse islands etc.
- Bus stops near junctions to be re-located
- Providing signs/lane-markings/lighting

Typical junction improvement measures are shown in



Junctions coming along the dedicated cycle tracks should be designed accordingly with priority to the cyclists. Pedestrians should be given priority at all the junctions. If it is difficult to channelize the pedestrian movement, it is advised to install pelican signals.

Intersection improvements are recommended to facilitate the movement of public transport, safe movement and crossing of pedestrians at junctions. List of junctions proposed for improvement in their geometry are given in the Table below;

Sl. No	Name of the Junction	Sl. No.	Name of the Junction
1	Ongole Bypass Junction	9	NTR Statue Junction
2	NH5 Guntur Road	10	KP Road Junction
3	Outer Ring Road – FCI Road Intersection	11	Kothapatnam Bus Stand Junction
4	Tobacco Board Junction	12	Mastan Dargah Circle
5	Kargil Petrol Bunk Junction	13	Bandlametla Junction
6	SP Office Pandaripuram Junction	14	Chruch Center
7	Bus Stand Intersection	15	Bhagyanagar 4th lane Junction
8	Satyanarayana Puram 60'.0'' & 40'.0'' Kurnool Road Junction	16	Mangamur Donka Junction

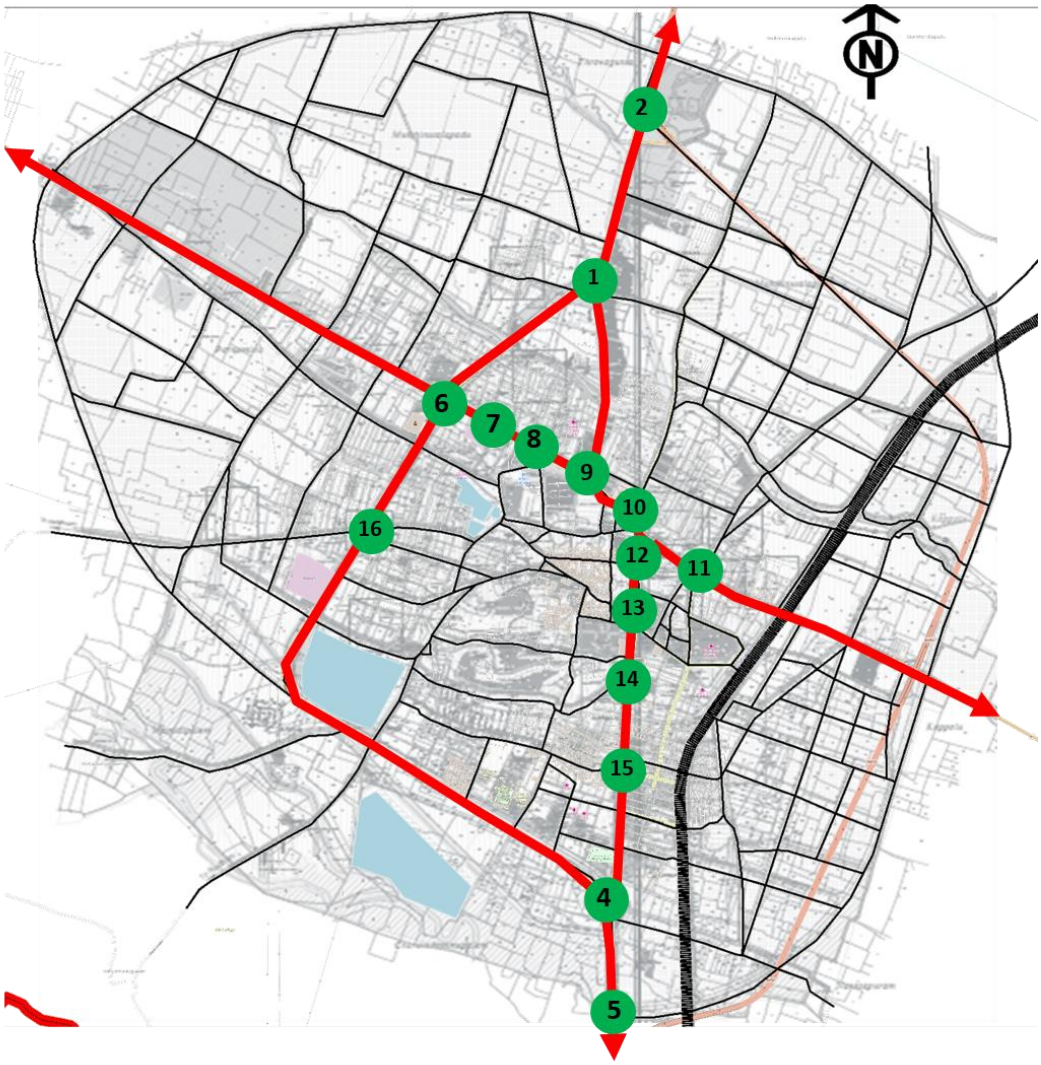


FIGURE 5.6-1: PROPOSED JUNCTIONS FOR IMPROVEMENTS

Traffic signals are necessary for safe movement of traffic at a junction. IRC 93:1985 provides the guidelines on designs and installation of road traffic signals. The IRC 93 suggests 5 warrants for the installation of signals at any junction. Traffic control signals should not be installed, unless one or more of the signal warrants specified herein are met. Information should be obtained by means of traffic and engineering studies and compared with the requirements set forth in the warrants. If these requirements are not met, a traffic signal should not be put into operation.

The need for signals at surveyed junctions in the city was checked through Warrants given in IRC 93:1985. All the survey junctions qualified for signal installation. The following are the locations for which installation of signals is proposed. These junctions, either do not have a signal or have signals which do not function. List of junctions proposed for signalization are presented below,

1. Addanki Bus Stand Circle
2. Mastan Dargah Circle
3. Pandaripuram Junction
4. Jayaram Hall Circle

Geometric improvements and signalization serve only for short term duration. The traffic level at few junctions reach the 10000 PCU mark during peak hours as shown below. The crucial junction being Pandaripuram Junction and Mastan Dargah Junctions. The situation will deteriorate considerably with growing population of private modes in the city.

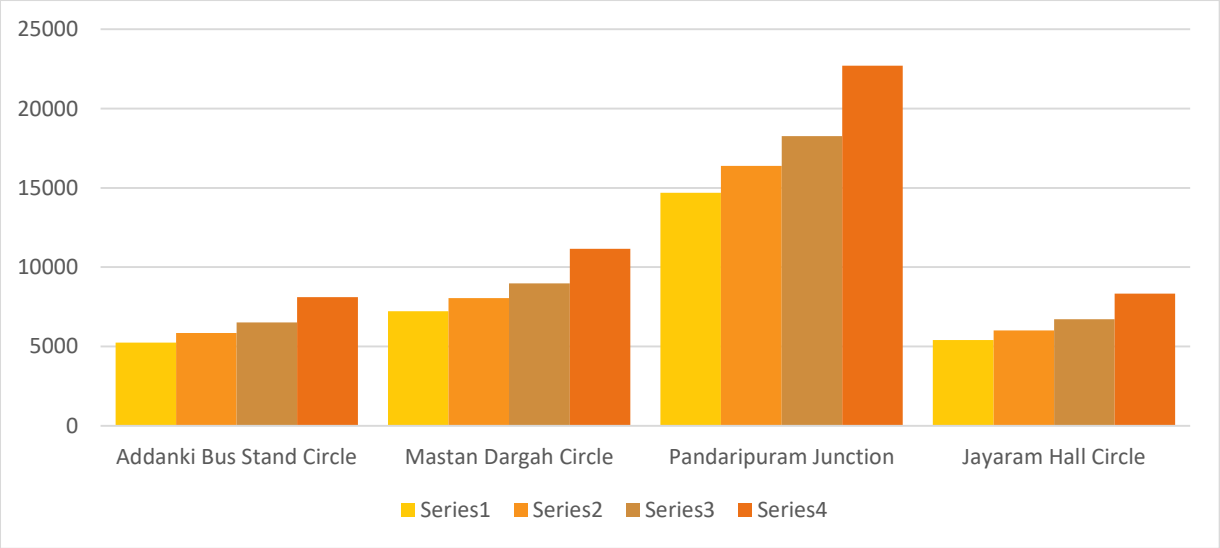


FIGURE 5.6-2: ESTIMATED TRAFFIC AT JUNCTIONS

Hence improvements to these junctions need to be considered for signalization/ roundabouts or grade separators. The type of junction has to be suited to the road type, the environment and

capacity, in order to maintain good readability both of the road and of the junction, as well as a satisfactory level of safety. According to the above, for example, junctions or roundabouts should not be used on motorways, and signalized junctions need not to be used on rural roads, except in very special cases.

However, Pandaripuram Junction and Mastan Dargah Junction has been identified for grade separation.

TABLE 5.6-1: LIST OF JUNCTIONS WITH TYPE OF IMPROVEMENT

Junction Type	2018	2023	2028	2038
Addanki Bus Stand Circle	Signal	Signal	Signal	Signal
Mastan Dargah Circle	Signal	Signal	Signal	GS
Pandaripuram Junction	GS	GS	GS	GS
Jayaram Hall Circle	Signal	Signal	Signal	Signal

It was observed that most of the locations have $PV^2/(2*10^8)$ values higher than 2, this indicates a considerable need to improve the pedestrian crossing facilities. Based on the PV^2 value and ROW constraints, pedestrian proposals were made at important junctions in Table 5.6-2.

TABLE 5.6-2: PV2 ANALYSIS FOR VARIOUS JUNCTIONS IN ONGOLE

CODE	LOCATION	PV Square/10^8 Value	Intervention
TMC_1	Addanki Bus Stand Junction	68.43	Grade Separator (Foot Over Bridge/Subway)
TMC_2	Mastan Dargah Centre	1.92	Signal Controlled Pedestrian Crossing
TMC_3	Kolkata-Chennai Highway (NH5) Circle	179.60	Grade Separator (Foot Over Bridge/Subway)
TMC_4	Jayaram Hall Circle	1.41	Signal Controlled Pedestrian Crossing

Detailed Junction improvement plans/ designs need to be carried for important junctions which shall be supplemented by topographic surveys.

5.6.2 TRAFFIC MANAGEMENT PLANS

Following are the general Traffic management measures.

- Proper sign boards should be provided at important junctions, arterial/sub arterial roads, entry/exit points of market areas, cordon points, accident prone locations, school/college zones and other commercial areas.
- Zebra crossings, Lane Markings and Stop lines should be marked on all arterials and sub arterial roads.

- Pedestrian crossings should be provided at mid-blocks near school/college zones and major commercial areas. Pelican signals should be installed at such places. An exclusive pedestrian phase should be provided for safe pedestrian crossing with a cycle time no less than 15sec and designed as per IRC..
- Pedestrian refuge islands should be provided at wider junctions.
- Parking should be restricted at least 50-100m near to the junction on all the approach roads.
- Hawkers and Vendors should be restricted at least 50-100m near to the junction on all the approach roads and from using footpaths.
- Bus stop and Auto/Taxi stand has to be shifted 50-100m away from junctions
- Commercial vehicles (except Goods Auto) should not be allowed during peak periods inside the city which should be stopped at all Outer Cordons.
- Before implementation of Traffic Management Schemes, traffic awareness programmes shall be organized.

5.6.3 PAVEMENT MARKINGS AND SIGNAGES

Even though road signs and markings are provided on major road stretches of Ongole, some of the sign boards are not visible and some are not maintained properly. It is recommended that proper signs be installed at all appropriate locations. Road signs are classified in three categories:

a) **Mandatory/Regulatory Signs:** To inform users about certain rules and regulations to improve safety and free flow of traffic. These include all signs such as STOP, GIVE WAY, Speed Limits, No entry etc. The violation of rules and regulations conveyed by these signs is a legal offence (Figure 5.6-3).

FIGURE 5.6-3: MANDATORY SIGNS

b) **Cautionary/Warning Signs:** To caution the road users of certain hazardous condition either on or adjacent to the roadway. Some examples are Hairpin bend, Narrow Bridge etc. (Figure 5-29).

c) **Informatory Signs:** These signs are used to provide information and to guide road users along routes. The information could include name of places, sites, direction to the destinations etc. (Figure 5.6-4).

Traffic control devices such as Centre line, Traffic lane lines, Stop lines, Pedestrian crossings, Parking space Kerb marking for visibility, Obstruction marking etc. must be provided keeping in view all users of the road and especially for night time driving. All the traffic signs should be facilitated as per the guidelines provided in IRC: 67-2001.

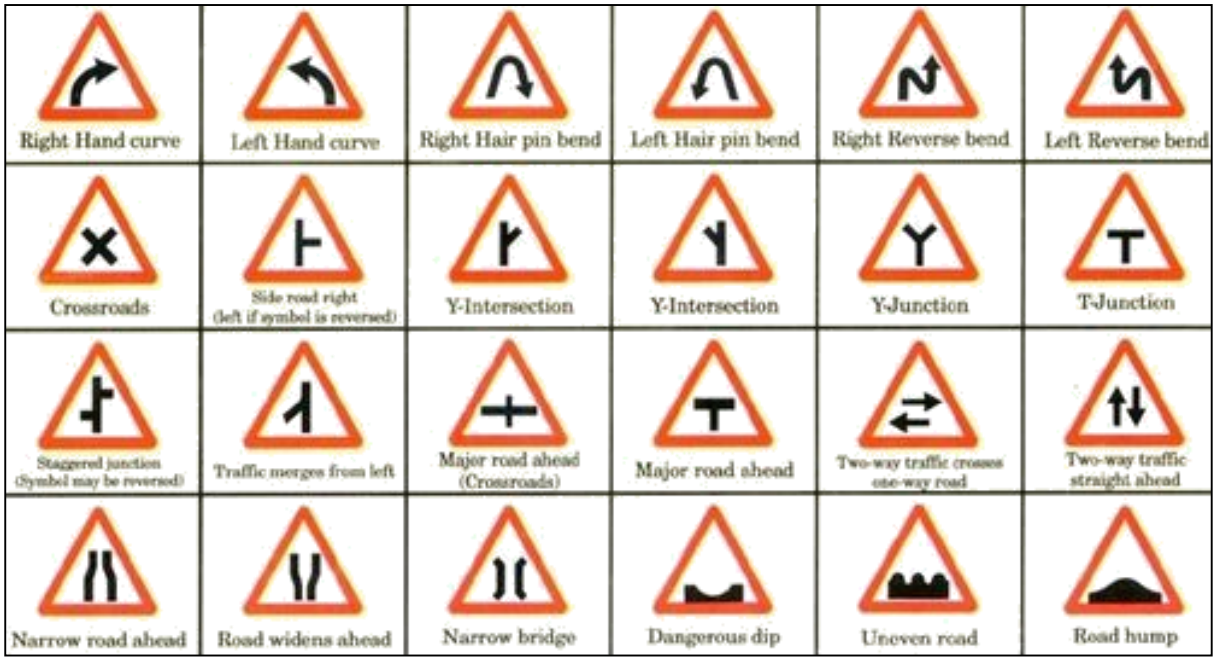


FIGURE 5.6-4: CAUTIONARY OF WARNING SIGNS

FIGURE 5.6-5: INFORMATORY SIGNS

5.7 TRAVEL DEMAND MANAGEMENT MEASURES

Travel demand management is an intervention (excluding provision of major infrastructure), to modify travel decisions so that more desirable transport, social, economic and/or environmental objectives can be achieved, and the adverse impact of travel can be reduced. A combination of TDM strategies and policies help reduce travel demand or redistribute this demand in space or in time. A demand management approach to transport has the potential to deliver better environmental outcomes, improved public health and stronger communities, and more prosperous and livable cities. A broad range of demand management strategies are available and can be brought to use depending on the situation and suitability. Some of the "tools" used for TDM are listed below:

Subsidizing transit costs for employees or residents.
Car parking controls and pricing
Flex-time work schedules with employers to reduce congestion at peak times
Road space rationing by restricting travel at certain times and places.
Workplace travel plans
Road space reallocation, aiming to re-balance provision between private cars and other sustainable modes
Introducing active trip reduction programs
Public education and awareness programs

The city can choose and implement any of these strategies, as they do not have any significant financial implications and most of them are policy decisions.

5.6.4 PARKING POLICY AND MANAGEMENT

Effective parking strategies are essential to manage the unauthorized parking activities in the city. The parking strategies should address the issues which will in turn reduce the automobile dependency. The various measures adopted for parking are:

Short term Measures

- Develop and approve multi-year parking tariff policy
  - Differential parking tariffs to encourage the use of Multi-level car parks and off street surface parking, and escalate tariff as per pre-defined increments
  - Have effective penalties for parking violation and enforce them
  - No free residential parking on main roads (width > 6m) between 07:00 hrs and 22:00 hrs; no on –street parking within 75 m of entry/exit points near important/major traffic junctions, major industries, commercial spaces, education buildings, hospitals etc.
  - Improve public transport to realize mode shift
  - Ban on street parking in CBD/Core city/Commercial Areas

Medium and Long term measures

- Promote use of technology for effective enforcement of parking violations-
- Develop and approve a differential parking tariff to encourage use of peripheral parking
- Parking Restriction and Enforcement
- Congestion Charge
  - Impose congestion charge during peak hours on entry of private vehicles in core city area
- Cash-out measures, transit incentives, unbundling, curb side parking meters, price sensitivity, shared parking, parking regulation, remote parking and public transport facilities, improved enforcement and control

On-Street Parking- Demand Management

1. Many of the on-street parking locations show a parking index of less than 50%. OMC should curtail parking supply by 50% on the stretches where parking index is less than 50%.
2. **Signs and pavement markings:** On–street parking areas (eg. for cars, two wheelers) should be provided with marked parking bays. Parking bays should be delineated by painted lines, studs, markers or textured surfaces different to the rest of the area. OMC should provide proper

signboards with the words 'Park in Bays Only' and should be used at all entry points to the precinct and the 'END RESTRICTED PARKING AREA' sign should be used at all exit points from a precinct. In addition a smaller version of RESTRICTED PARKING AREA signs should be used as repeater signs where necessary within the area.

Parking signs and road marking

3. **Permissive parking**: In order to provide equitable parking to all the road users, permissive parking spaces should be provided at designated parking areas within a restricted parking area scheme using permissive parking signs. If so, the parking spaces/areas should be signposted using parking control signs in accordance.

   Types of parking control include:

   - Parking symbol – eg. ¼p, ½p, 1p or 2p
   - Times of operation – eg. 9 am– 9 pm mon – fri
   - User limitations – eg. Motor cycles, bicycles, cars.

4. **Enforcement:** Enforcement of other parking schemes such as pay parking and permissive parking implemented by parking authorities within restricted parking areas should be carried out by authorized officers. They should regulate parking demand by issuing high penalty charge for breaching the traffic rules, restricting parking duration, encouraging employees to use less convenient parking spaces (such as parking lots at the urban fringe) during peak periods in order to leave the most convenient spaces for **customers, limiting the use of on-street parking** for longer duration by local residents and prohibiting on-street parking on certain routes during peak periods to increase traffic lanes.

5. **Parking Pricing:** Parking pricing should be allowed on following road stretches with proper markings clearly. It is suggested that a parking fee of Rs.5/- for two-wheelers and Rs. 10/- of cars for one hour should be charged. Time restriction is important to encourage short-term parking. It is also recommended to implement a differential parking fee policy with increasing fee structure in the central area and outer areas or a differential parking fee policy with increasing fee structure in peak hours or duration of parking. Paid parking can also provide a means of revenue generation to the municipality.

5.8 TECHNOLOGICAL MEASURES

Technological improvements include advanced applications which, without embodying intelligence as such, aim to provide innovative services relating to different modes of transport and traffic management and enable various users to be better informed and make safer, more coordinated, and 'smarter' use of transport networks.

5.8.1 INTELLIGENT TRANSPORT SYSTEMS

ITS encompasses all modes of transportation- air, road and rail and intersects various components of each mode- vehicles, infrastructure, communication and operational systems. Intelligent Transport Systems will include:

a) **Advanced Traffic Management Systems (ATMS)** integrates various sub-systems (such as CCTV, vehicle detection, communications, variable message signs etc) into a coherent single interface that provides real information on traffic status.

b) **Advanced Traveller Information Systems (ATIS)** provides users of transportation systems both public and private mode users travel related information regarding routes, estimated travel times etc.

c) **Advanced Vehicle Control Systems (AVCS)** are tools and concepts that enhance the driver's control of the vehicle to make safe and more efficient.

d) **Commercial Vehicle Operations** for constant monitoring of heavy vehicles. It can be in the form of smart cards, weigh bridges etc.

e) **Advanced Public Transportation Systems** to enhance efficiency of public transit systems through information systems, signal priorities, GPRS etc

Vehicle-actuated control uses information on current demands and operations, obtained from detectors within the intersection, to alter one or more aspects of the signal timing on a cycle-by-cycle basis. Timing of the signals is controlled by traffic demand. Actuated controllers may be programmed to accommodate:

- Variable phase sequences (e.g., optional protected LT phases)
- Variable green times for each phase
- Variable cycle length, caused by variable green times

Such variability allows the signal to allocate green time based on current demands and operations. A proper clearance interval between the green & the red phases is also ensured. The various advantages of actuated signals are:

- They can reduce delay (if properly timed).

- They are adaptable to short-term fluctuations in traffic flow.
- Usually increase capacity (by continually reapportioning green time).
- Provide continuous operation under low volume conditions.
- Especially effective at multiple phase intersections.

TYPICAL OPERATION OF ATCS

- An area sub-divided into zones or corridors
- Corridors operate on common background cycle
- Signal timings and Cycle lengths updated dynamically based on real-time demand
- Signals synchronized for green-wave
- Offset deviation corrected at plan transition

5.8.1.1 CASE STUDY: VEHICLE-ACTUATED WITRAC TECHNOLOGY IN PUNE

The WiTrac is a vehicle-actuated system that uses wireless technology to control traffic signals. The Master control of this system operates several sub-controls by sending wireless signals. The system is also equipped with cameras that constantly monitor traffic status and keep an eye on each and every vehicle within its jurisdiction. A special centralized control room monitors these cameras. The system is power efficient since it runs on solar power with power backup of up to 72 hours. Also, its installation does not require digging up of roads to lay cables (it being wireless). The system is highly power efficient, and the mounted solar panels offer the system 72 hours of backup time. A typical Junction Installation is shown below:

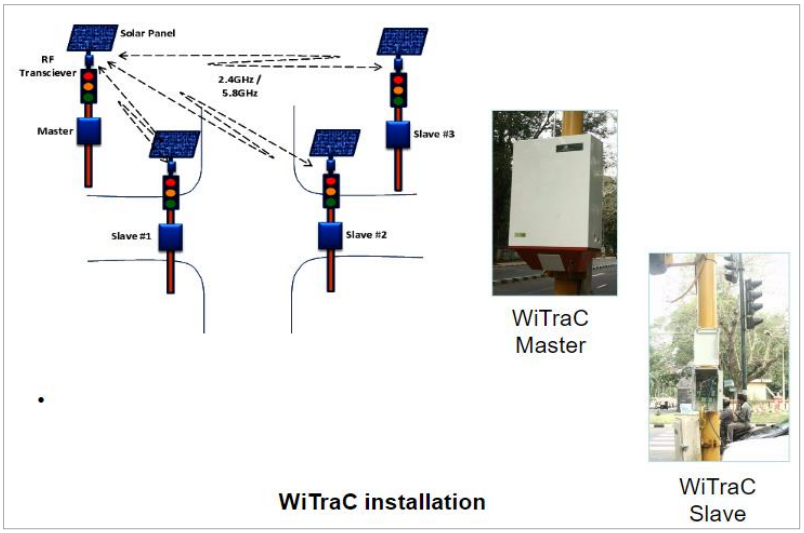


FIGURE 5.8-1: WITRACC INSTALLATION

Trafitronics, the company responsible for marketing of WiTrac, has already installed the system in the following cities:

TABLE 5.8-1: CITIES WITH WITRAC SYSTEMS IMPLEMENTED

LOCATION	NO. OF JUNCTIONS
Pune Phase I	38
Pune Phase II	30
Kolkata	95
Jaipur Phase (I,II,II)	25
Ahmedabad	93

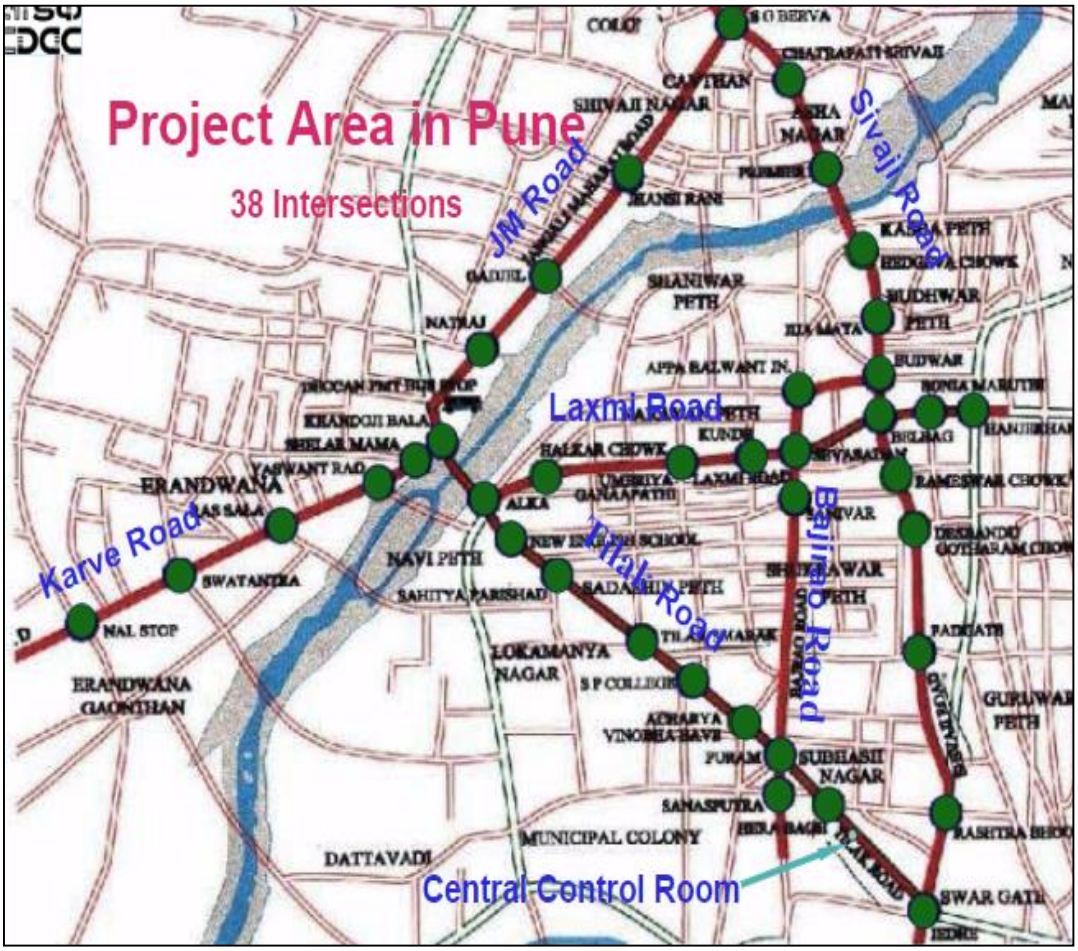


FIGURE 5.8-2: ATCS PROJECT JUNCTIONS IN PUNE

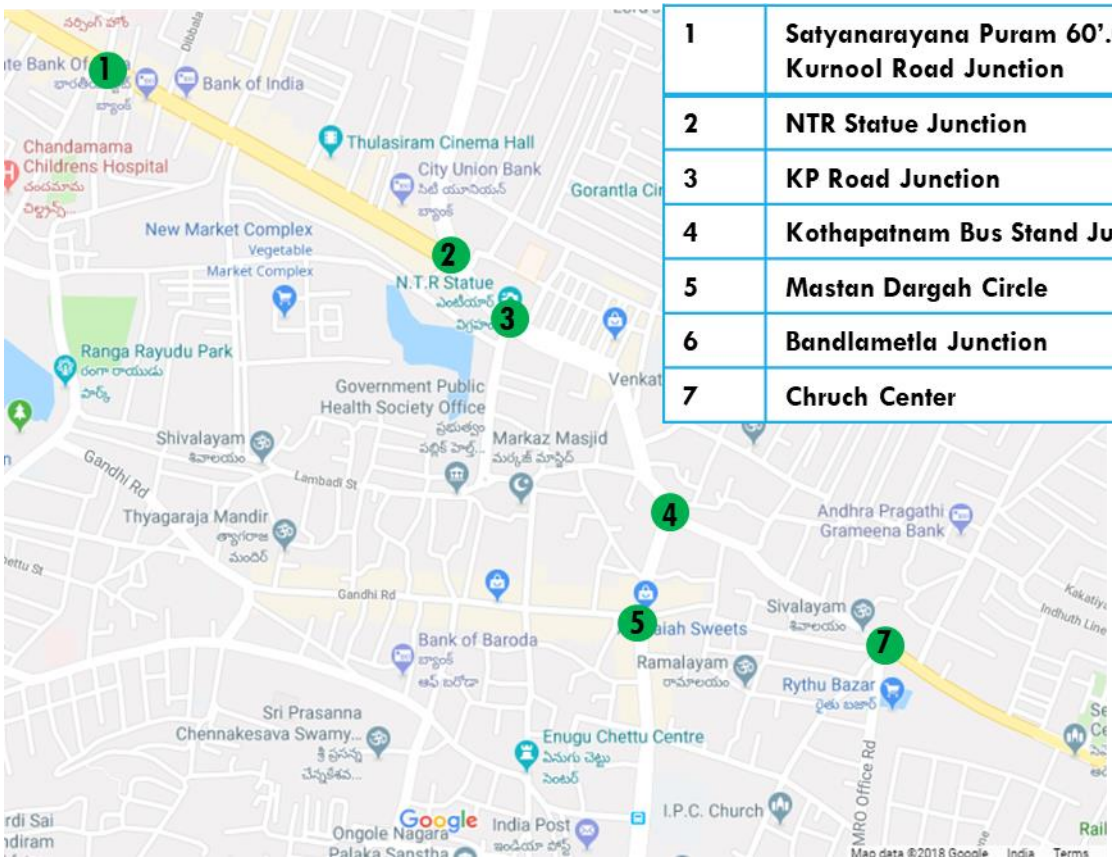
Impact Analysis of ATCS System in Pune

- Average travel speed increase in the range of 2% to 12%
- Reduction in average delay in the range of 11% to 30%
- Estimated annual fuel savings in the year 2006 due to implementation of ATCS is about Rs. 4.77 Crores
- Estimated annual time saving benefits in the year 2006 due to implementation of ATCS is about Rs. 0.83 Crores

- Total annual saving in the year 2006 due to implementation of ATCS on the 6 project corridors is about Rs. 5.60 Crores
- Overall Increase in the Traffic Volume is 9.06%

5.8.1.2 ATCS for ONGOLE

In case of Ongole based on the traffic volume analysis and proposed junction improvements in Section 5.6, the following list of junctions have been identified for the installation of ATCS systems.



1	Satyanarayana Puram 60'.0" & 40'.0" Kurnool Road Junction
2	NTR Statue Junction
3	KP Road Junction
4	Kothapatnam Bus Stand Junction
5	Mastan Dargah Circle
6	Bandlametla Junction
7	Chruch Center

FIGURE 5.8-3: PROPOSED LOCATIONS FOR ATCS

This system is expected to considerable improvement the traffic movement in the city.

Chapter 6

PROJECT IMPACT ASSESSMENT

6. PROJECT IMPACT ASSESSMENT

6.1 PHASING AND PRIORTIZATION OF PROJECTS

“Prioritization” as an activity, identifies all individual projects that need to be executed in order to achieve the transportation goals of the city. This phase weaves the projects in one logical sequence, thus forming an "implementation program" which shall be discussed in the Chapter 7.

The implementation program outlines the following elements:

1. A sequence in which the projects should be undertaken. It should be noted that the "duration" of a project does not necessarily indicate its "priority". Some very long duration project may have to be started 5 years after the implementation of the LCMP commences whereas some short duration projects may have to be started immediately. Priorities of projects would be reflected in the suggested sequence.
2. Identification of all projects in two categories, as “Critical” and “Desirable.” It should be noted that “Critical” does not necessarily mean “High priority”, and vice versa. Also, as with priority, the duration of a project does not necessarily indicate its criticality. Some Critical projects may have to be logically started 10 or 15 years down the line, but are still critical for achieving the stated objectives of the LCMP. In other words, not implementing “Desirable” projects may have only a mild impact on achieving the transportation objectives, but not implementing “Critical” projects would severely compromise the essence of the vision and objectives of LCMP.

Each project is prioritized based on scoring it across seven criteria:

- Mobility
- Accessibility
- Safety
- Energy
- Environment
- Carbon-di-Oxide Mitigation
- Project Cost

6.1.1 PROPOSAL 1: PUBLIC TRANSPORT SYSTEM

TABLE 6.1-1: PHASING AND PRIORITIZATION OF PUBLIC TRANSPORT SYSTEM PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
Improved Bus System	Critical	High	Phase I, II
Intermodal Facilities	Desirable	High	Phase I, II,III
Terminals	Critical	Medium	Phase II

Proposed Schemes	Category	Priority based on scoring	Phasing
Bus Stops	Critical	High	Phase I
Intermediate Public Transport	Critical	High	Phase I

6.1.2 PROPOSAL 2: NON-MOTORISED TRANSPORT FACILITY IMPROVEMENT

TABLE 6.1-2: PHASING AND PRIORITIZATION OF PEDESTRIAN FACILITY PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
Footpath	Critical	High	Phase I

TABLE 6.1-3: PHASING AND PRIORITIZATION OF BICYCLING PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
Semi Segregated Cycle Track	Critical	High	Phase II
Segregated Cycle Tracks	Critical	Medium	Phase II
Cycle parking Stands	Critical	High	Phase I

6.1.3 PROPOSAL 3: FREIGHT MANAGEMENT PLAN

TABLE 6.1-4: PHASING AND FREIGHT MANAGMENT PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
Freight Policy	Critical	Medium	Phase II
Freight Terminals	Critical	Medium	Phase II

6.1.4 PROPOSAL 4: PARKING MANAGEMENT PLAN

TABLE 6.1-5: PHASING AND PRIORITIZATION OF PARKING MANAGEMENT PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
On-street Parking	Desirable	Medium	Phase I
Offstreet Parking	Desirable	Medium	Phase I, II
MLCP	Desirable	Medium	Phase I, II

6.1.5 PROPOSAL 5: INTELLIGENT TRANSPORTATION SYSTEMS

TABLE 6.1-6: PHASING AND PRIORITIZATION OF ITS PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
Automated Vehicle Location System	Desirable	Medium	Phase I, II
Variable Message Signs	Desirable	Medium	Phase I, II
ITS control Centre, PIS, Common Mobility Card, GPS, Mobile phone Applications and Surveillance Cameras	Desirable	Low	Phase III

6.1.6 PROPOSAL 6: ROAD NETWORK PLAN

TABLE 6.1-7: PHASING AND PRIORITIZATION OF ROAD NETWORK PROPOSALS

Proposed Schemes	Category	Priority based on scoring	Phasing
ROB/RUB	Critical	High	Phase I

Proposed Schemes	Category	Priority based on scoring	Phasing
Road Widening	Desirable	Medium	Phase II and Phase III
Junctions for Geometry Improvement	Critical	High	Phase I
Development of New Links	Desirable	Low	Phase II and Phase III

All the proposals discussed so far can be broadly grouped under three categories:

- Short Term Improvements (Phase I): these are short term proposals that need to be reviewed and implemented within 5 years as per the requirement.
- Medium Term Improvements (Phase II): the projects than need to reviewed implemented between 5-10 years as per the requirement.
- Long Term Improvements (Phase III): the projects than need implemented between 10-20 years.

Accordingly, long term, medium term and short-term proposals for Ongole are shown in Table 6.1-8, Table 6.1-9 and Table 6.1-10.

6.1.7 SHORT TERM PROPOSALS

TABLE 6.1-8: LIST OF SHORT-TERM PROPOSALS

S. NO	PROJECTS
1	Junction Improvements
2	Footpath
3	Bicycles Stands
4	Bus Shelters
5	Improvement of Existing Bus Terminals
6	Parking Management Plan – On Street Parking
7	Improved Bus System
8	Skywalks

6.1.8 MEDIUM TERM PROPOSALS

TABLE 6.1-9: LIST OF MEDIUM-TERM PROPOSALS

S. NO	PROJECTS
1	Up-gradation of Existing Roads
2	Shared Cycle Tracks
3	Dedicated Cycle Tracks
4	New Bus Terminal
5	Proposed Truck Terminals
6	Off-Street Multi-Level Parking
7	ITS Systems

6.1.9 LONG TERM PROPOSALS

TABLE 6.1-10: LIST OF LONG-TERM PROPOSALS

S. NO	PROJECTS
1	Development of New Links
2	Rail Over Bridges/Rail Under Bridges
3	Grade Separators

The projects identified in the earlier section are divided into three categories based on the urgency and duration of the implementation. Some of the long-term projects have potential to enter into Public Private Partnership (PPP); however, case to case project reports are required for validating the feasibility of each project.

6.2 IMPACT ASSESSMENT OF SHORT, MEDIUM- & LONG-TERM IMPROVEMENTS

Projects evolved in LCMP will help to achieve sustainable development goals by means of reducing private mode share and travel time. The anticipated impacts of proposed projects are presented in Table 6.2-1.

TABLE 6.2-1: IMPACT OF PROPOSED PROJECTS

Network Characteristics	Base Year (2018)	BAU Scenario (2038)	SUT Scenario (2038)
Walk	15.9%	10.4%	30.3%
Car	3.6%	4.6%	3.6%
Two wheeler	41.4%	52.8%	15.5%
Auto Rickshaw	32.6%	17.1%	14.2%
Public Transport	4%	13.5%	30.1%
NMV (Cycle +Cycle Rickshaw)	2.5%	1.56%	6.4%
Avg. Network Speed (kmph)	25.7	20.2	27.8
Avg. Volume-Capacity (V/C) Ratio	0.92	1.40	0.87

6.2.1 SOCIAL IMPACT

The impact of the proposed projects from the social angle is analyzed at a broader perspective. It is found that most of the projects have significantly less impact with respect to Rehabilitation and Resettlement. Land acquisition for some of the projects is inevitable. The proposed projects significantly improve mobility with reduced travel time. The broad impacts have been compiled in Table 6.2-2.

TABLE 6.2-2: BROAD IMPACT OF PROPOSED PROJECTS

Project	ROW/Land Acquisition	Improve Mobility	Reduction in Travel Time
Improved Bus Systems	No	Yes	Yes
Intermodal Stations	Yes	Yes	Yes
Bus Terminals	Yes	Yes	NA
Freight Terminals	Yes	Yes	NA

Project	ROW/Land Acquisition	Improve Mobility	Reduction in Travel Time
Bus Shelters	Yes	Yes	Yes
ROBs/ New Roads/Flyovers	Yes	Yes	Yes
Bypass/Ring Roads	Yes	Yes	Yes
Foot Path	No	Yes	NA
Cycle Tracks	Yes	Yes	Yes
Major Junction Improvements	No	Yes	Yes

6.2.2 ENVIRONMENTAL IMPACTS

Environmental and social screening is intended to provide inputs into identification of potential impacts with the implementation of the LCMP. Screening is conducted by identifying the interaction of environmental components on the project activities for various projects. Screening conducted for the identified projects and respective impacts identified are presented in the Table 6.2-3.

TABLE 6.2-3: IMPACTS OF PROPOSED PROJECT IMPLEMENTATION

	Project	Sub Components	Impacts
1	Transit Hubs (based on TOD principles)	Development of serviced land for high density development Public transport interchange hubs	Construction activity around the highway.
2	Pedestrian / NMT Infrastructure Improvement	Land acquisition for road widening wherever necessary	Relocation of existing vending activity. Removal of squatters and encroachers from the footpaths, if any. Causing livelihood loss even though they are un-authorized.
		Construction of new footpath	Improvement in safety of pedestrians due to measures proposed.
		Pedestrian Infrastructure development like subways/foot over bridges/ signals etc.	Improvement in pedestrian safety. Slowing of traffic at the time of constructing and erecting structures across major intersections.
3	Public Transport Planning	Terminals/Depots/ Transport Hubs/Bus Stops	Acquisition of land for the facilities causes loss of livelihood, loss of shelter, severance of community & social ties. Increase of noise and air pollution in the areas of terminals and depots. Improvement in approaches to the terminals and depots causing impacts on adjacent land-uses and land acquisition. Construction stage impacts include the increase in air and noise pollution. Contamination of road runoff with stacked construction materials. Improvement of traffic conditions

	Project	Sub Components	Impacts
			during operation stage causing reduction in air and noise pollution. Temporary interruption to traffic and increases of emissions from vehicles due to higher idling times Temporary increase of noise levels due to idling and traffic snarls Alternate traffic diversion routes increasing route length and consequently emissions Alternate traffic diversion routes exposing previously low traffic routes to higher urban traffic and increasing air / noise pollution.
4	Road Network Improvements	Road Widening/New Link/Flyovers	Land acquisition causes loss of livelihood, property dismantling etc. Temporary interruption to traffic and increases of emissions from vehicles due to higher idling times Temporary increase of noise levels due to idling and traffic snarls Alternate traffic diversion routes increasing route length and consequently emissions Alternate traffic diversion routes exposing previously low traffic routes to higher urban traffic and increasing air / noise pollution
		Junction Improvements	May cause removal / displacement of squatters & Encroachers. Air and noise pollution from construction impacts Contamination of runoff from road with construction material as sand / cement / silt from stacked excavated earth
5	Others-Road Infrastructure	Banning and restrictions	Reduction in urban congestion due to banned movement of freight in the day hours Improved speeds in core area due to reduction in congestion
6	Freight Management	Creation of new freight terminal	Acquisition of land in the peripheries Contamination of runoff from road with construction material as sand / cement/ silt from stacked excavated earth

6.2.2.1 TECHNOLOGY TRANSITIONS

An understanding of vehicles, fuels and CO emissions from electricity use in transportation system is essential to learning the implications of travel demand on CO2 emissions and air quality.

6.2.2.1.1 VEHICLES AND FUELS

The transport sector relies primarily on fossil fuels. The dependence on fossil fuels is linked to the domination of internal combustion engine technology on a global scale. In future, however, multiple transitions can affect vehicles and associated infrastructures. In the case of Ongole there would be:

- A change in fuels due to greater use of CNG (predominantly in buses), and cleaner petrol and diesel; more efficient engines.
- More electricity for transportation such as buses, e-rickshaws well as promoting electric vehicles.

The impact of the proposed projects from the environmental effects is analysed at a broader perspective. Very few projects have significantly less impact with respect to air and noise pollution. Some of the broad indicators for environmental impact changes are quantified and are presented in Table 6.2-4 and Table 6.2-5.

TABLE 6.2-4: ENVIRONMENTAL IMPACTS OF PROPOSED PROJECTS

Name of the Impact	Base Year (2018)	BAU Scenario (2038)	SUT Scenario (2038)
Local Emissions (Tonnes/day)	10.8	14.3	8.3
GHG Emissions (Tonnes/day)	264.9	513.3	322.1
Exposure to Transport Noise	>75	>75	<75
Percent of public transport fleet in compliance with Indian emissions standards	0	0	80%

TABLE 6.2-5: MODE-WISE ENVIRONMENTAL IMPACTS OF PROPOSED PROJECTS

Emission Type	Local Emissions				CO2/GHG Emissions			
	Base-2018	BAU-2038	SUT-2038	% Reduction	Base-2018	BAU-2038	SUT-2038	% Reduction
Vehicle Type	Tonnes/Day				Tonnes/Day			
Cars	0.9	2.3	0.6	-74%	40.4	123.4	38.1	-69%
2Ws	4.7	6.0	5.0	-18%	73.7	115.0	113.4	-1%
3Ws	1.5	1.0	0.4	-62%	39.2	79.6	34.2	-57%
Buses	3.7	5.0	2.4	-52%	111.6	195.3	136.4	-30%
All Modes	10.8	14.3	8.3	-42%	264.9	513.3	322.1	-37%

Thus, the timely implementation of the proposed project shall result in improved travel times, cleaner air and improved travel experience in the city.

Chapter 7

IMPLEMENTATION PLAN

7. IMPLEMENTATION PLAN

7.1 PROJECT COSTING

The projects identified in the earlier section are divided into three categories based on the phasing of projects for implementation. The long-term, medium-term and short-term projects have come as the output of transportation assessment carried out specifically to understand the future demand and system requirement. Some of these evolved projects have potential to enter into Public Private Partnership (PPP). It is important to highlight that the LCMP serves only to identify schemes and once these schemes are detailed for feasibility and engineering purpose, some of these costs may vary. The tentative block cost estimation is done in reference with the district scheduled rates for year 2018.

The projects proposed are to be implemented in three phases.

- Phase I - To be implemented between 2018 and 2022
- Phase II – To be implemented between 2022 and 2032
- Phase III - To be implemented between 2032 and 2038

The overall short-term project cost is estimated to be 189.71 crores. All junction improvement schemes, footpath implementation, cycle track network development, removal of encroachment will fall into this category. While the approximate cost of medium-term projects is 239.20 crores. The long-term projects will cost around 147.09 crores. The detail costing is represented in Table 7.1-1 & Table 7.1-2.

TABLE 7.1-1: PHASE WISE COSTING OF THE PROPOSED PROJECTS

Sl.No	Projects	Total Cost (in Crores)	Phasing Rs (in Crores)		
			2018-2022	2022-2028	2028-2038
1	Improvement of Road Network	304.34	9.60	187.02	116.95
2	Improvement of Non-Motorised Transport Facilities	102.03	99.41	2.80	0.00
3	Improvement of Public Transport System	85.03	69.41	13.07	2.55
4	Improvement of Freight Transportation System	38.21	0.00	16.98	21.23
5	Intelligent Transportation System Facilities	44.79	10.82	19.06	6.37
6	Improvement of Parking Facilities	0.72	0.46	0.26	0.00
7	**Overall Comprehensive Traffic and Transportation Plan Proposals**	**575.11**	**189.71**	**239.20**	**147.09**

TABLE 7.1-2: PHASE WISE COSTING OF THE PROPOSED PROPOSALS

Sl.No	Projects	Unit	Total Quantity	Unit Rate (in Crore)	Total Cost (in Crores)	Project Phasing Quantities			Phasing Rs (in Crores)		
						2018-2023	2023-2028	2028 - 2038	2018-2023	2023-2028	2028 - 2038
Improvement of Road Network											
1	Upgradation of Existing Roads	Km.	29.9	2.653	79.30	0.00	29.89	0.00	0.00	79.30	0.00
2	New 4-Lane Roads (Proposed Outer Ring Road)	Km.	30.0	5.041	151.23	0.00	15.00	15.00	0.00	75.62	75.62
3	Bridges (2-Lanes)	No.	0.0	4.616	0.00	0.00	0.00	2.00	0.00	0.00	9.23
4	Flyover (4-Lanes)	No.	2.0	7.694	15.39	0.00	1.00	1.00	0.00	7.69	7.69
5	Rail Over Bridges (4-Lanes)	No.	4.0	12.205	48.82	0.00	2.00	2.00	0.00	24.41	24.41
6	Junction Improvements	No.	16.0	0.600	9.60	16.00	0.00	0.00	9.60	0.00	0.00
Total Project Cost					304.34				9.60	187.02	116.95
Improvement of Non-Motorised Transport Facilities											
1	Footpath	Km.	85.0	1.167	99.23	85.00	0.00	0.00	99.23	0.00	0.00
2	Foot Over Bridges	No.	2.0	0.849	1.70	0.00	2.00	0.00	0.00	1.70	0.00
3	Skywalk	Km.	0.0	16.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
4	Pedestrian Subway	No.	0.0	2.547	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5	Shared Cycle Tracks	Km.	14.6	0.019	0.27	0.00	14.60	0.00	0.00	0.27	0.00
6	Dedicated Cycle Tracks	Km.	22.5	0.037	0.84	0.00	22.50	0.00	0.00	0.84	0.00
7	Bicycles	No.	0.0	0.001	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8	Bicycle Sub Docking Stations	No.	0.0	0.013	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9	Bicycle Major Docking Stations	No.	0.0	0.037	0.00	5.00	0.00	0.00	0.19	0.00	0.00
Total Project Cost					102.03				99.41	2.80	0.00
Improvement of Public Transport System											
1	Bus Fleet Augmentation-(Diesel & CNG Buses)	No.	44.0	0.722	31.75	30.00	14.00	0.00	21.65	10.10	0.00
2	Bus Fleet Augmentation-Electric Buses	No.	10.0	1.443	14.43	10.00	0.00	0.00	14.43	0.00	0.00
3	Bus Shelters	No.	340.0	0.096	32.47	340.00	0.00	0.00	32.47	0.00	0.00
4	Improvement of Existing Bus Terminals	No.	3.0	0.425	1.27	2.00	1.00	0.00	0.85	0.42	0.00
5	New Bus Terminal	No.	4.0	1.274	5.09	0.00	2.00	2.00	0.00	2.55	2.55
6	Bus Rapid Transit System	Km.	0.0	15.919	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7	Rail based Transit System	Km.	0.0	95.514	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Project Cost					85.03				69.41	13.07	2.55
Improvement of Freight Transportation System											
1	Upgradation of Existing Truck Terminal	Sq.m	0.0	0.000	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2	Proposed New Truck Terminals	Sq.m	45000.0	0.001	38.21	0.00	20000.00	25000.00	0.00	16.98	21.23
Total Project Cost					38.21				0.00	16.98	21.23
Intelligent Transportation System Facilities											
1	New Signal Installations	No.	10.0	0.425	4.25	15.00	0.00	0.00	6.37	0.00	0.00
2	Area Traffic Control System	Km.	7.0	0.637	4.46	7.00	0.00	0.00	4.46	0.00	0.00

Sl.No	Projects	Unit	Total Quantity	Unit Rate (in Crore)	Total Cost (in Crores)	Project Phasing Quantities			Phasing Rs (in Crores)		
						2018-2023	2023-2028	2028 - 2038	2018-2023	2023-2028	2028 - 2038
3	ITS control Centre, PIS, Common Mobility Card, GPS, Mobile phone Applications and Surveillance Cameras)	Km.	85.0	0.425	36.08	0.00	44.89	15.00	0.00	19.06	6.37
Total Project Cost					44.79				10.82	19.06	6.37
Improvement of Parking Facilities											
1	On street Parking	Km.	5.6	0.083	0.46	5.60	0.00	0.00	0.46	0.00	0.00
2	Off street Parking (Surface)	No.	2.0	0.129	0.26	0.00	2.00	0.00	0.00	0.26	0.00
3	Off street Parking (Multi-Level-Car-Parking)	No.	0.0	0.000	0.00	0.00	2.00	0.00	0.00	0.00	0.00
Total Project Cost					0.72				0.46	0.26	0.00
Overall Comprehensive Traffic and Transportation Plan Proposals											
Total Project Cost					**575.11**				**189.71**	**239.20**	**147.09**

7.2 FINANCING OPTIONS

As per the Recommendations of Working Group on Urban Transport for 12th Five Year Plan, the financing of urban transport projects in the country has largely been confined to gross budgetary support from the government and the user charges. Due to heavy investment needs of urban transport and conflicting demands on the general exchequer, the investment in urban transport in past has not kept pace with the rapidly increasing requirement of the sector. The current level of user charges of limited urban transport facilities, do not make the system self-sustainable. At the same time, providing safe, comfortable, speedy and affordable public urban transport to all has to be a necessary goal of the governance. The key funding sources besides GBS and fare box can be dedicated levies, land monetization, recovery from non-user beneficiaries, debt and private investments. The paradigm of financing has to clearly move towards non-users pay principle and the polluters pay principle. There is a need for long-term sustainable dedicating financing mechanism to address fast worsening scenario in the field of urban transport. All the various components in which the investment would be required in the 12th Five Year Plan would need to be funded through a combination of funding from Govt. of India, State Govt./urban local body, development agencies, property development, loan from domestic and financial institutions as well as PPP. Thus, it is imperative to identify projects that are amenable to Government funding or PPP.

7.2.1 PUBLIC PRIVATE PARTNERSHIP (PPP)

Public-Private Partnerships is cooperation between a public authority and private companies, created to carry out a specific project. They can take on a number of forms, and can be a useful method of capturing property value gains generated by transport infrastructure In a PPP for a new transport infrastructure development project, the public authority creates a secure environment for the private sector to carry out the project, and the private partner offers its industry know-how, provides funding and shares in the project's risk. The objectives of the public and private sector partners appear to be quite different. The public sector aims to best serve the interests of taxpayers. The aim is not to use public money to obtain a return on capital investments. The private sector, on the other hand, aims to ensure a return on investment for its shareholders and to be as profitable as possible and yet these two contrasting goals can function perfectly well together in the framework of a PPP. The decision to undertake a public-private partnership and the choice of the most suitable form of partnership greatly depends on the context and the types of project to be developed are given below:

- The project context may influence the type of PPP to be implemented. The public partner must evaluate the total cost of the project, its importance in terms of public

need, the time frame, the number of actors involved and the geographic area in question. Does providing this public service require a major infrastructure? Will it require high levels of human and financial resources to provide this service? Before a decision can be made, it is necessary to fully understand the context of the proposed project.

- The cost of the project is of course a critical factor, which will weigh on the choice. Many PPP concern projects for underground systems, LRT and BRT requiring significant levels of financing which the local authorities would have difficulty assuming alone.
- A well-structured institutional framework and the local authority's experience in developing transport projects are also decisive factors. Urban transport is an industrial and commercial activity, which involves financial risk. Bringing in experienced partners is one way of compensating for a lack of certain skills in this field, though a good PPP should call upon other forms of expertise on the part of the public authority. This can sometimes facilitate obtaining a loan, in particular from international funding agencies.
- The tasks entrusted to the private sector (design, construction, development, operation, maintenance) will influence the type of contract.
- The sharing of responsibilities and risks will determine the degree of involvement of each partner and the type and clauses of the contract. There are many types of contracts but it is primarily the sharing of financial risk, which will determine the key characteristics. There are two categories of risk: commercial risk, related to trends in revenue, and industrial risk, related to the cost of construction and trends in operating and maintenance expenses. If both types of risk are covered by the public partner, then it would be a management contract in which the private partner is merely performing the work. The private partner must meet the specifications but will not be motivated to improve the service nor propose innovative techniques or management;
- If the project is not self-financing, i.e. if, at the end of the contract, the total revenues and gains do not balance out the total costs, the transit authority may be required to provide compensation, depending on the clauses of the contract.

7.2.2 GOVERNMENT SOURCES OF FUNDING

One of the particularities of the urban transport sector is that it depends on funding from several sources and involves various partners, public and private, individual and collective.

7.2.2.1 VIABILITY GAP FUNDING

In a recent initiative, the Government of India has established a special financing facility called "Viability Gap Funding" under the Department of Economic Affairs, Ministry of Finance, to provide support to PPP infrastructure projects that have at least 40% private equity committed to each such project. The Government of India has set certain criteria to avail this facility under formal legal guidelines, issued in August 2004, to support infrastructure under PPP framework. Viability Gap Funding can take various forms such as capital grants, subordinated loans, O&M support grants and interest subsidies. It will be provided in instalments, preferably in the form of annuities. However, the Ministry of Finance guidelines require that the total government support to such a project, including Viability Gap Funding and the financial support of other Ministries and agencies of the Government of India, must not exceed 20% of the total project cost as estimated in the preliminary project appraisal, or the actual project cost, whichever is lower. Projects in the following sectors implemented by the Private Sector are eligible for funding:

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

7.2.2.2 AMRUT FUNDING

Since cities and towns in India constitute the second largest urban system in the world and contribute over 50% of the country's GDP, they are central to economic growth. For the cities to realise their full potential and become effective engines of growth, it is necessary that focused attention be given to the improvement of infrastructure in an organised manner. According to AMRUT guidelines:

One-third of the project cost as grant from GoI for cities with a population of above 10 lakh.

Balance funding by State Governments / ULBs or through private investment.

The tender will include O & M for five years based on user charges. For the purpose of calculation of the project cost, the O&M cost will be excluded; however, the States/ULBs will fund the O&M through an appropriate cost recovery mechanism in order to make them self-reliant and cost-effective.

7.2.2.3 DEDICATED URBAN TRANSPORT FUND AT CITY LEVEL

For the projects, which are not admissible under AMRUT, or viability gap funding, the alternative sources of funding that a city could avail by setting up a dedicated urban transport fund at city level are given below:

A dedicated urban transport fund would need to be created at the city level through other sources, especially land monetization, betterment levy, land value tax, enhanced property tax or grant of development rights, advertisement, employment tax, congestion, a cess on the sales tax, parking charges reflecting a true value of the land, traffic challans etc.

Pimpri-Chinchwad Municipal Corporation has already set up a dedicated urban transport fund through land monetization and advertisement rights. Similarly, Karnataka has set up a dedicated urban transport fund through MRTS cess on petrol and diesel sold in Bangalore, which is being used to fund the metro rail projects. The various sources of funding that can be used to set up the urban transport fund is given below:

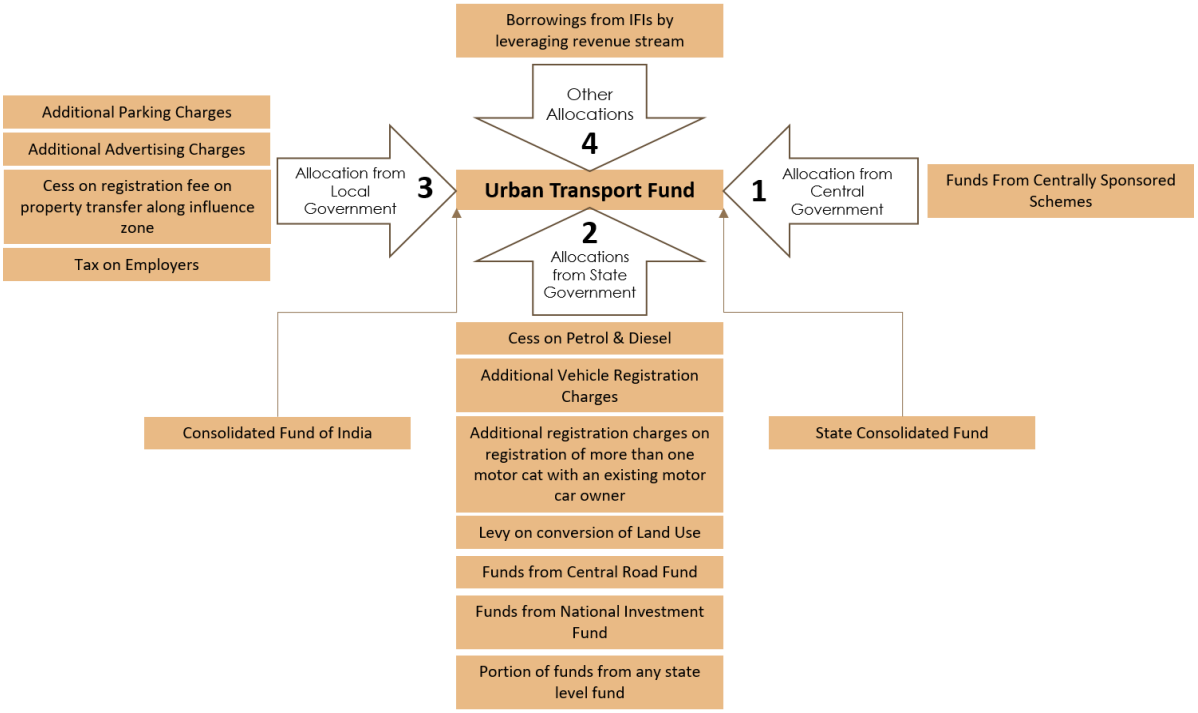


FIGURE 7.2-1: SOURCES OF FUNDS FOR URBAN TRANSPORT FUND

7.2.2.3.1 ANTICIPATED PURCHASE OF LAND

This method involves public authorities buying land before announcing that an infrastructure will be built or where the route will run. In this way, the purchase can be made at market price without the infrastructure. The strategy then consists in:

- Directly selling the land to private developers including the estimated added value in the sale price, such as was done in Aguas Claras on the periphery of Brasilia, or in Copenhagen;
- Developing the area as part of an urban renewal project and then selling it at market price, as was done in Copenhagen or in Japan, where rail companies were the first to use this method to finance their operations

A city can also levy additional stamp duty (5%) on registration of property.

7.2.2.3.2 BETTERMENT TAX

A betterment tax is not the same as a property tax, because the increase in value of property is not due to the action of the owner (such as would be the case with renovations and improvements) but from a community action, thus justifying the public authorities to impose such a tax. However, it is not easy to implement, which no doubt explains why this financing mechanism is still underused.

This tax must be levied on all areas that benefit from the new transport infrastructure. The land is valued each year based on an optimal use of each site, without considering the existing facilities. A tax based on the value of the land is then levied in order to generate funds for the public sector. Thus, if the value of the land increases, the tax collected also increases. This means that a vacant plot of land in the city centre which has been earmarked for building a residential and commercial complex will pay the same tax as an identical site which has already been developed in a similar manner. Unlike construction taxes, no tax reduction is available to landowners who leave the site empty. Likewise, taxes are not increased if the site is built upon. Landowners will therefore to seek to capitalize on the use of their land.

7.2.2.3.3 LAND VALUE TAX

Once an area is well connected by public transport and is accessible to the commercial area and also the liveability of the area increases it is possible that the price of the land will increase. Such increase in price can be source revenue for the municipality. Similar to parking, the obtained revenue needs to be utilized for improvement of the area and other areas in the vicinity. A substantial amount of revenue could be generated through cess on turnover, particularly in cities, based on industry, trade and commerce activities. Such cess has already been levied for Bangalore MRTS project. Bangalore has also levied luxury tax and professional tax towards the metro fund.

7.2.2.3.4 ADVERTISING

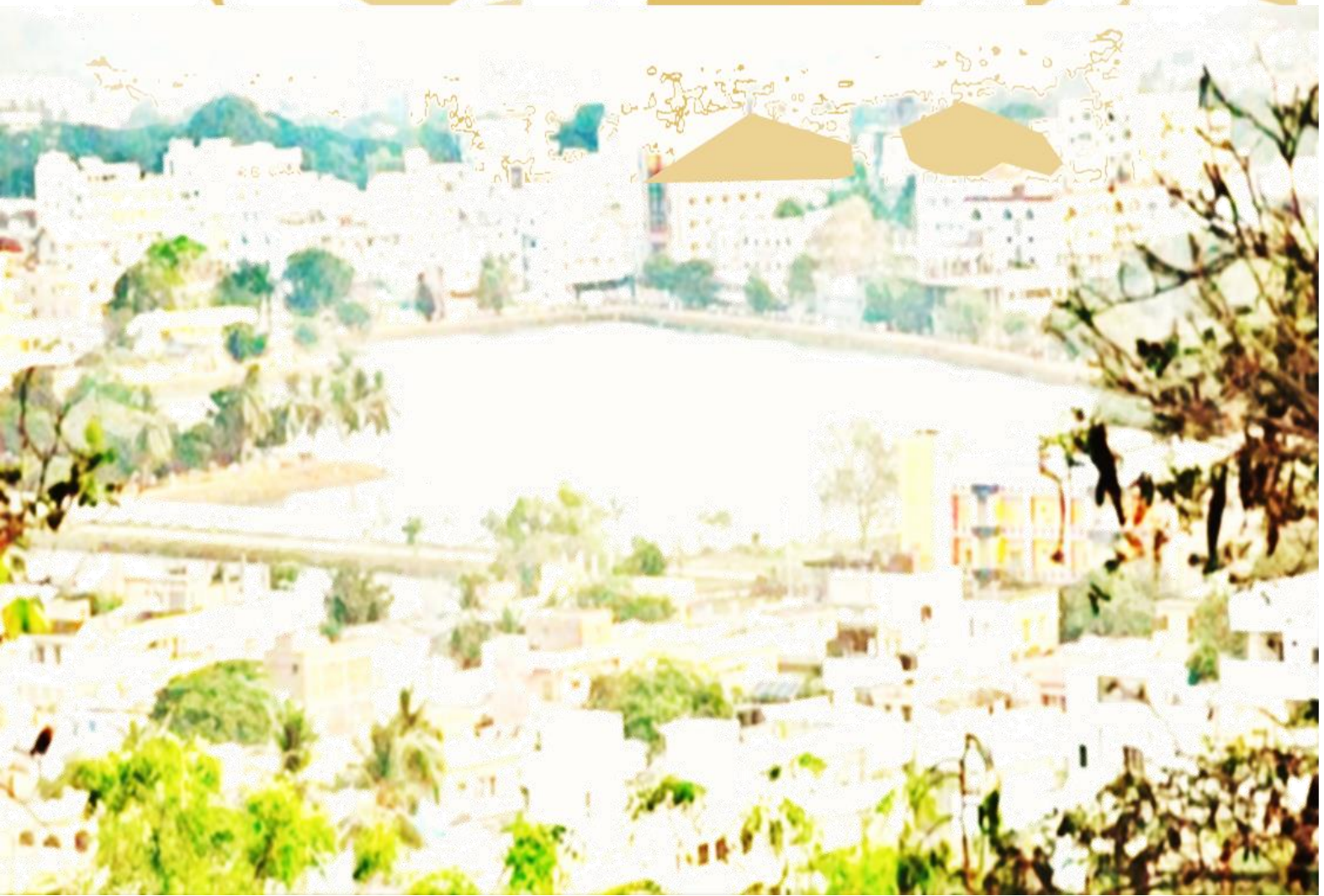
This is another important source of revenue for the city. When properly utilised, this source can be of immense value in supporting sustainable urban transport measures in a city. The revenues from advertising in the city can be used to improve the existing transport system and/or create new schemes in sustainable transport.

Paris, France has used the advertising money in developing a public bike scheme, which is now a well renowned model. Similarly, Transport for London (TfL) has made a deal with the advertising specialist, Clear Channel, for the regular maintenance and design of the street furniture in return for the advertising space on bus shelters.

One important aspect that needs to be considered is that the advertising money needs to be utilized for improving the transport system rather than spending it on building more roads. In the similar way, the advertising should not be overdone to avoid visual pollution. Further, ideally advertising revenue should not be a reason for building of pedestrian overpasses as the greater good for the society from these overpasses is minimal.

Chapter 8

INSTITUTIONAL FRAMEWORK



8. INSTITUTIONAL FRAMEWORK

8.1 BACKGROUND

City transport system generally involves several organizations that look after various forms and aspects of the transport system and network and have overlapping functions and areas of work. Therefore, to delineate areas and to remove ambiguity of functions the institutional framework has been proposed.

With the formation of a State level UMTA, part of the problem has been sorted. However, this would have a macroscopic view of resolving policy issues for all urban centres within the state. There still remains a need to set up a localized organization that results in coordinated strategic level planning at the city level and deal with more day to day issues of urban transport.

Following is the list of departments and Organizations involved in urban affairs and urban transport in Kakinada

- Housing and Urban Planning Department
- State Urban Development Department
- Public Works Department
- National Highway Authority of India (NHAI)
- Superintendent of Police, (Traffic) Ongole
- Andhra Pradesh State Road Transport Corporation (APSRTC)
- Railways
- Regional Transport Office (RTO)
- Ongole Municipal Corporation (OMC)

In view of bringing the institutional setup in a proper structure, it is important to understand the issues with the present Institutional set up, listed below.

- No clear segregation between the planning and implementing bodies
- Lack of coordination amongst all the departments in the urban transport sector
- All departments related to urban transport do not function in coherence.

Road projects are implemented in isolation with other projects which should otherwise be an integral part of road development like footpath, cycle tracks, pedestrian facilities etc. No control over mushrooming IPT modes in the city, which lead to issues of congestion along with contesting with the buses for passengers. Operation issues in public transport due to poor route and service

planning. No dedicated organization that is in charge of long-term urban transport planning for the city.

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

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

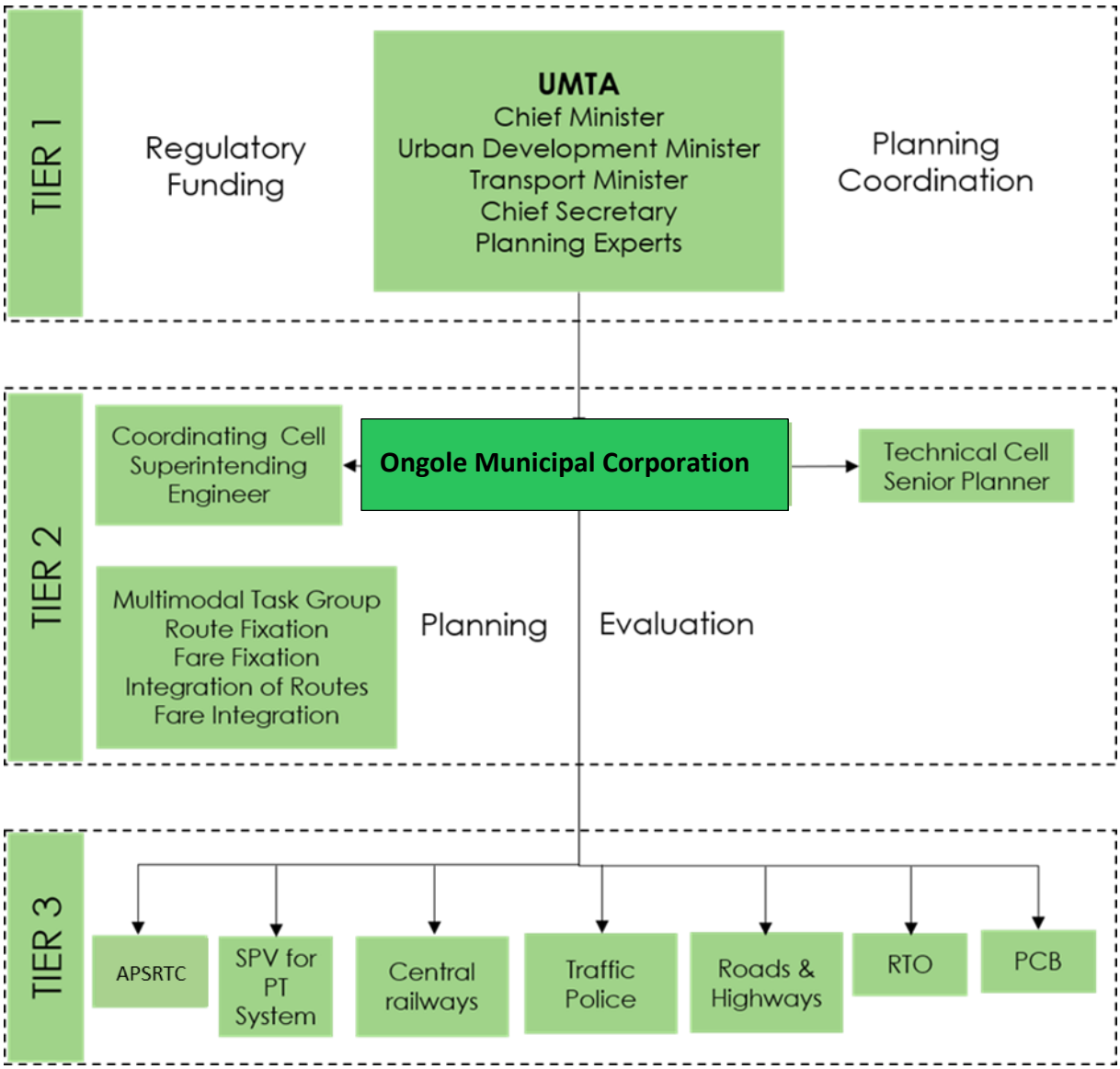


FIGURE 8.1-1: RECOMMENDED STRUCTURE FOR UMTA SETUP

8.2 BROAD FUNCTIONS OF UMTA

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

Undertake overall planning for public transport in the city, covering all modes - road, rail, and water and air transport systems

- Allocate routes amongst different operators
- Procure public bus services for different routes through contracting, concessions, etc. Ensure compliance of terms and conditions of license
- Recommend revocation of license for non-compliance of terms and conditions of the license
- Carry out surveys and manage a database for scientific planning of public transport requirements
- Co-ordinate fare integration among different operators of public transport and determine the basis for sharing of revenues earned from common tickets or passes.
- Operate a scheme of passes for the users of public transport and channelize subsidies to operators for any concessions that are offered in accordance with government policy.
- Regulate the Arrangement amongst Operators for the Sharing of Their Revenue Derived from The Use of Passes promote efficiency in public transport operation

Protect the interest of the consumers

- Settle disputes between different operators and between operators and infrastructure providers
- Levy fees and other charges at such rates and in respect of such services as may be determined by regulations;

8.3 LEGAL BACKING OF UMTA

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

- Objectives and functions of UMTA
- Operational area of UMTA
- Powers and delegation of powers of UMTA
- Authority to have power to acquire land by agreement
- Power of Government to transfer to the Authority lands belonging to it or to other ULBs, etc.
- Power of Authority to borrow

- Laying of annual estimate of income and expenditure
- Authority to approve or amend such estimate
- Estimates to be submitted to Government for sanction
- Supplementary estimates may be prepared and submitted when necessary
- Provisions regarding expenditure
- Accounts and audit
- Schedule of officers and employees to be submitted for sanction of Government
- Appointments, etc., by whom to be made
- Powers of entry
- Directions by the Authority
- Members and officers to be public servants
- Power to make rules
- Power to make regulations

8.4 MANPOWER REQUIREMENT AND STAFFING PLAN

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

8.5 IMPLEMENTING AGENCIES

Based on roles and responsibilities of various institutions, the agencies responsible for implementing the proposed projects in the LCMP are given in Table 8.5-1.

TABLE 8.5-1: DETAILS OF IMPLEMENTATION AGENCY

Sl.No	Projects	Agencies Responsible	Implementation Operation	
			Construction	Operation/Maintain
Improvement of Road Network				
1	Upgradation of Existing Roads	PWD/NHAI/OMC	PWD/ NHAI / Private	PWD / NHAI / Private
2	New Links	PWD/NHAI/OMC	PWD/ NHAI / Private	PWD / NHAI / Private
4	Flyover (4-Lanes)	PWD/NHAI	PWD/ NHAI / Private	PWD / NHAI / Private
5	Rail Over Bridges (4-Lanes)	PWD/NHAI/OMC	PWD/ NHAI / Private	PWD / NHAI / Private
6	Junction Improvements	PWD / OMC / State Govt. / NHAI	State Govt. / OMC	PWD / NHAIs
Improvement of Non-Motorised Transport Facilities				
1	Footpath	OMC / PWD	PWD / OMC/ Traffic Police	OMC / PWD/ Traffic Police
2	NMT Only Lanes	OMC / PWD	PWD / OMC	OMC / PWD
5	Shared Cycle Tracks	OMC / PWD	PWD / OMC	OMC / PWD
6	Dedicated Cycle Tracks	OMC / PWD	PWD / OMC	OMC / PWD
Improvement of Public Transport System				
1	Bus Fleet Augmentation-(Diesel & CNG Buses)	APSRTC	State Govt.	APSRTC
3	Bus Shelters	APSRTC/OMC	APSRTC/OMC/PPP	APSRTC/OMC/PPP
4	Improvement of Existing Bus Terminals	APSRTC / State Govt.	State Govt. / APSRTC	APSRTC
5	New Bus Terminal	APSRTC / State Govt.	State Govt. / APSRTC	APSRTC
6	Public Education and Awareness	Directorate of Urban	GoI / State Govt. / OMC	Public Education and awareness

Sl.No	Projects	Agencies Responsible	Implementation Operation	
			Construction	Operation/Maintain
	program	development /OMC/traffic police		program
Improvement of Freight Transportation System				
2	Proposed New Truck Terminals	State Govt. / OMC / Traffic Police	State Govt. / Private	Private
Intelligent Transportation System Facilities				
1	New Signal Installations	OMC/Traffic Police	Traffic Police/OMC/PPP	Traffic Police/KMC/PPP
2	Area Traffic Control System	OMC/Traffic Police	Traffic Police/OMC/PPP	Traffic Police/KMC/PPP
3	ITS control Centre, PIS, Common Mobility Card, GPS, Mobile phone Applications and Surveillance Cameras)	OMC/Traffic Police	Traffic Police/OMC/PPP	Traffic Police/KMC/PPP
Improvement of Parking Facilities				
1	On street Parking	OMC/Traffic Police /respective and owner/PWD	OMC/Traffic Police	OMC/Traffic Police
2	Off street Parking (Surface)	OMC/Traffic Police /respective and owner/PWD	OMC/Traffic Police /Private	OMC/Traffic Police /Private
3	Off street Parking (Multi-Level-Car-Parking)	OMC/Traffic Police /respective and owner/PWD	OMC/Traffic Police /Private	OMC/Traffic Police /Private
4	Parking Policy	Traffic Police/OMC		Traffic Police/OMC

Chapter 9

STAKEHOLDER CONSULTATION

9. STAKEHOLDER CONSULTATION

The Stakeholder workshop on Low Carbon Mobility Plan for Ongole was held on 11th of December, 2018 at the AP Secretariat in Vijayawada. It was held to get suggestions on the recommendation of the comprehensive mobility plan adopted for Ongole city. The workshop included a presentation by Urban Mass Transit Company on the Business as Usual (BAU) and Sustainable Urban Transport (SUT) and the projects identified as part of the LCMP project. The presentations were followed by a rich discussion with the city stakeholders, which gave new perspective and suggestions on the implementation of this project in the city after making a Detailed Project Report (DPR) for the same.

Introduction of the Project: Mr. N P Rama Krishna Reddy (Managing Director) from the Amaravati Metro Rail Corporation Limited introduced the LCMP project to the city stakeholders by explaining its importance of planning for the future developments of Ongole. He further added that the LCMP team had been working diligently on the project, and had devised the project proposals, which could be further detailed out for implementation. The presentation was attended by the following members (refer annexure----);

Mr. N. P. Rama Krishna Reddy	Managing Director, AMRC
Mr. B. Gopi Naik	Motor Vehicle Inspector
Mrs. G. Vijaya Geetha	Regional Manager
Mr. S. Rama Krishna	Sr. Vice President, UMTC
Mr. Ankush Malhotra	Vice President, UMTC
Mr. J. Siva Niranjan	Manager, UMTC
Mrs. Harshita Sarma	Asst. Manager, UMTC
Mr. Rakesh Jinka	Project Officer, UMTC
Ms. Sri Navya Annem	Sr. Office, UMTC

Figure:

LOW CARBON MOBILITY PLAN FOR ONGOLE

A detailed presentation on the Comprehensive Mobility Plan for Ongole was carried out by the UMTC team (Refer annexure -----).

The following points are discussed in detail in the presentation:

- An overview of the CMP project was presented with a detail description of:
  - The scope of work.
  - Detailed approach and methodology of the CMP Project.
  - Details of Secondary data collection and Primary Surveys.
- Profile of the City
- Inferences from the travel characteristics and city growth patterns are presented along with the projected population and employment for the base and horizon years.
- The existing and forecasted travel demand in the study area are explained.
- The following Sustainable Urban Transport Strategies are discussed in detail:
  - Integrated Land Use Transport Strategy - The major and minor activity nodes in the City identified and network suggested and further network linkages established are detailed along with the identified mobility corridors for Transit Oriented Development.
  - Road Network Improvement Strategy - Strategies such as Network Pattern (Ring Radial Structure), Lane Configurations (Up gradations of Existing Roads, envisaged Road Cross Sections), Proposed New Links (Missing Links and New Roads) and Proposed Road Infrastructure (ROBs/RUBs) are narrated in detail.
  - Public Transport Strategy - Strategies such as City Bus Systems (with details on Required Fleet, Routes and Vehicle Type), Proposed new Bus Terminal Locations, Intermediate Public Transport System (with details on Infrastructure Improvements, Routes to be integrated with the Public Transport System and Phase wise up gradation of e-Rickshaws), Locations of Multimodal Integration Nodes and programs to promote Public Transport Outreach are explained.
  - Non-Motorised Transport Strategy - Corridors identified for the footpath development and bicycle infrastructure along with their details are indicated.
  - Traffic Engineering and Management Strategy - Proposals pertaining to junction improvements in terms geometry, design and pedestrian safety infrastructure is explained. Parking Management with idea on parking policy and Parking Solutions

with identified On-Street and Off-Street Parking Locations are also explained. Intelligent Transport Solutions with proposed location for improvements and Proposed Vehicle Technologies are discussed.

- Freight Strategy - Locations of the truck terminals along with the area required and proposed trucks capacity with the stakeholders is narrated.

- The scenario comparison assessing the impacts on travel characteristics for horizon year for Business as Usual Scenario and Sustainable Urban Transport Scenario are incidentally explained the benefits of Sustainable Urban Transport Scenario and Sustainable Urban Transport Strategies.
- Prioritization of identified Projects in three phases under Immediate - Short term plans, Medium term plans and Long-term plans for development of a comprehensive system to capture the maximum benefits are explained.
- The presentation concluded by explaining the total and phase wise Block Cost Estimates.

Urban Mass Transit Company Limited

Amaravati Metro Rail Corporation Limited

ANNEXURE

ANNEXURE 1–PRIMARY SURVEY ANALYSIS

ROAD NETWORK INVENTORY

Objective: Road network inventory aims at updating the network database with the existing features of roadway sections covering all arterial, sub arterial and other important local/connecting links in the study area.

Conduct: The Survey is conducted on the major road sections identified within the study area, a full-scale inventory survey was undertaken to create a road network database as shown in the survey format in Annexure A. Manual carriage way section wise details were carried out on a typical working day.

Road Stretches: Road length of approx. 50 km in Ongole (Figure 3.2.1).

Inventory Analysis: The scenario of the existing road network for Ongole has been analysed under the following sections**,**

CARRIAGE WAY

From the network inventory analysis it is observed that, a larger share which is about 92% of the surveyed network has well paved road surface, of which 42% if flexible in nature and 50% of the survey network has rigid surface. The surveyed network is largely two-way in nature allowing movement on either directions. The important link with one-way movements are observed along KP road. 49% of survey network has carriage way below 12m.

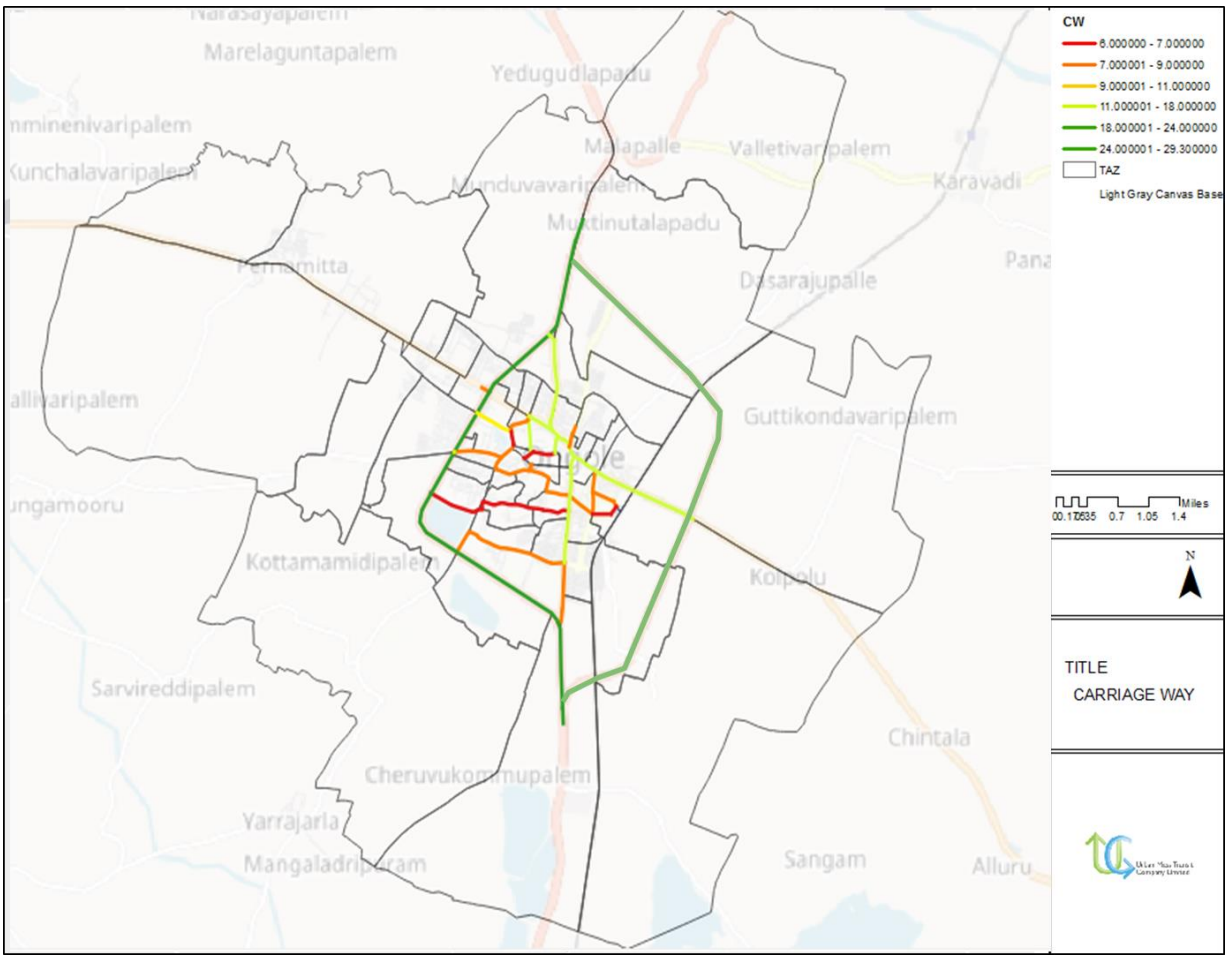


Figure 1: EXISTING ROAD NETWORK CLASSIFICATION BASED ON CARRIAGE WAY

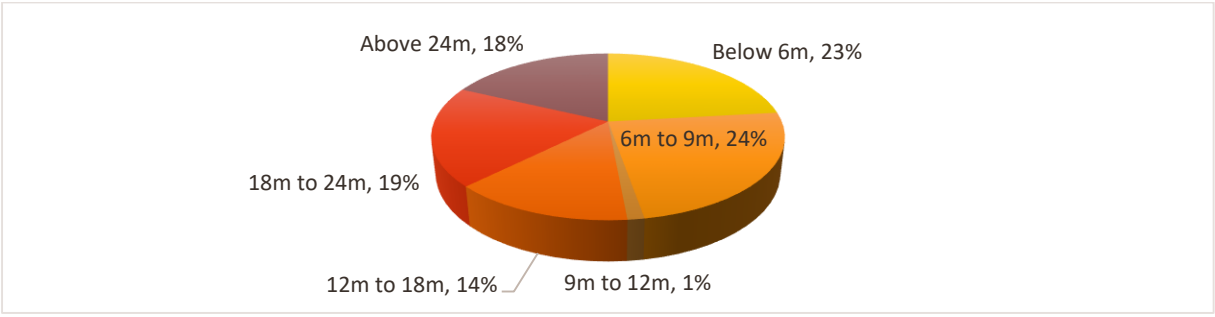


Figure 2: DISTRIBUTION OF EXISTING ROAD NETWORK CLASSIFICATION BASED ON CARRIAGE WAY

Distribution of network according to their carriage way width is given in Figure 3.2.2. Majority of the roads have 4 lanes and 6 lanes having 52% share of total length. Remaining are Single Lane, Intermediate Lane (IL) and 2 lane with divided/undivided roads.

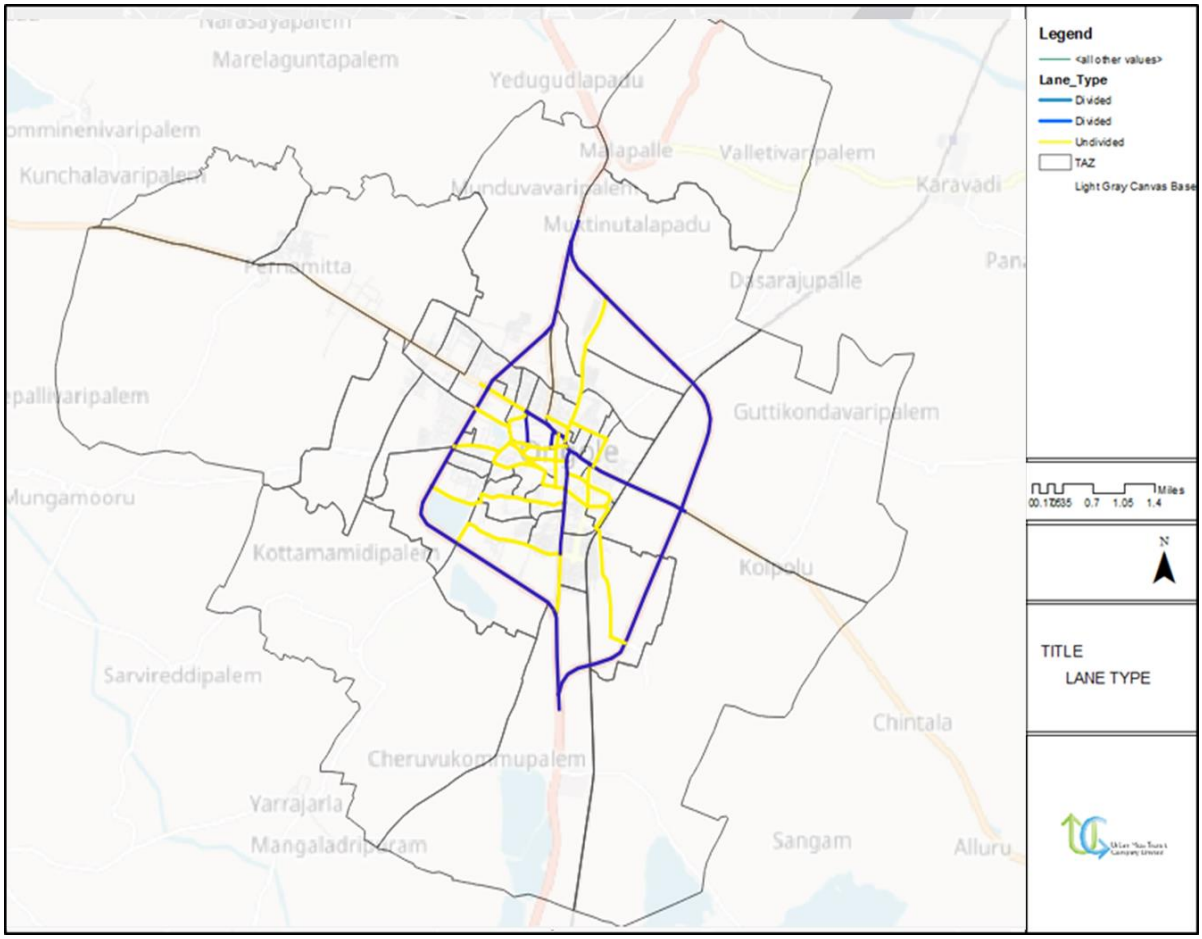


Figure 3 : EXISTING NETWORK CLASSIFICATION BASED ON LANE TYPOLOGY

49% of the survey network is divided while the remaining 51% is undivided. It is observed that the divided lanes are observed on the arterial roads and few sub arterial roads which are the Trunk Road and the Highway Road, indicating the infrastructure supporting higher speeds for the external movement in the city. The collector roads are largely undivided with 2 lanes. It is observed that 41% of the survey network is 2 lanes in nature.

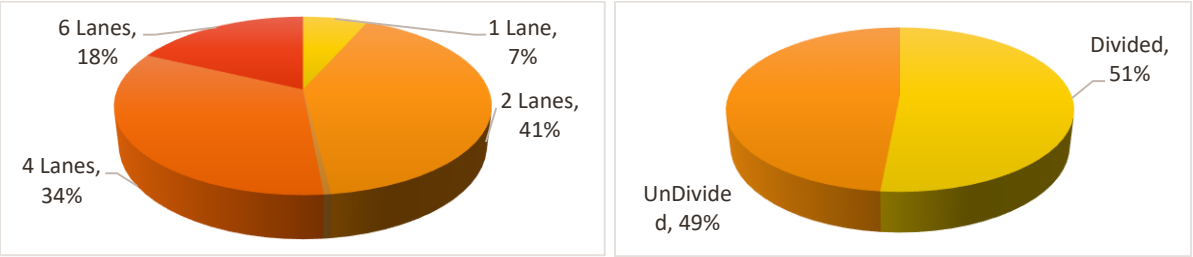


Figure 4 CLASSIFICATION BASED ON NUMBER OF LANES AND LANE TYPOLOGY

It is observed that 64% of the surveyed network has shoulder space available to cater the needs of the future traffic and transport demand. 42% of the potential roads with are the sub arterial and collector

roads varying between 12m to 24 m which are essential improve the movement within city have about 2.4m to 6m wide space available to improve the urban fabric of the streets and the movements.

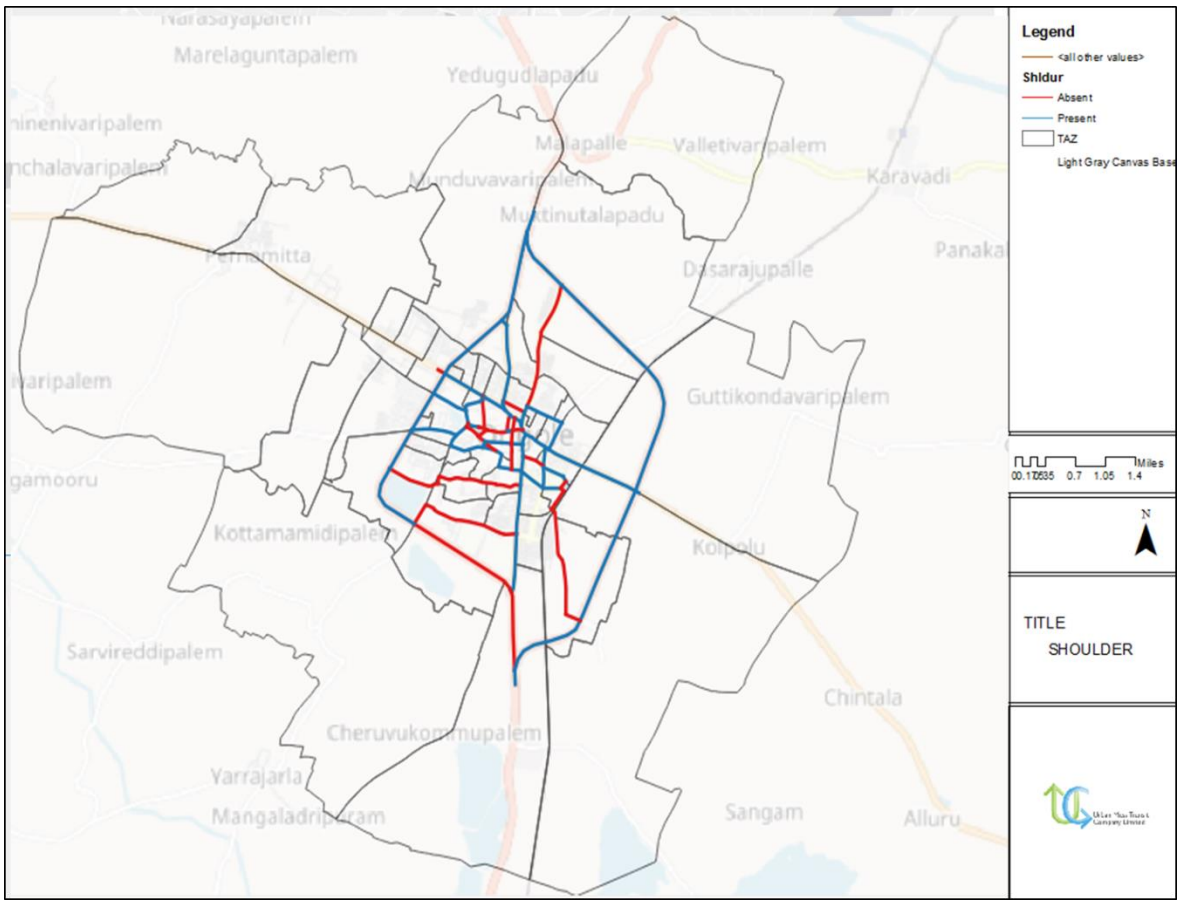


Figure 5: EXISTING ROAD NETWORK CLASSIFICATION BASED ON AVAILABLITY OF SHOULDER

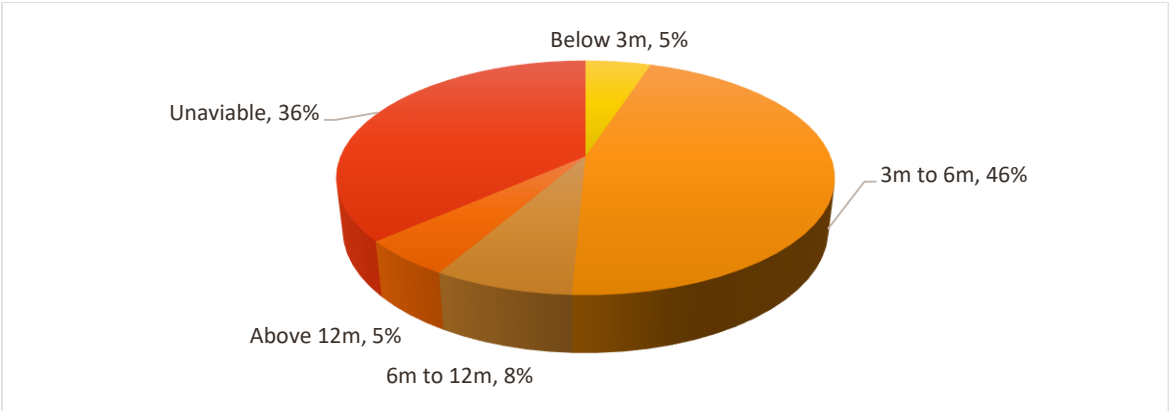


Figure 6: DISTRIBUTION OF EXISTING ROAD NETWORK CLASSIFICATION BASED ON SHOULDER WIDTH

PESDESTRIAN FACILITIES

From the surveyed Road Network Inventory Analysis it is observed that only 12% of the network has facilities (footpath) to support safe pedestrian movement. While the remaining 88% of the network has no provisions for pedestrian facilities with a minimum clear and continuous walking space of 1.8m.

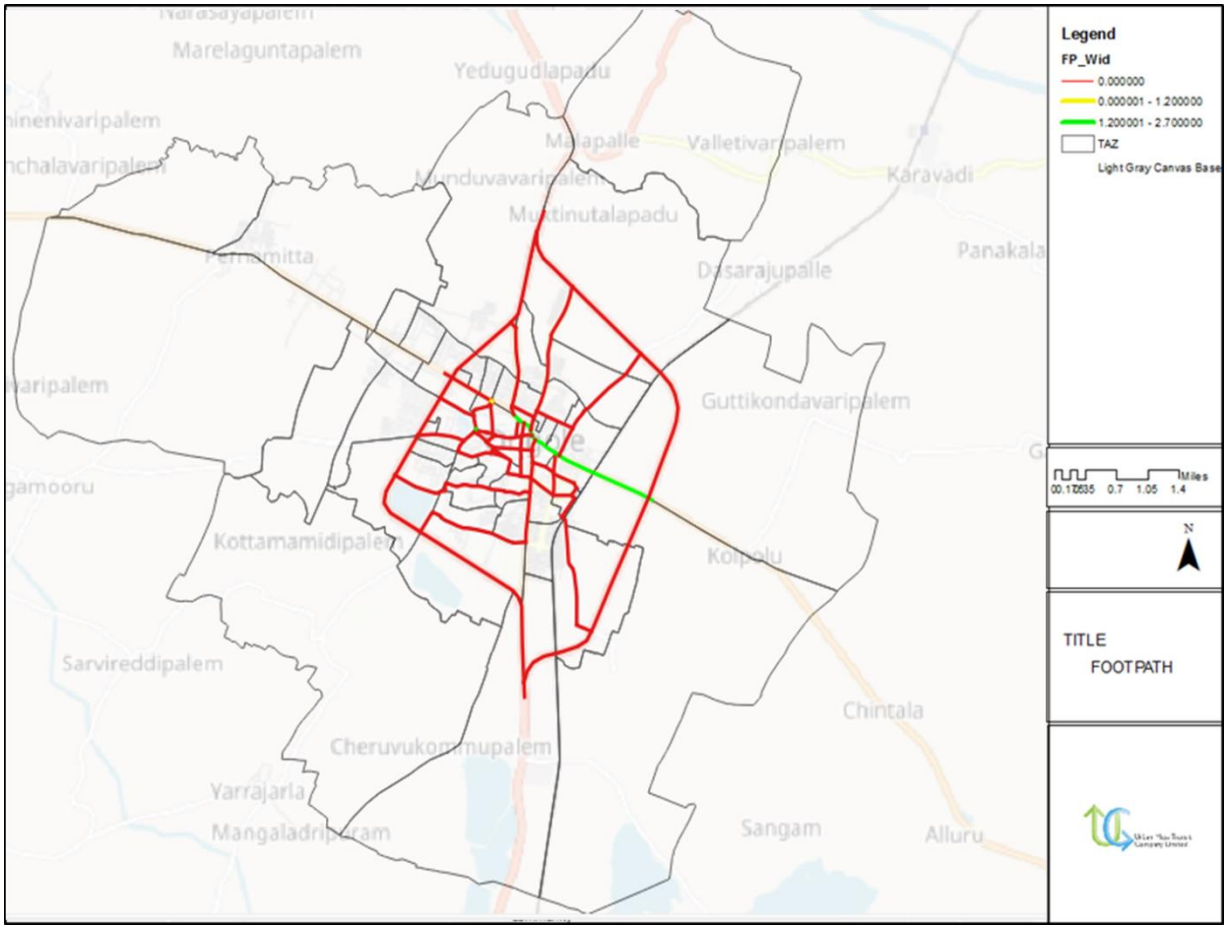


Figure 7: EXISTING ROAD NETWORK CLASSIFICATION BASED ON AVAILABLITY OF FOOTPATH WITH A CLEAR WALKING SPACE

NON-MOTORIED VEHICLE FACILITIES

Currently there are no dedicated Non Motor Vehicle facilities (corridors) existing within the study area. Designated bicycle parking is available at the bus and rail terminals.

PARKING FACILITIES

The nature of parking in the city is both on street and off street. On street parking is majorly observed at public spaces like bus depots, railway station and certain recreational spaces. It is observed that 21% of the survey network has on street parking activates. Though the number of on street parking zones are minimal, larger intensity of parking is observed around the Ongole bus stand and railway station area.

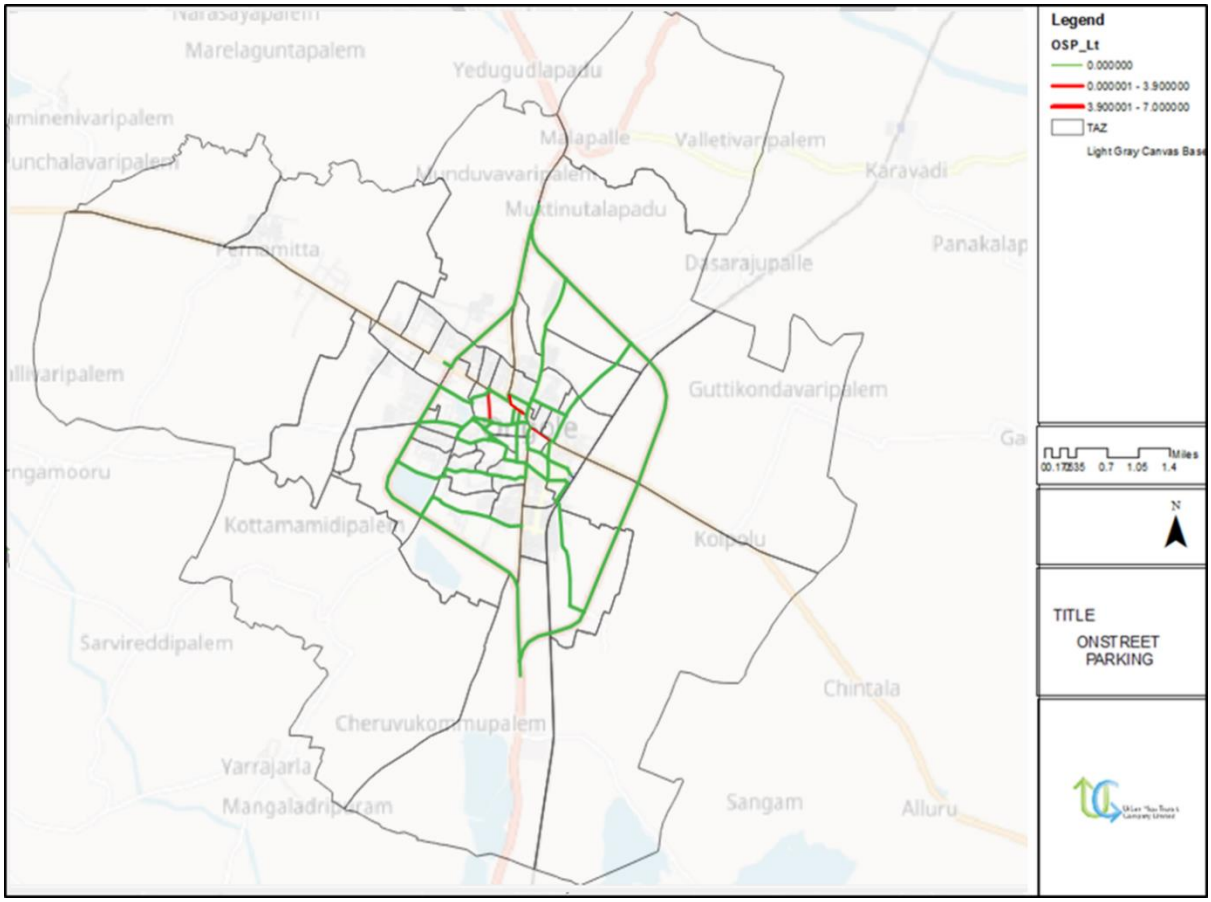


Figure 8: EXISTING ROAD NETWORK CLASSIFICATION BASED ON STREET PARKING ACTIVITES

INTERSECTIONS

The heavy traffic flow at peak hours congest most of the junctions especially to the south westernside of the city. The near the RTC bus stand and along Kurnool road were observed to have higher traffic flows. The Major Intersections within the Ongole Study are Addanki Bus Stand Junction, Kurnool Road Junction, Mastan Dargah Centre, Jayaram Hall Circle, Kotta Patnam Bus Stand Junction and so on. It is observed that there are about 21 notable junctions (minor and major) of which 5 are signalized junctions while the rest are unsignalised.

Key Inferences:

1. The network structure in the city is largely inorganic with two major radials connecting the sub-urban places around the city. The National Highways by-passing the city from an external ring, while there is no clear structure within the city.
2. The network is observed to be dense on the south-western side of the city indicating inequity in the urban spread and growth.
3. About 49% of the survey network has carriage way below 12m.

4. Only 12% of the surveyed network is facilitated with pedestrian infrastructure.
5. The city has no designated infrastructure facilities for non-motorised vehicles.
6. On street parking activities in the city are observed to be largely restricted.
7. Major parking activities are observed along RTC Bus stand, Kurnool Road and Trunk Road.
8. Two-wheelers constitute to a greater share of on street parking along the major roads, while cars constitute a larger share in designated parking spaces.

SPEED AND DELAY SURVEYS

Objective: The principle objective of the study is to find out the journey speed, running 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.

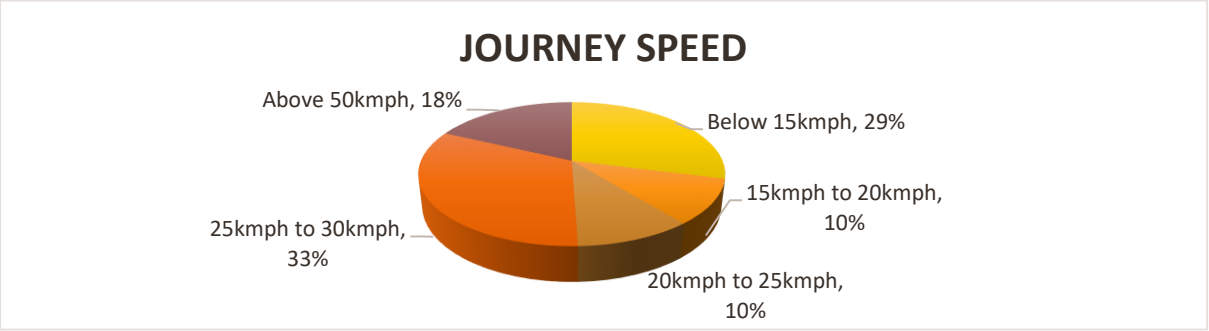
Conduct: The survey was conducted using GPS during only peak period in both directions. Data such as delay information on different road stretches and at intersections/level crossings in the study area as shown in the survey format in Annexure A.

Road Stretches: Road length of approx. 50 km in Ongole similar to the road network inventory was surveyed

Data Analysis: The speed and delay of the existing road network for Ongole has been analysed under the following sections,

TRAVEL SPEED

The average speed within the city is observed to 20kmph. The average speed along observed along the National Highway, Chennai-Vijayawada Highway passing out of the city is 65kmph and the speed on Bypass Road that 29kmph. The speed of other important roads within the city range between 6kmph to 29kmph. The lower speeds are observed due to narrow roads within the city.



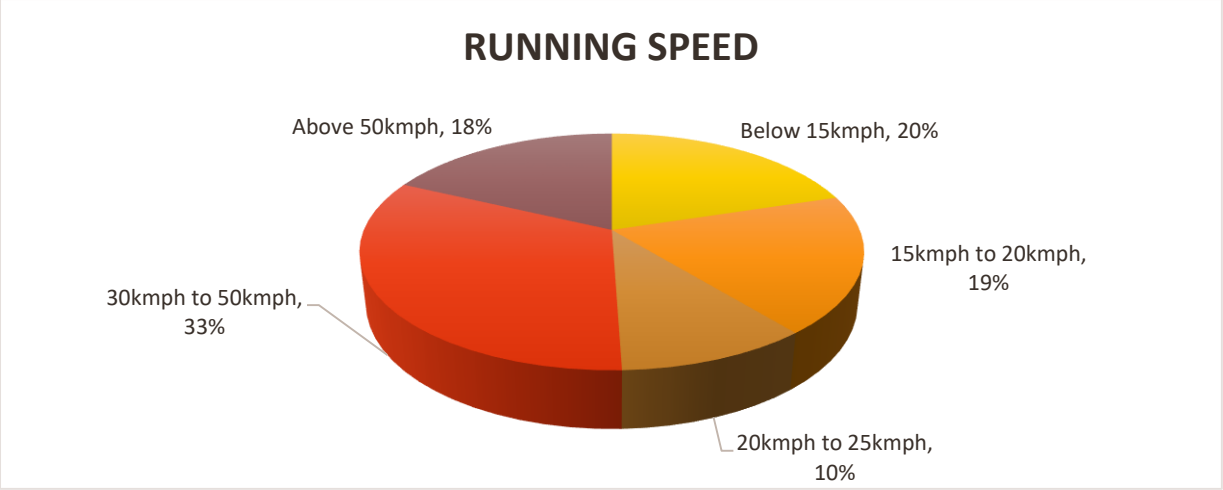


Figure 9: DISTRIDUTION OF JOURNEY AND RUNNING SPEEDS ALONG THE NETWORK

Table below represents the summary of the speed and delay survey in Ongole.

Table 1: JOURNEY AND RUNNING SPEEDS ACROSS VARIOUS ROADS IN THE STUDY AREA

S.No.	Name of the road	Journey Speed	Running Speed
1	Chennia -vijayawada	73.8	73.8
2	Chirala-ongole road	29.0	31.9
Arterial Roads		51.4	52.9
1	Pattivaari street	12.6	15.7
2	Lambadi street	11.9	14.4
3	Addanki bus stand	20.4	22.6
4	New market	21.4	23.6
5	Mukthinuthala padu road	12.6	15.7
6	Gopal nagar	12.6	15.7
7	Aluri street	12.6	15.7
8	Dibbala road	15.0	17.4
9	Mukthinuthala padu road	28.0	32.0
10	kurnool road	11.4	13.6
13	chimakurthi road	11.4	13.6
14	Trunk road	12.5	14.8
15	Kp road	21.4	23.6
19	FCI Road	21.4	23.6
20	Gopi krishna theatre road	20.4	24.6
21	Lambadi street	15.0	17.8
22	Rajapanagal road	10.6	11.4
Other Roads		**20.1**	**22.5**

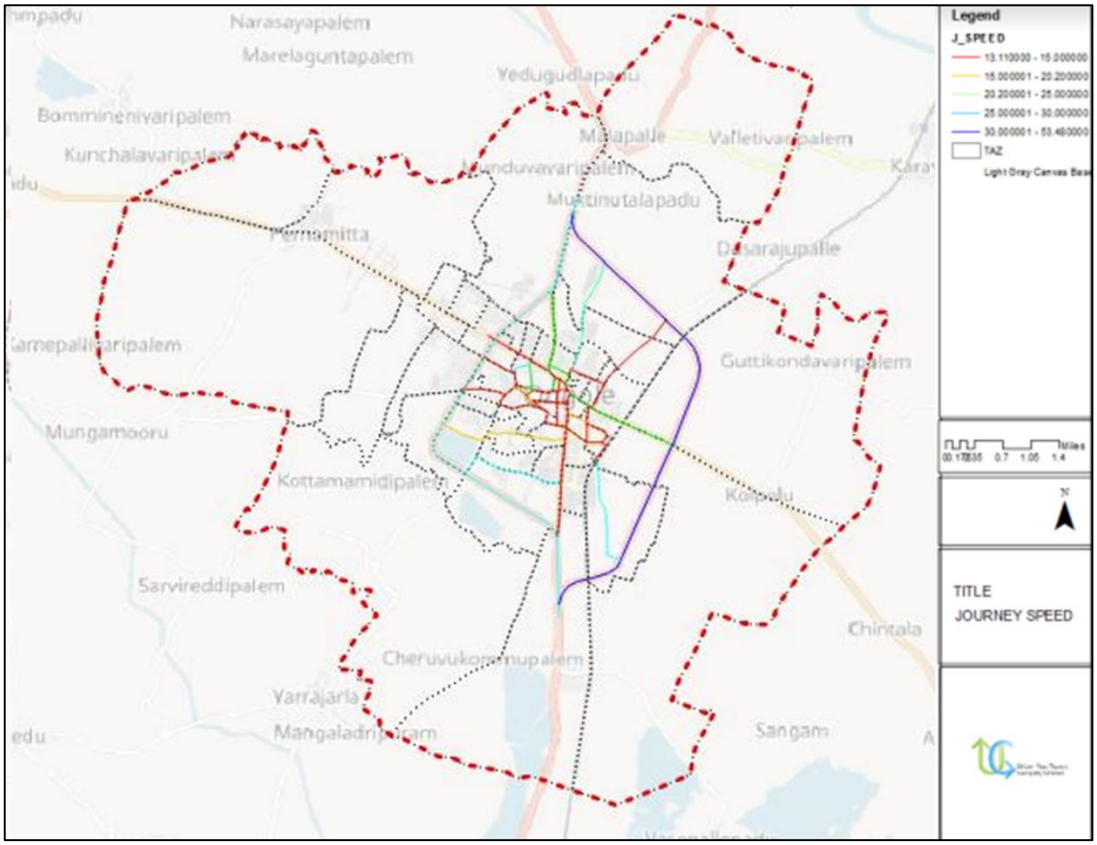


Figure 10: JOURNEY SPEEDS ALONG THE NETWORK

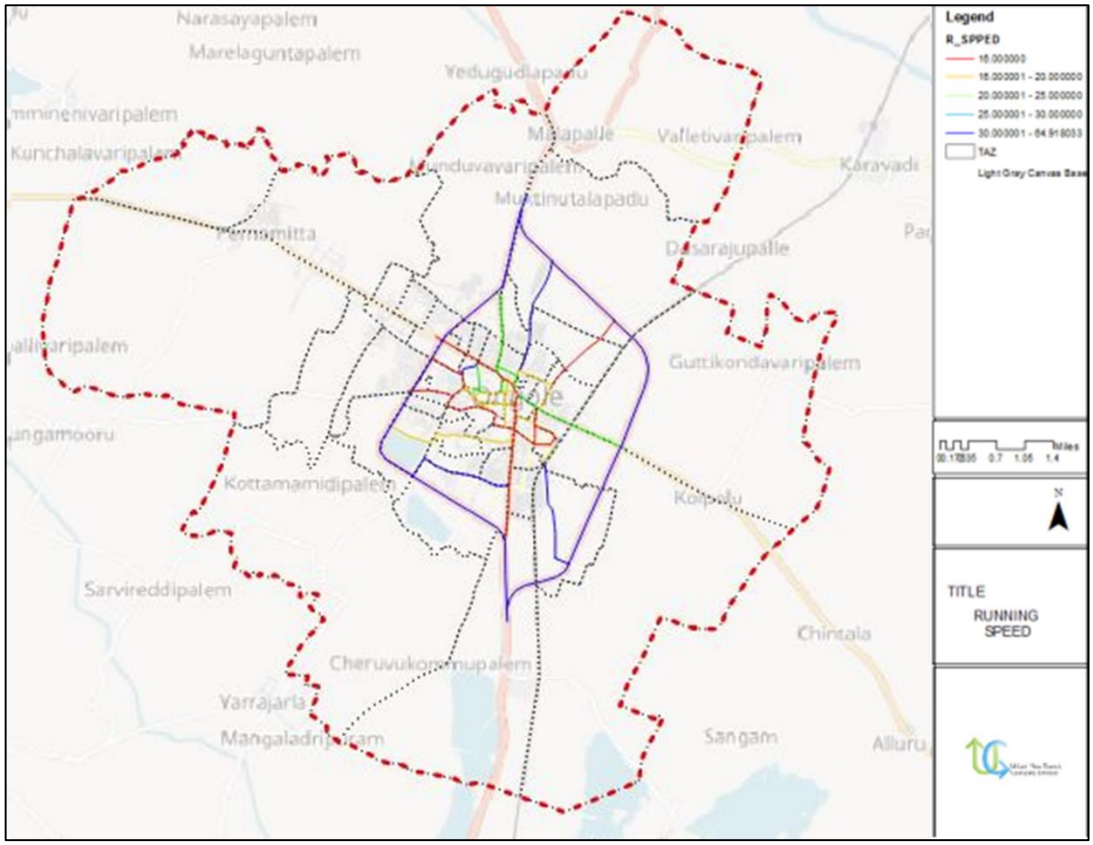


Figure 11: RUNNING SPEEDS ALONG THE NETWORK

DELAYS IN TRAVEL

The delays observed in the travel speed along the survey network is largely due to traffic movement and hindrances. The other major reasons of delay experienced is due to, chaotic movement through narrow roads. The Figure shows the share of cause of delays along the surveyed network.

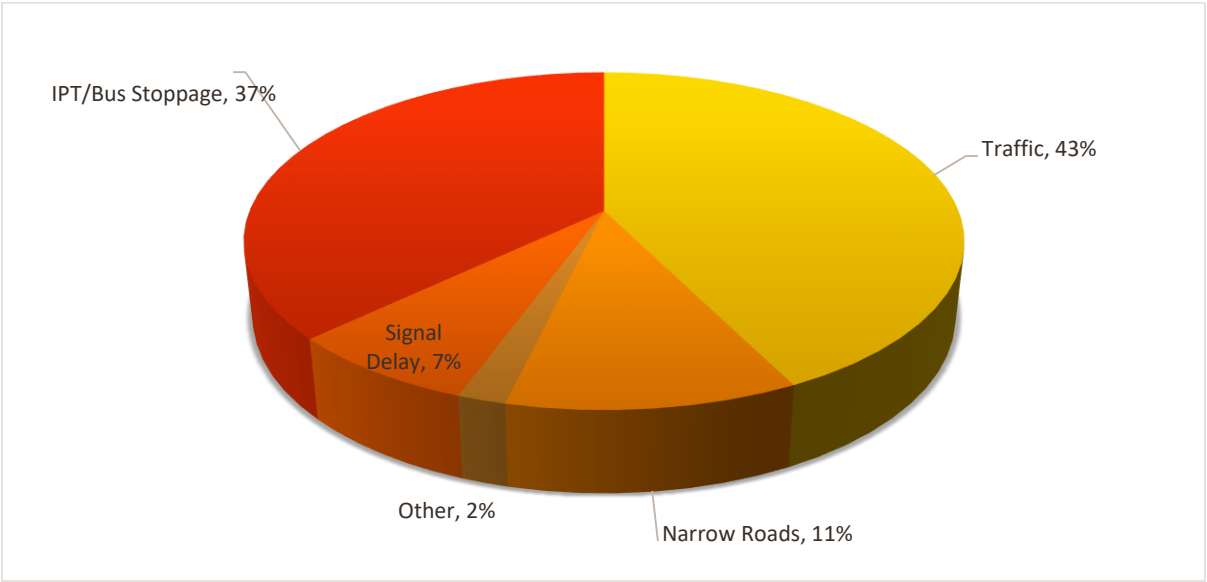


Figure 12: DISTRIBUTION OF CAUSES OF DELAY ALONG THE NETWORK

Key Inferences:

1. The average journey speed along the network is observed to 20kmph.
2. The average speed along the arterial roads is observed to be over 51kmph.
3. The speed along the collector and local roads varies between 10kmph to 24kmph.
4. The delays in travel speeds are caused largely due to traffic and delay at intersections.

ORIGIN - DESTINATION SURVEY (OD) - OUTER CORDON

Objective: Surveys will be conducted at outer cordons identified at the periphery of the city. The data will help in realising the travel characteristics and mode wise travel pattern.

Conduct: The survey is conducted for 24 hours with a sample of 10% of the traffic on a typical working day, interviewing vehicle passenger and goods for OD, occupancy, travel cost, time etc. as shown in the survey format in Annexure A

Location: Five outer cordon points were identified to capture the external and internal interactions with Ongole.

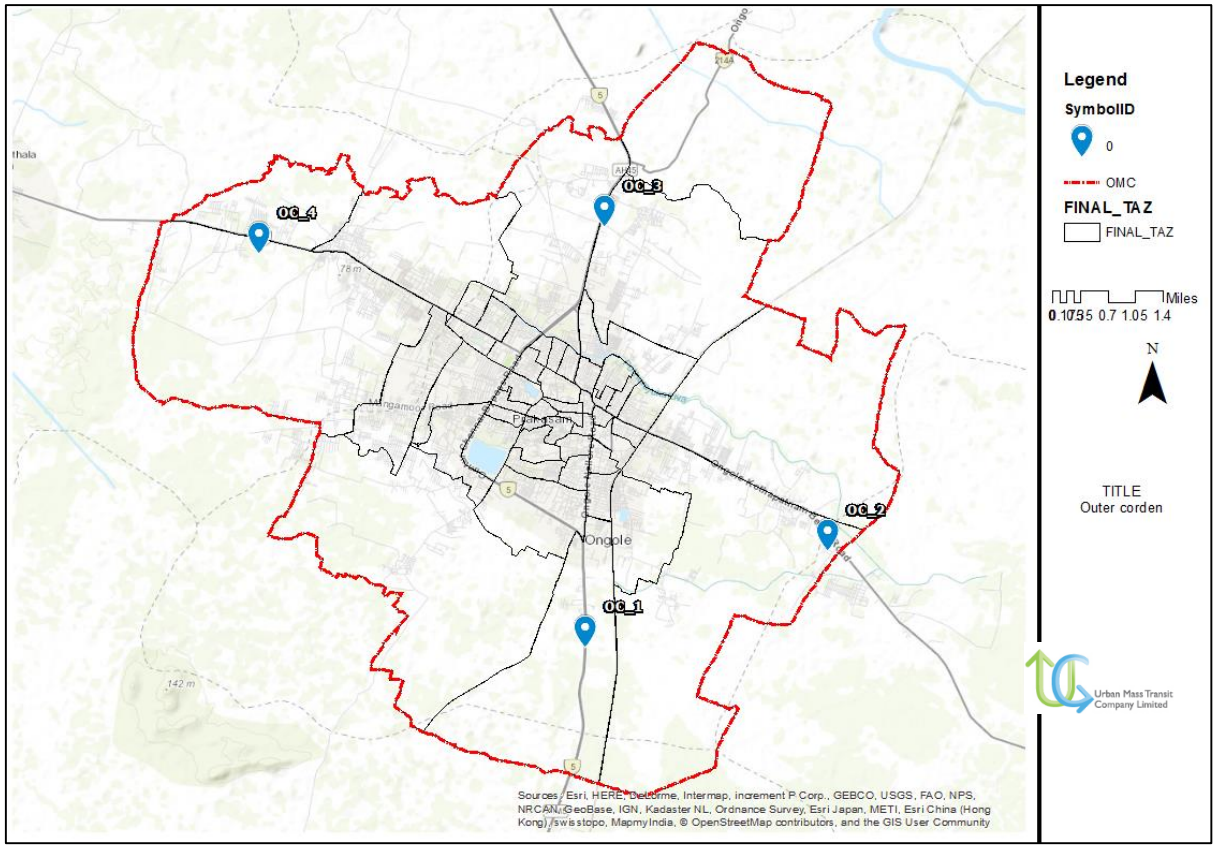


Figure 13: OUTER CORDON LOCATIONS

Table 2: OUTER CORDON LOCATIONS

Code	Location
OC_1	Vijayawada-Chennai Highway, Near Indian Oil Petrol Pump
OC_2	Kothapatnam Road, Near Sub Station, Koppolu
OC_3	Chirala-Ongole Road, Near Aurna Trucks
OC_4	Ongole Road, Near Petrol Pump, Prakasam

Analysis:

The general analysis for Origin and Destination Survey was carried out for the Interim stage of the study. A detailed analysis with the share of zonal interactions will be discussed in the draft report.

PASSENGER VEHICLES:

It was observed that majority of the trips were work based trips, accounting to 64% of the trips. The same pattern is observed in the trip frequency analysis, wherein more than 50% of the trips were made daily twice (up and down). These patterns indicates the dependency between surrounding towns and Ongole in terms employment.

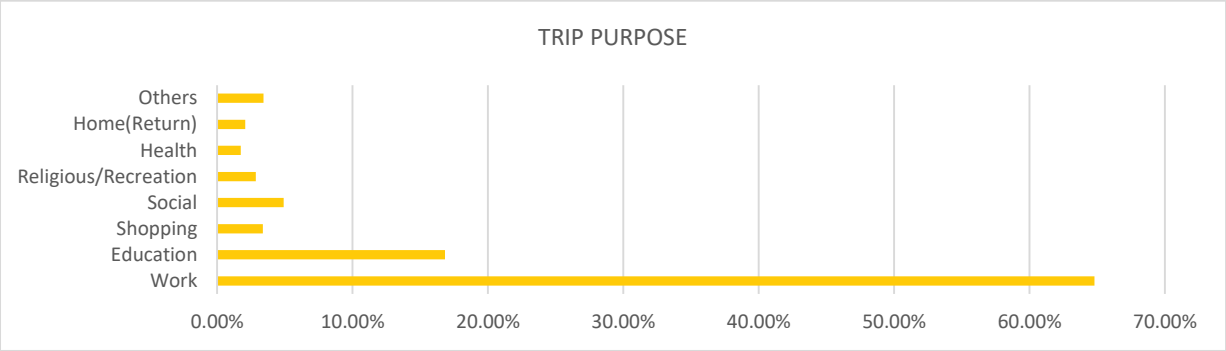


Figure 14: TRIP PURPOSE FOR PASSENGER VEHICLES AT OUTER CORDON LOCATIONS

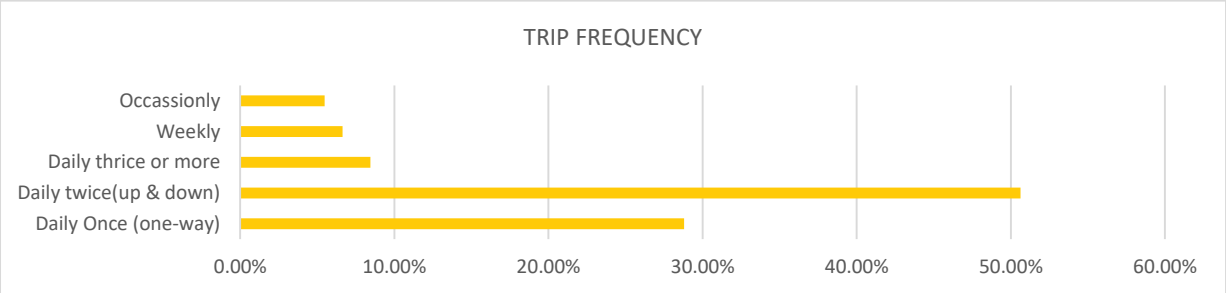


Figure 15: TRIP FREQUENCIES FOR PASSENGER VEHICLES AT OUTER CORDON LOCATIONS

It has been observed that the city has greater share of interactions with surrounding town and villages such as Kothapatnam, Pelluru, Pernamitta, Chimakurthy, Tanguturu and Kavali. These trips are mostly work based trips indicating that Ongole is an important employment node for these towns within 25km of

distance . The average travel distances captured for the passenger vehicles at the outer cordon locations are as shown in Figure

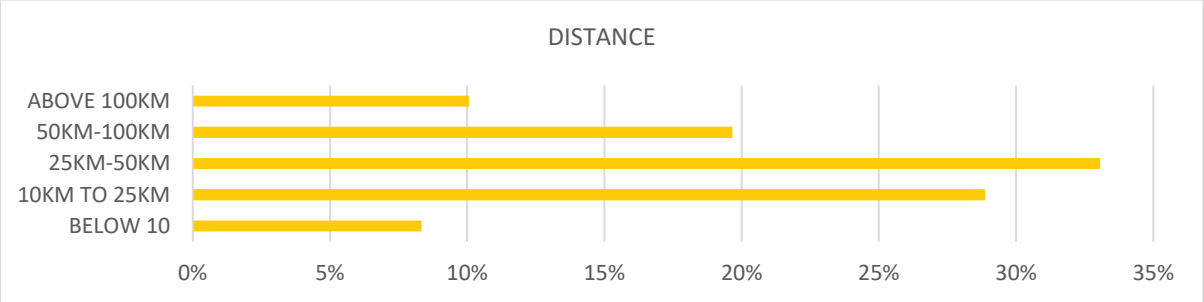


Figure 16: TRAVEL DISTANCES AT OUTER CORDON LOCATIONS

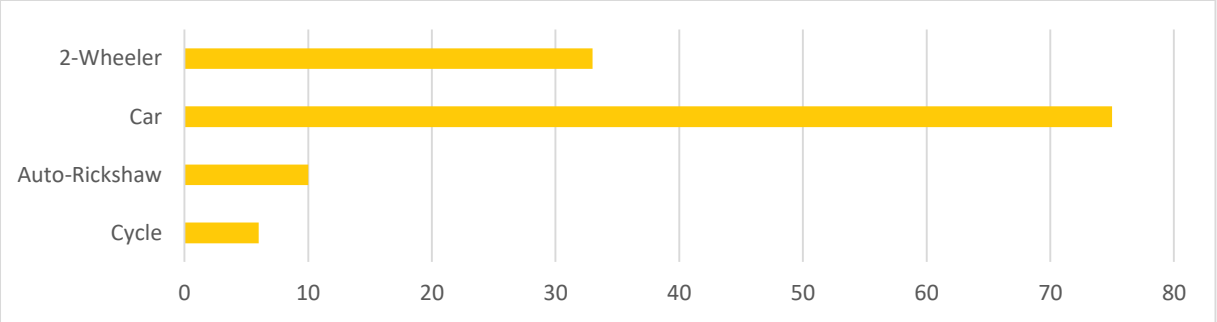


Figure 17: AVERAGE TRAVEL DISTANCES AT OUTER CORDON LOCATIONS

Table 3: PASSENGER VEHICLE OCCUPANCY AT OUTER CORDON LOCATIONS

MODE	OCCUPANCY
2-Wheeler	1.5
Car	3.2
Auto-Rickshaw	3.7
Cycle	1
Cycle Rickshaw	2.1

The Table represents the vehicle occupancy at the outer cordon locations. While the average occupancy of buses is observed to be 36.

CLASSIFIED TRAFFIC VOLUME COUNTS - OUTER CORDON

Objective: The survey aims to assess the floating population and to establish the peak to daily flow ratios.

Conduct of the Survey: Manual traffic counts were carried out on typical working day at all locations listed. At each identified station, both directional counts will be carried out by vehicle type for 24 hours as shown in the survey format in Annexure A.

Location: The survey was conducted at four outer cordon points as shown in Figure and Table.

Analysis: The quantum and temporal variation of total daily traffic, intensity and composition of vehicles and passenger trips moving in the study area are presented in the following sections. Table represents the daily traffic volume at outer cordon.

Table 4: DAILY VOLUME AT OUTER CORDON LOCATIONS

Location ID	Inbound		Outbound		Total		% Incoming PCU	% Outgoing PCU
	Vehicles	PCUs	Vehicles	PCUs	Vehicles	PCUs		
OC 01	13,933	16,874	13,913	18,449	27,846	35,323	48%	52%
OC 02	4,169	5,634	2,826	3,867	6,995	9,502	59%	41%
OC 03	11,986	17,448	11,499	17,198	23,485	34,646	50%	50%
OC 04	7,940	12,915	9,901	16,350	17,841	29,266	44%	56%

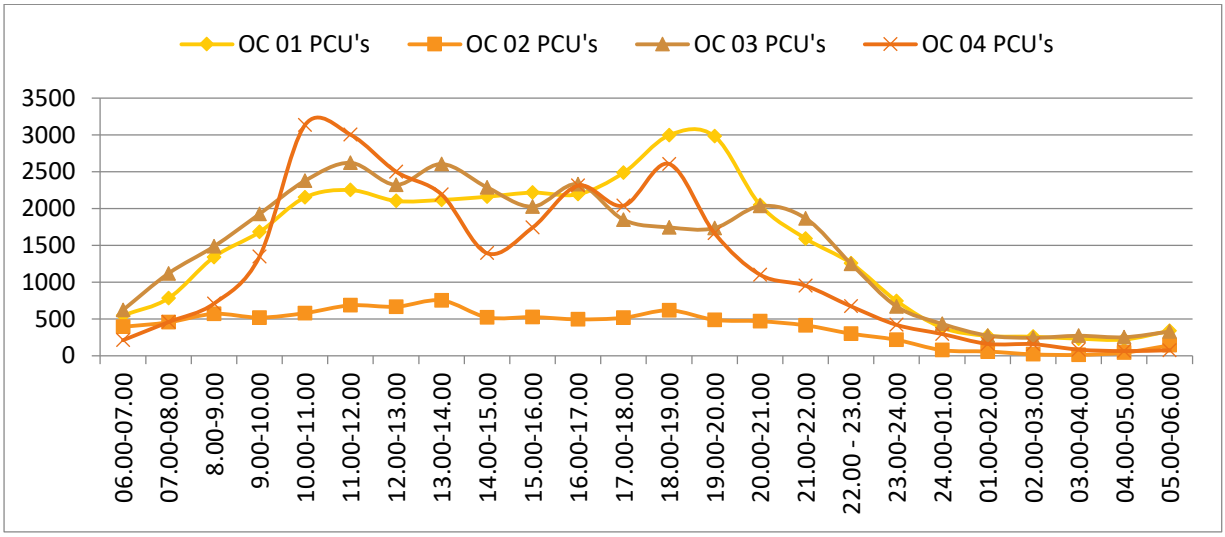


Figure 18: HOURLY VARIATIONS OF PCUS AT OUTER CORDON LOCATIONS

Table 5: PEAK HOUR VOLUMES AT OUTER CORDON LOCATIONS

Location ID	Peak Hour	Towards Ongole		Away From Ongole		Total	
		Vehicles	PCUs	Vehicles	PCUs	Vehicles	PCUs
OC 01	18.30-19.30	1,130	1,485	1,360	1,740	2,490	3,225
OC 02	12.45-13.45	926	1,001	751	1,045	527	767
OC 03	11.00-12.00	883	1,081	843	1,169	1,856	2,620
OC 04	10.15-11.15	739	944	926	1,257	1,989	3,426

It is observed that two wheerlers constitute the highest accounting to about 37% of the modal share at outer cordon locations, followed by auto rickshaws with 30%. The high share of the two wheelers movement is due to its frequent interactions with the sub urban area like Mukthinuthalapad, Pelluru, etc. The modal share for the same are as shown in Figure and Table

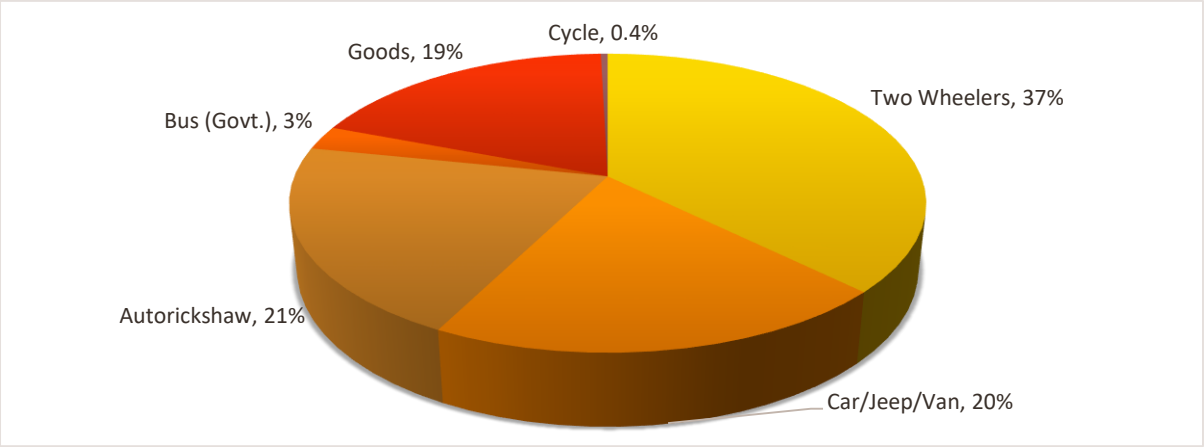


Figure 19: OVERALL DAILY TRAFFIC COMPOSITION AT OUTER CORDON LOCATIONS

Table 6: LOCATIONWISE CLASSIFICATION OF DAILY TRAFFIC

MODE	OC_1	OC_2	OC_3	OC_4
Two Wheelers	50.4%	43.9%	27.7%	27.0%
Car/Jeep/Van	14.4%	13.5%	25.2%	25.2%
Auto rickshaw	19.4%	29.9%	22.6%	16.6%
Bus (Govt.)	2.4%	4.5%	2.8%	1.9%
Goods	13.0%	8.1%	21.3%	28.6%
Cycle	0.4%	0.1%	0.4%	0.6%

Key Inferences:

1 The outer cordon locations OC-1, OC-3 and OC-4 have highest traffic volume as these highways connect Kurnool and Vijayawada (via Guntur) and Chennai (Via Nellore).

2 Two-wheelers contribute to the highest modal share at the survey outer cordon locations due to the frequent interactions with the surrounding villages.

CLASSIFIED TRAFFIC VOLUME COUNTS – SCREEN LINE

Objective: The survey aims to assess the traffic scenario and to establish the peak to daily flow ratios.

Conduct of the Survey: Video traffic counts were carried out on typical working day at all locations listed. At each identified station, both directional counts will be carried out by vehicle type for 16 hours as shown in the survey format in Annexure A.

Location: The survey was conducted at five screen lines points along the two north-south and east-west screen lines as shown in Figure and Table

Table 7 SCREEN LINE LOCATIONS

CODE	LOCATIONS
SL_1	KP Bus Stand Flyover Road, Near Central Crime Station
SL_2	Chirala-Ongole Road, Near Enushalem Chruch
SL_3	Kurnool Road, Near Ongole Electricity Office
SL_4	Trunk Road, Near KP Complex

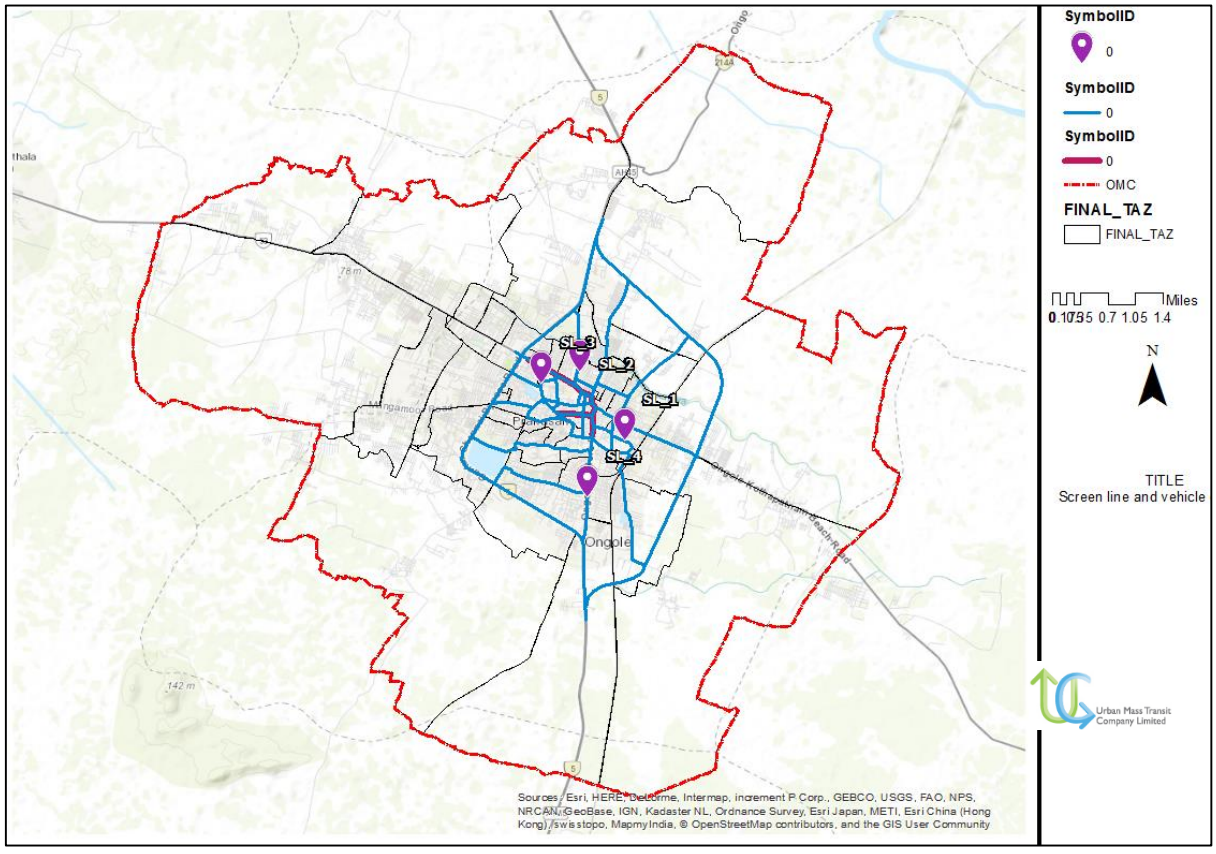


Figure 20: SCREEN LINE LOCATIONS

Analysis: The quantum and temporal variation of total daily traffic, intensity and composition of vehicles and passenger trips moving in the study area are presented in the following sections. Table represents the daily traffic volume at outer cordon.

Table 8: DAILY VOLUME AT SCREEN LINE LOCATIONS

Location ID	East Bound		West Bound		Total		% Incoming PCU	% Out going PCU
	Vehicles	PCUs	Vehicles	PCUs	Vehicles	PCUs		
SL_1	10,899	10,887	11,965	10,734	22,864	21,620	50%	50%
SL_3	28,703	30,222	30,198	32,061	58,901	62,283	49%	51%
Location ID	North Bound		South Bound		Total		% Incoming PCU	% Out going PCU
	Vehicles	PCUs	Vehicles	PCUs	Vehicles	PCUs		
SL_2	3,291	3,861	2,202	2,390	5,493	6,251	62%	38%
SL_4	22,420	23,330	33,224	33,463	55,644	56,792	41%	59%

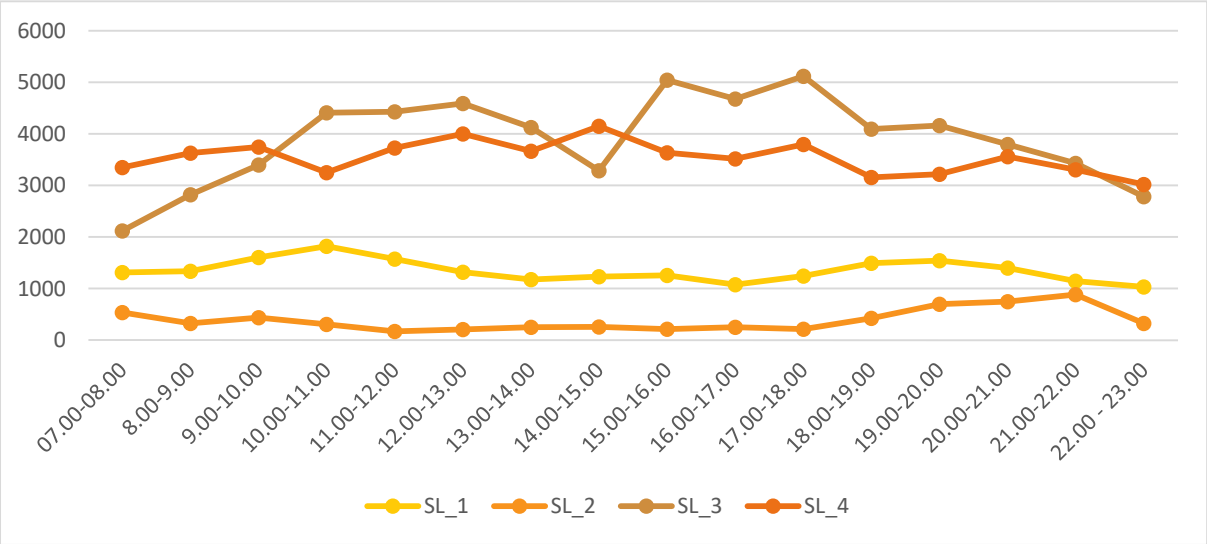


Figure 21 HOURLY VARIATIONS OF PCUS AT SCREEN LINE LOCATIONS

Table 9: PEAK HOUR VARIATIONS AT SCREEN LINE LOCATIONS

Location ID	Peak Hour	Inbound		Outbound		Total	
		Vehicles	PCUs	Vehicles	PCUs	Vehicles	PCUs
SL_1	09.00-10.00	1195	1042.35	774	780	1,969	1,822
SL_3	17.00-18.00	2,012	2,023	2,021	2,070	4,033	4,093
SL_2	17.00-18.00	218	200	196	225	414	425
SL_4	17.00-18.00	1,327	1,303	1,910	1,857	3,237	3,159

It is observed that two wheelers constitute the highest accounting to about 57% of the modal share at screen line locations, followed by auto rickshaws with 28%. The modal share for the same are as shown in Figure and Table

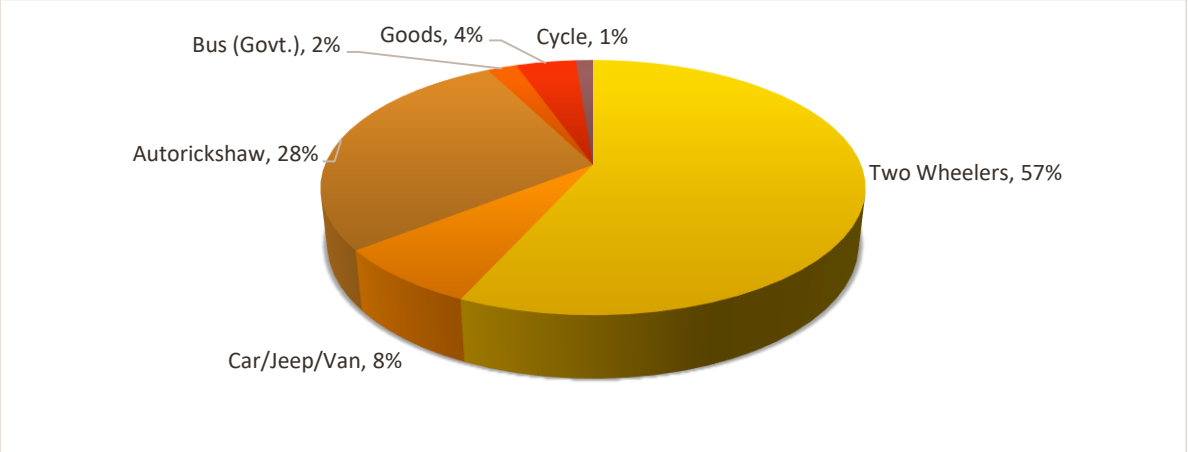


Figure 22 OVERALL DAILY TRAFFIC COMPOSITION AT SCREEN LINE LOCATIONS

Table 10 LOCATIONWISE CLASSIFICATION OF DAILY TRAFFIC

MODE	SL_1	SL_2	SL_3	SL_4
Two Wheelers	68.1%	55.7%	55.1%	54.3%
Car/Jeep/Van	6.5%	5.2%	8.7%	8.0%
Auto Rickshaw	18.2%	30.6%	27.9%	29.5%
Bus (Govt.)	1.1%	0.2%	4.6%	1.8%
Goods	2.9%	1.7%	3.1%	5.4%
Cycle	2.6%	5.0%	0.5%	0.6%

Key Inferences:

1 The screen line location SL-3 and SL-4 have highest traffic volume due to the connectivity to a larger share of urban growth which is towards the south west.

2 Two-wheelers constitute the highest share in modal composition at all the screen line locations.

VEHICLE OCCUPANCY SURVEY

Objective: The survey aims to identify and establish the average occupancy of vehicles.

Conduct: Manual survey was carried out on a typical working day for a duration of 16hrs at all identified locations. The captured the occupancy for by vehicle type. I.e. cars, jeeps, vans, buses, trucks, MAVs, LCV's tractors, motorized two wheelers and so on as show in the survey format in Annexure A.

Location: The survey was conducted at five screen line points as shown in Figure and Table.

Analysis: From the table it is observed that bus occupancy varies from 16 to 27 and averages out at 22.4. Average occupancy for cars and two wheelers is found to be 2.9 and 1.5 respectively. The Auto Rickshaw has an average occupancy of 3.1.

Table 11 OCCUPANCY AT SCREEN LINE LOCATIONS

CODE	Direction	Two Wheeler	Car	Auto Rickshaw	Bus	Cycle	Cycle Rickshaw
SL_1	EAST BOUND	**1.45**	**3.3**	**3.0**	**24.0**	**1.1**	**1.5**
	WEST BOUND	**1.43**	**3.4**	**2.8**	**24.0**	**1.1**	**1.2**
SL_2	NORTH BOUND	**1.4**	**2.9**	**3.3**	**15.9**	**1.3**	**1.5**
	SOUTH BOUND	**1.6**	**1.6**	**3.2**	**21.6**	**1**	**1**
SL_3	EAST BOUND	**1.5**	**3.5**	**3.2**	**22.4**	**1.1**	**1.3**
	WEST BOUND	**1.4**	**3.4**	**3.2**	**23.1**	**1.0**	**1.4**
SL_4	NORTH BOUND	**1.3**	**2.3**	**3.0**	**21.7**	**1.0**	**1.7**
	SOUTH BOUND	**1.5**	**3.5**	**3.1**	**26.8**	**1.0**	**1.9**
Overall		**1.5**	**2.9**	**3.1**	**22.4**	**1.0**	**1.3**

Key Inferences:

1. The average occupancy of two wheelers is observed to be 1.5.
2. The average occupancy of 3 seater auto rickshaw was observed to be 2.9, while the average occupancy of shared auto rickshaw (7seater) is observed to be 3.3.
3. Highest two wheeler occupancy was observed at SL_2 along Chirala-Ongole Road, while the highest occupancy of cars, auto rickshaws and buses were observed along Kurnool Road, near Ongole Electricity Office.

TURNING MOVEMENT COUNTS AT INTERSECTIONS

Objectives: The survey aims to in identifying and analysing the seriousness of problem at the intersection, critical movements, etc. and for designing the junction to perform more efficiently.

Conduct: Video traffic counts were carried out on a typical working day for a duration of 16 hours at all locations listed below. At each identified intersection, for all arms 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 slow-moving vehicles as shown in the survey format in Annexure A.

Locations: Four critical intersections were identified as shown in Figure and Table

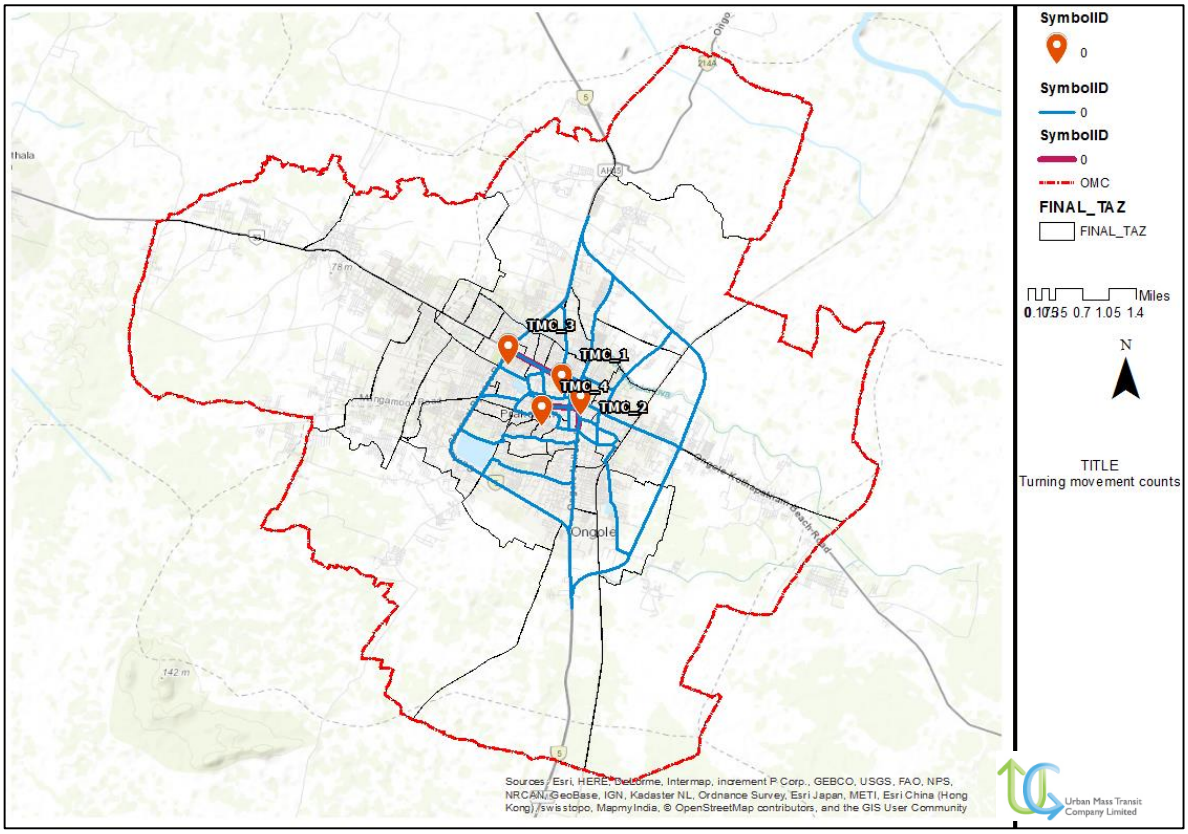


Figure 23: TMC LOCATIONS

Table 12 TMC LOCATIONS

CODE	LOCATION
TMC_1	Addanki Bus Stand Junction
TMC_2	Mastan Dargah Centre
TMC_3	Kolkata-Chennai Highway (NH5) Circle
TMC_4	Jayaram Hall Circle

Analysis: The quantum and temporal variation of total daily traffic, intensity and composition of vehicles and passenger trips moving in the study area are presented in the following sections. Table represents the daily traffic volume at the surveyed intersections.

Table 13 DAILY TRAFFIC VOLUME AT INTERSECTIONS

Code	Location	Total Vehicles	Total PCUs
TMC_1	Addanki Bus Stand Junction	55,254	65,417
TMC_2	Mastan Dargah Centre	76,117	86,305
TMC_3	Kolkata-Chennai Highway (NH5) Circle	1,54,962	1,99,238
TMC_4	Jayaram Hall Circle	56,833	58,582

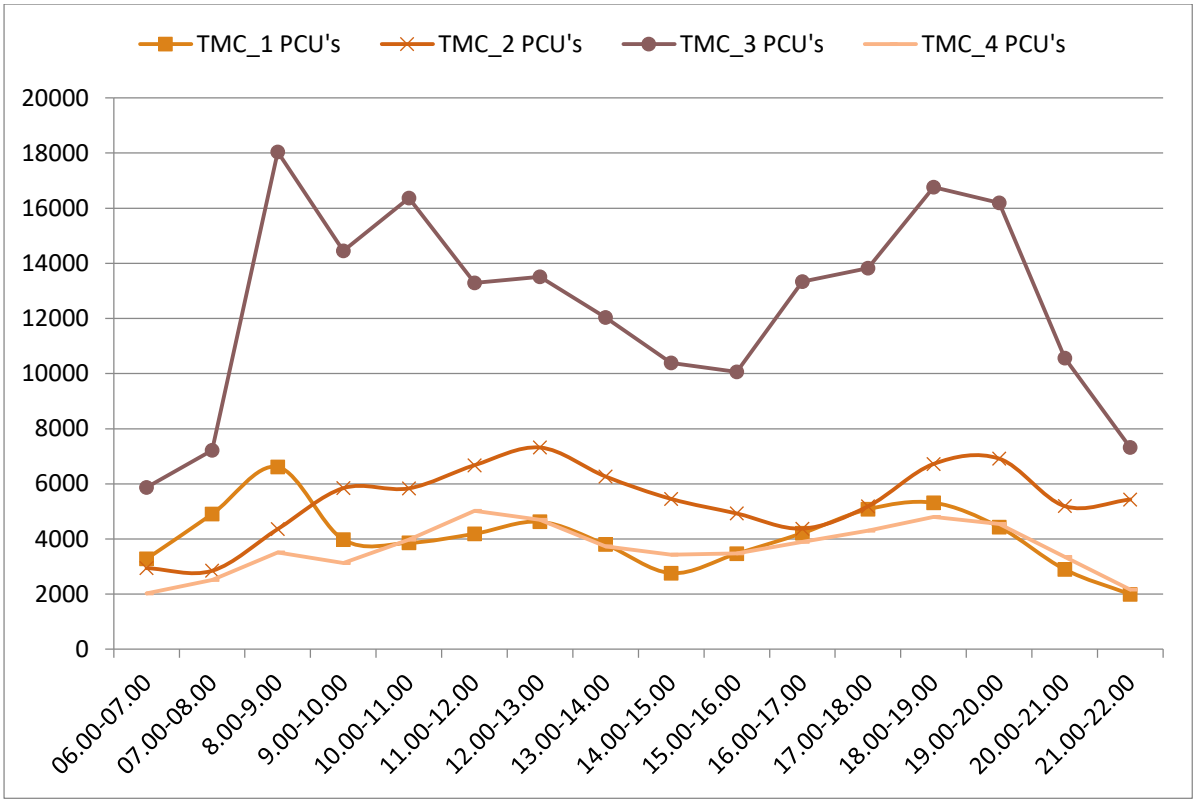


Figure 24 HOURLY VATIATIONS OF DAILY TRAFFIC VOLUMES

Table 14 PEAK HOUR TRAFFIC VOLUMES

Code	Location	Morning Peak	PUCs	PH%	Evening Peak	PUCs	PH%
TMC_1	Addanki Bus Stand Junction	08.00-09.00	6,613	10%	18.00-19.00	5,316	8%
TMC_2	Mastan Dargah Centre	11.30-12.30	7517	9%	19.00-20.00	6917	8%
TMC_3	Kolkata-Chennai Highway (NH5) Circle	08.00-09.00	18038	9%	18.15-19.15	17085	9%
TMC_4	Jayaram Hall Circle	11.15-12.15	5088	9%	18.15-19.15	4964	8%

It is observed that two wheelers constitute the highest accounting to about 47% of the modal share at survey intersections, followed by auto rickshaws with 30%. The modal share for the same are as shown in Figure and Table.

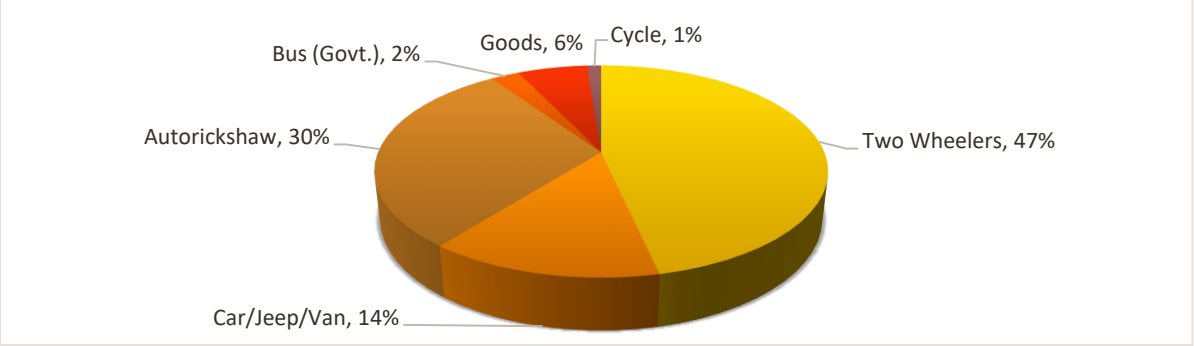


Figure 25: TRAFFIC COMPOSTION AT TMC LOCATIONS

Table 15 LOCATION WISE TRAFFIC COMPOSITION FOR INTERSECTIONS

MODE	TMC_1	TMC_2	TMC_3	TMC_4
Two Wheelers	42.4%	56.6%	35.1%	67.1%
Car/Jeep/Van	11.8%	9.3%	19.0%	9.2%
Auto rickshaw	39.9%	30.0%	29.6%	19.5%
Bus	0.8%	0.7%	4.6%	0.3%
Goods	3.9%	1.4%	10.5%	1.4%
Cycle	0.8%	1.4%	0.9%	2.0%

Key Inferences:

1. Highest traffic volume is observed at Kolkata-Chennai Highway (NH5) Circle due is interaction with the Highway and Chimakurthy Road, connecting important activity nodes of the city.
2. Two wheelers contribute to the higher share of traffic composition in the city, followed by auto rickhsaws.
3. Highest share of two wheelers is observed at Mastan Dargah Centre and the highest share of auto rickshaws are observed at Addanki Bus Stand Junction.

TERMINAL PASSENGER COUNTS AND SURVEY

Objective: The survey aims to evaluate the percentage of people using Bus/Rail transport and to identify the characteristics of travellers.

Conduct: The survey for a period of 16 hours at Bus/Rail Terminals and the travel and traffic characteristics of the intercity & intra city bus travellers are captured along with trip characteristics and details to estimate the rail/bus passengers the existing demand and supply scenarios for the same as shown in the survey formats in Annexure A.

Locations: The surveys were conducted at all the three public transit terminals present in in Ongole.

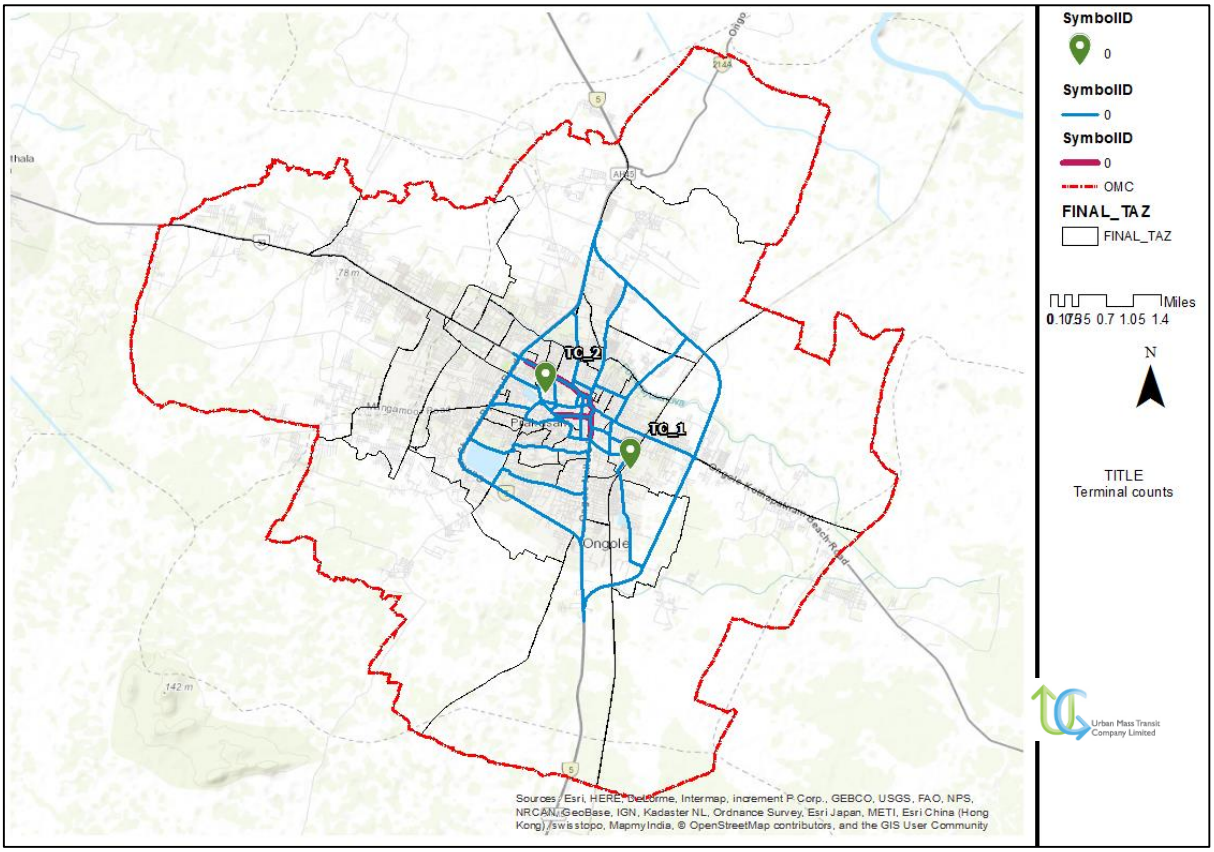


Figure 26 TERMINAL SURVY AND COUNTS LOCATIONS

Table 16 TERMINAL SURVEY AND COUNTS LOCATIONS

CODE	LOCATION
TC_1	Ongole Railway Station
TC_2	Ongole Bus Stand

Analysis: The terminal passenger surveys indicate that Ongole Bus Stand has the highest share of passenger volume accounting up to 75%, followed by Ongole Railway Station. The in and out flow volumes are shown in Table The hourly variations at these terminals are as shown in Figure.

Table 17 TERMINAL PASSESNGER VOLUMES

S. No.	Code	Name of the Terminal	Buses			Passengers			Occupancy	% Share of Overall Passengers
			In	Out	Both	In	Out	Both		
Bus Station										
1	TC_1	Ongole Bus Station	1152	1030	2182	24188	36030	60218	27.6	75%
Railway Station										
2	TC_2	Ongole Railway Station				10069	10340	20409		25%
Grand Total						34257	46370	80627		**100%**

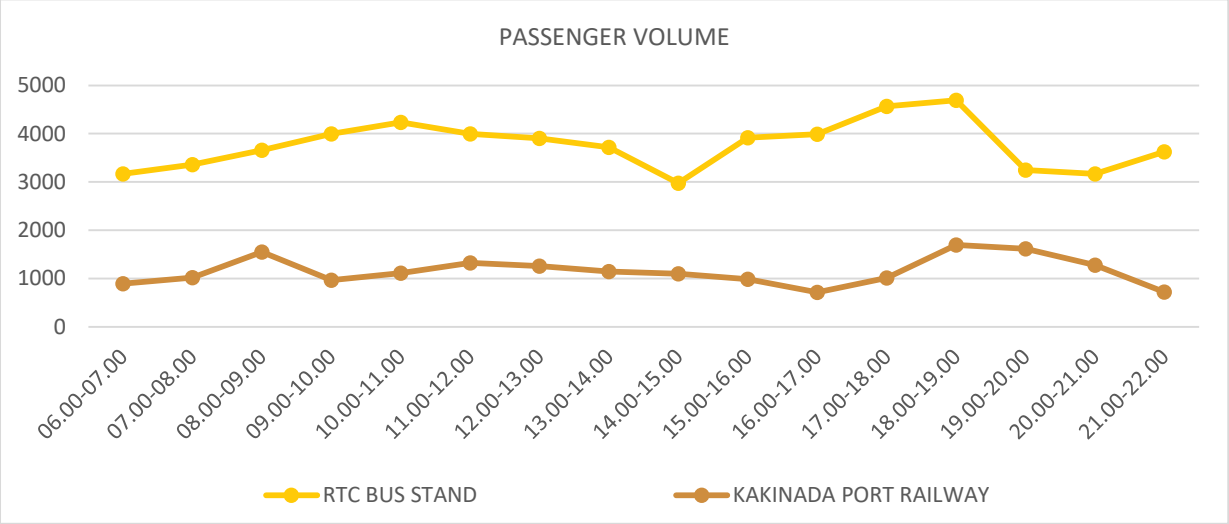


Figure 27 HOURLY VARIATIONS OF PASSENGERS AT TERMINAL LOCATIONS

It is observed that the peak hour for the Bus based transit and rail based transit are towards the evenings. The peak hour volumes are shown in Table

Table 18 PEAK HOUR PASSENGER VOLUMES AT TERMINAL LOCATIONS

S. No.	Code	Name of the Terminal	Peak Hour	Passengers			% Share in Total Volumes		
				In	Out	Both	In	Out	Both
Bus Station									
1	TC_1	Ongole Bus Station	17.30-18.30	2008	2816	4867	8%	8%	8%
Railway Station									
2	TC_2	Ongole Railway Station	18.15-19.15	400	860	1890	4%	9%	10%

The terminal passenger survey analysis was conducted along with the counts to capture the travel characteristics and trip matrices. The interim report discusses the travel characteristic of the same while the trip interactions will be addressed in draft report.

It is observed that majority of the trips are work based trips accounting to 44% of the total trips, which is observed to be justified by tip frequency distribution wherein 65% of the trips are made on daily basis (Table and Table).

Table 19 DISTRIBUTION OF TERMINAL PASSENGER TRIPS BASED ON PURPOSE

PURPOSE	TOTAL	BUS PASSENGERS	RAIL PASSENGERS
Work	44%	49%	40%
Education	25%	10%	38%
Shopping	2%	0%	3%
Social	8%	10%	8%
Religious/Recreation	5%	8%	2%
Health	6%	5%	6%

Home(Return)	5%	10%	1%
Others	4%	8%	2%

Table 20 DISTRIBUTION OF TERMINAL PASSENGER TRIPS BASED ON FREQUENCY

FREQUENCY	TOTAL	BUS PASSENGERS	RAIL PASSENGERS
Daily once(one-way)	45%	23%	62%
Daily twice(up & down)	20%	17%	22%
Daily thrice or more	2%	3%	1%
Weekly	18%	29%	9%
Occasionally	15%	27%	5%

The access and egress modes of the terminal passengers were analysed and it was observed that bus is used as the major mode of last mile connectivity by the terminal passengers. The mode wise distribution of dispersal mode is as show in the Table and Figure

Table 21 MODE WISE DISPERASL OF TERMINAL PASSENGERS

DISPERSAL MODE	TOTAL	BUS PASSENGERS	RAIL PASSENGERS
2-wheeler	38%	36%	40%
Car/Jeep/Van	4%	3%	4%
Auto Rickshaw	37%	16%	13%
Bus	15%	39%	36%
Walk	6%	6%	7%

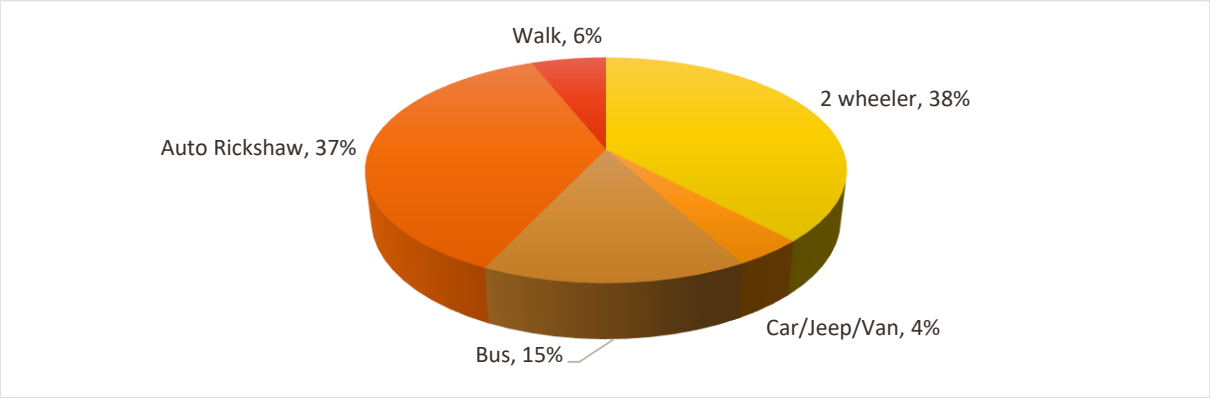


Figure 28: DISTRIBUTION OF DISPERSAL MODES OF TERMINAL PASSENGERS

It is observed that the average access and dispersal time of terminal passengers is observed to be around 12 minutes and the average distance accounts to about 12kms, due it passengers traveling from the sub-urban areas. It is observed that bus is used as a prominent mode to access the terminals by passengers travelling from the surrounding villages. While auto rickshaws are widely used by passengers in the city due to its availability and fare as in case of shared auto rickshaws. The Figure and Table represent the access and egress trip characteristics in terms of distance, time and costs.

Table 22 MODE WISE TERMINAL PASSENGER ACCESS AND EGRESS TRIP CHARACTERISTICES

ACCESS/EGRESS MODE	AVERAGE TIME	AVERAGE DISTANCE	AVERAGE COST
2-wheeler	12.40	5.79	13.27
Car/Jeep/Van	20.78	7.41	19.69
Auto Rickshaw	14.91	5.40	11.74
Bus	34.37	8.80	35.82
Cycle	5.00	2.60	0.00
Walk	8.08	2.71	0.00

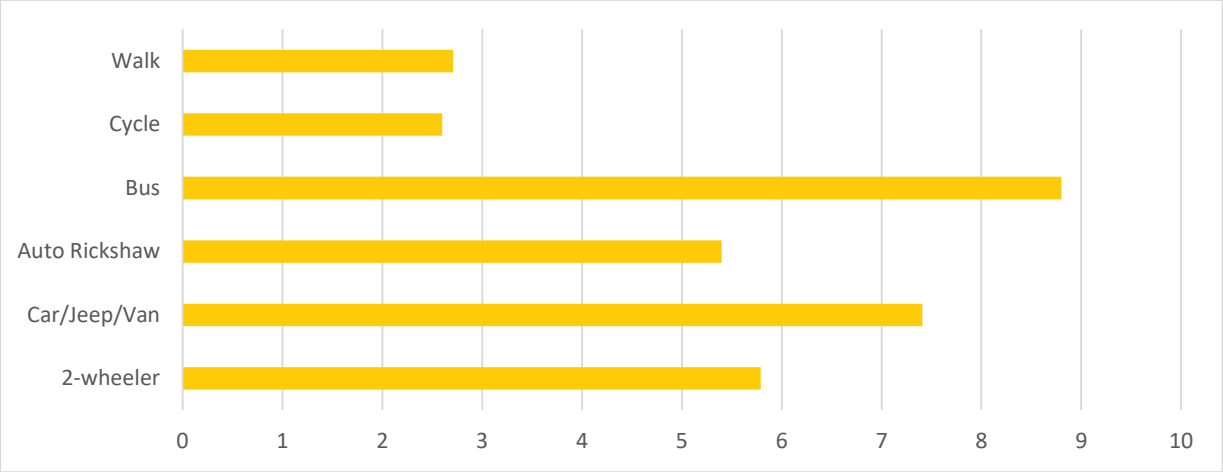


Figure 29: 7MODE WISE AVERAGE DISTANCE OF TERMINL PASSENGER ACCESS AND EGRESS

Key Inferences:

1. The passenger volume at bus terminals is observed to be higher when compared to the rail terminal. This is due to availability of buses at higher frequency compared to the trains. Thus, indicating that bus is the major mode of travel for external connectivity.

BOARDING AND ALIGHTING PASSENGERS COUNT AT BUS STOPS:

Objective: To evaluate the number of people using Public Transport for their daily travel in the city and to identify the characteristics of travellers.

Conduct: The survey aims to capture the quantum of boarding and alighting at the identified bus stops for a period of 16 hours.

Locations: The survey was conducted in the following 5 bus stop locations as shown in Table and Figure

Table 23 BOARDING AND ALIGHTING SURVEY LOCATIONS

CODE	LOCATION
BS_1	Bus Stand Center, Trunk Road
BS_2	Kothapatanam Bus Stop
BS_3	Adanki Bus Stop

BS_4	Pranga Rayadu Cheruvu Bus Sop
BS_5	Bandla Mitla Center Bus Stop

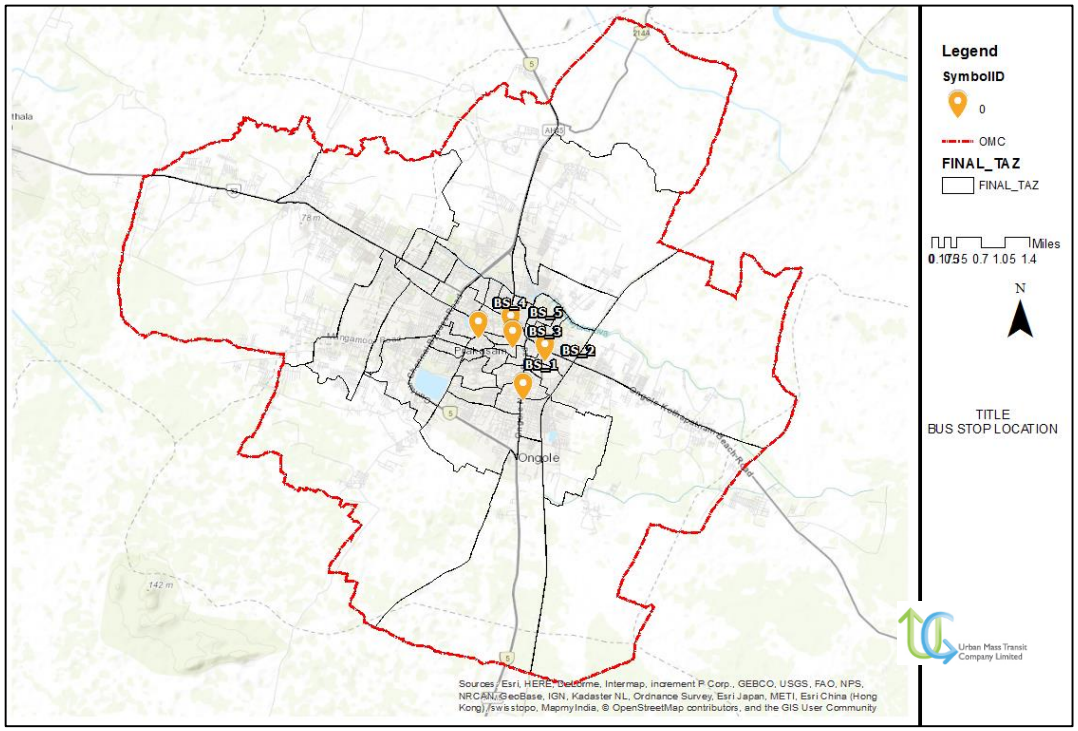


Figure 30: Boarding and Alighting Surveys

Analysis: The results boarding and alighting survey indicates that Bus Stand Center Bus Stop has the highest number of passengers boarding and alighting amongst all the surveyed locations. The highest number of boarding are observed at BusStand center, Adanki and Kothapatnam bus stop and alighting at DKW College Bus Stop. The following Table represents the location wise boarding and alighting at surveyed locations.

Table 24 BOARDINGS AND ALIGHTINGS AT SURVEYED LOCATIONS

CODE	LOCATIONS	PB	PA	Total PB+PA	Average Dwell Time (min)
BS_1	Bus stand centre trunk road	632	603	1235	1.4
BS_2	Kothapatnam bus stand	547	530	1077	1.1
BS_3	Adanki bus stand	349	325	674	1.1
BS_4	DKW College Bus Stop	76	126	202	1.2
BS_5	Pranga Rayudu Cheruvu bus stop	78	83	161	1.3
Total		1650	665	2315	1.2

Table 25 MODE WISE BOARDINGS AND ALIGHTINGS

Mode	PB	PA	Total PB+PA	PB	PA	Dwell Time (min)	Sitting	Stan - ding	% Share in Overall PB	% Share in Overall PA	% Share in Overall Total

											PB+PA
Intercity Bus	1543	1476	3019	51%	49%	1.26	34.3	0.7	92%	89%	90%
Auto 7 seater	139	191	330	42%	58%	1.31	3	0	8%	11%	10%
All Modes	1682	1667	3349	50%	50%	1.28	18.85	0.34	100%	100%	100%

The major mode of public transport in the city is through sub-urban bus services and auto-rickshaws.. The survey captured the boarding and alighting's of auto-rickshaw observed in the above table constitutes the auto-rickshaws stopping at bus stops to pick up the transit passengers. The Table represents the mode wise boarding and alighting details at surveyed locations.

Key Inferences:

1. Bus stand center is observed to have higher footfalls with respect to the boarding and alighting.
2. The sub-urban bus services are provide the inter-city and intra city services in Ongole.

STATED PREFERENCE SURVEY:

Objective: The survey aims to evaluate the preferences of commuters and to identify their travel characteristics.

Conduct: The survey was conducted for a period of 16 hours through manual interviews wherein the user trip characteristics, deals and their preferences in regard to the public transit were collected as shown in the survey format in the Annexure A.

Locations: The survey was conducted at workplaces, through roadside interviews at above identified 4 TMC locations as discussed in Section 3.8. (Figure and Table).

Analysis: The stated preference data represented a reasonable share of sample form all the modes and was observed to be in ordinance with the vehicular share observed through turn movement counts conducted to the junctions (Figure and Figure).

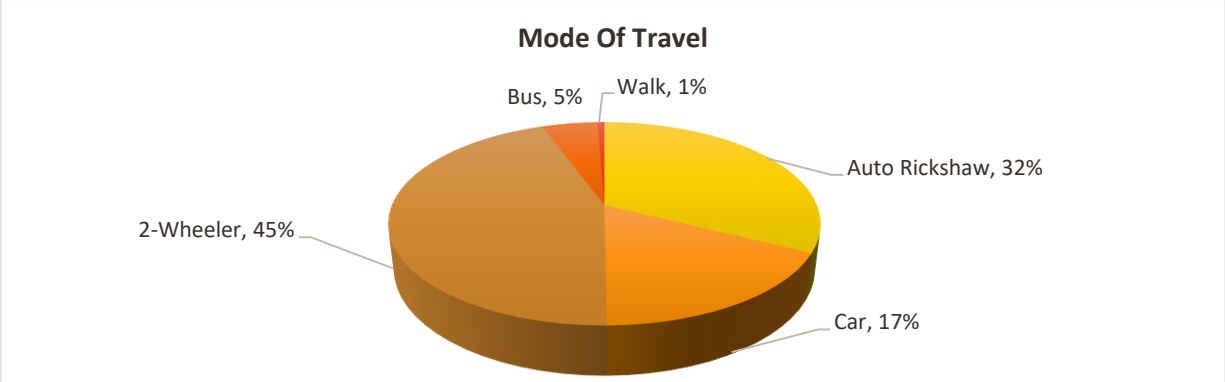


Figure 31: MODE OF TRAVEL OF SP RESPONDEES

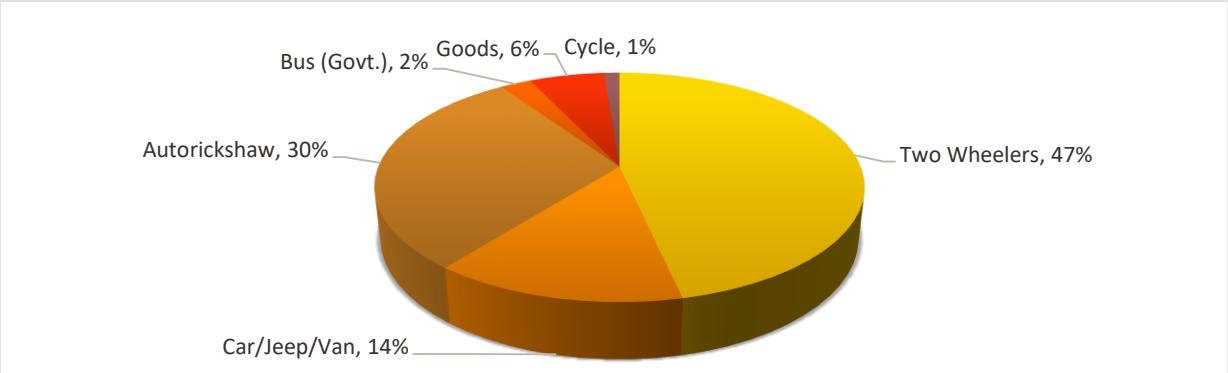


Figure 32: VEHICULAR SHARE AT TMC LOCATIONS

It is observed that 23% of the users are willing to use a new and improved public transport facilities with a waiting time of 10 minutes and below and reduction in travel time and cost over 25% of the their existing modes. The Table details out the results of users preferences.

Table 26 WILLINGNESS TO USE NEW AND IPMROVED PUBLIC TRANSIT SERVICES

Code	Choice	SP: OP1	SP: OP2	SP: OP3	SP: OP4	SP: OP5	SP: OP6	SP: OP7	SP: OP8	All SP
1	Definitely Existing	1%	1%	3%	12%	1%	1%	1%	96%	14%
2	Probably Existing	1%	21%	62%	71%	1%	32%	74%	1%	33%
3	Can't Say	5%	60%	28%	13%	56%	57%	21%	1%	30%
4	Probably Improved PT System	80%	17%	7%	4%	35%	10%	3%	1%	20%
5	Definitely Improved System	14%	2%	1%	1%	8%	1%	1%	1%	3%
Total		100%	100%	100%	100%	100%	100%	100%	100%	100.0%

Key Inferences:

1. Over 25% reduction in travel time and cost is preferred to use a new and improved public transit system.
2. The waiting time is observed to be negotiated over the cost as in case of Ongole.

IPT COMMUTER SURVEY:

Objective: The survey aims to evaluate the travel characteristics of people using Intermediate Public Transport for their daily travel in the study area.

Conduct: The survey is conducted for a duration of 16 hours through interviews at major IPT Stops capturing the commuter trip details as show in the survey format in Annexure A.

Location: The survey is conducted at across the 5 TMC locations (Figure and Table.) which were observed to be the major IPT catchments nodes in Ongole.

Analysis: It is observed that majority of the IPT trips were work based trips followed by educational trips (Figure). The average distances commuted by the surveyed passenger's trip purposes are as shown in 3.12.2. It is observed that, for the surveyed passengers the average distance of work trips is about 6km and about 3.3km for educational and social trips and about 6.4 km for the remaining trips.

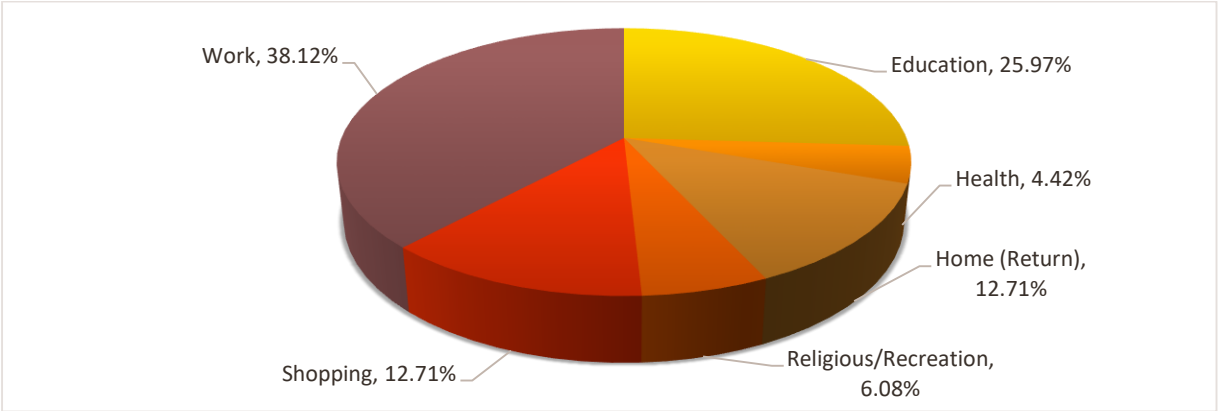


Figure 33 DISTRIBUTION IPT COMMUTER TRIPS BASED ON TRIP PURPOSE[9]

[9] Distribution based on survey passengers, this share will later be computed with the household survey data to extract the overall travel characteristics.

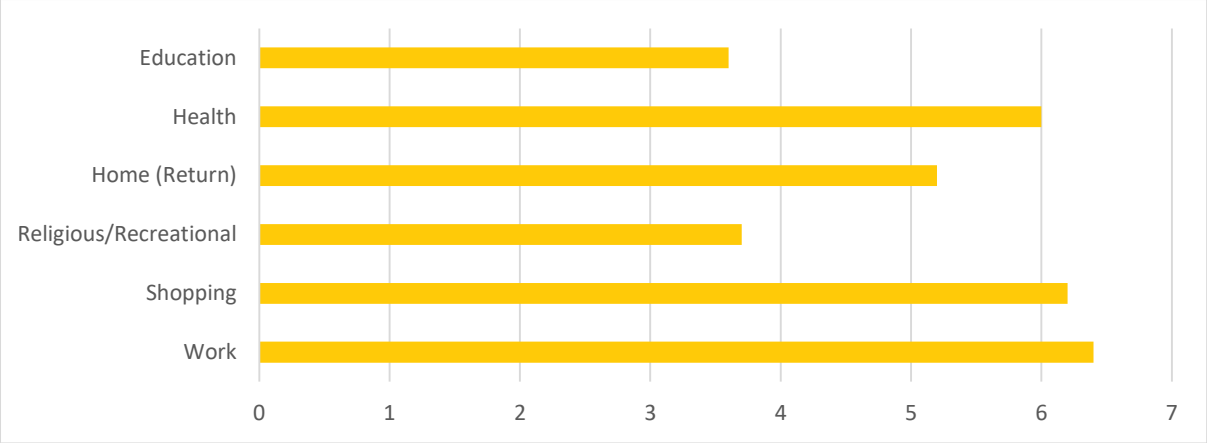


Figure 34: TRIP PURPOSE BASED AVERAGE TRIP DISTANCES [2]

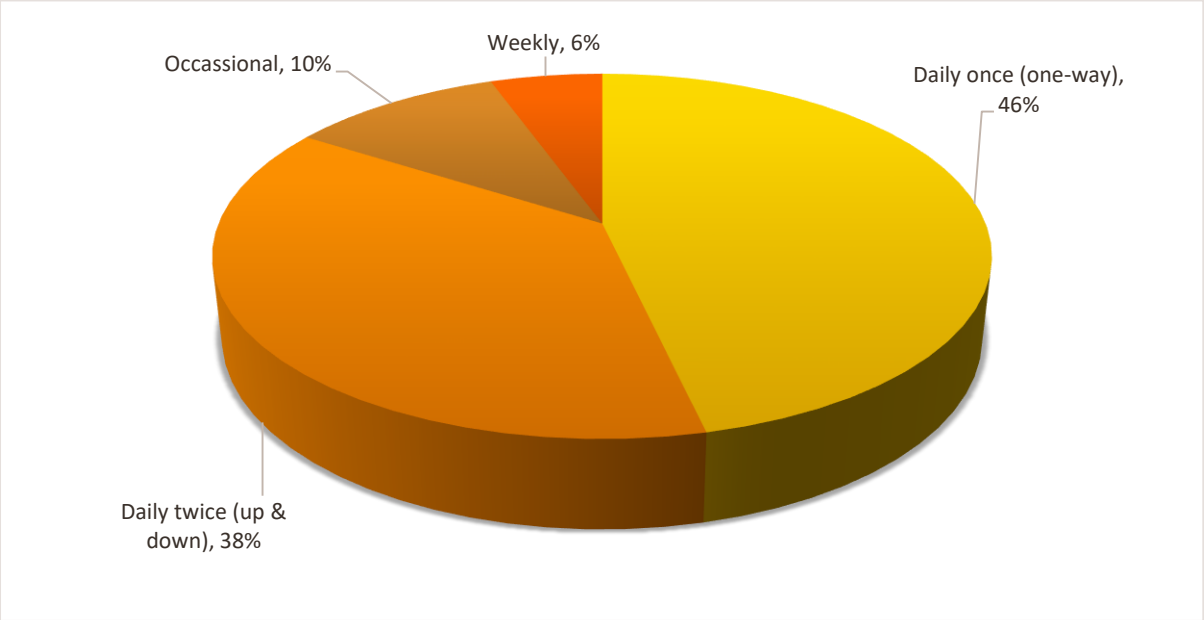


Figure 35: DISTRIBUTION IPT COMMUTER TRIPS BASED ON TRIP FREQURNCEY[10]

[10] Distribution based on survey passengers, this share will later be computed with the household survey data to extract the overall travel characteristics.

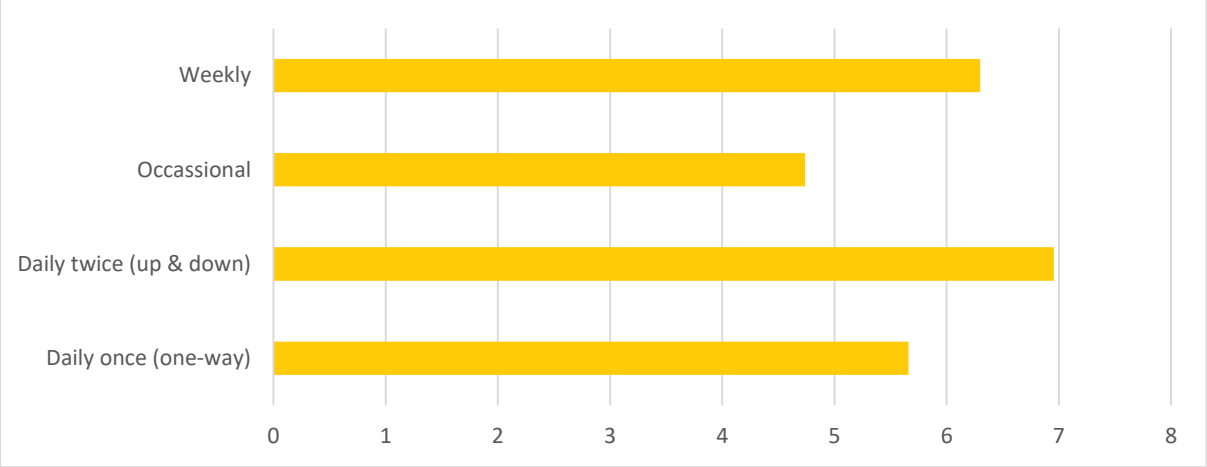


Figure 36: TRIP FREQUENCY BASED AVERAGE TRIP DISTANCES [3]

About 86% of the surveyed IPT passenger trips were observed to be daily trips followed by occasional trip accounting to 10% of the total trips (Figure). The average trip distance of daily trips is about 6.3km owing to the interaction between Ongole and it's immediate out growths, while the occasional users is about 4.7km. Thus, the work based daily trips are made within a distance of 6.7kms. The Figure shows average trip lengths of survey passengers' base on the trip frequency.

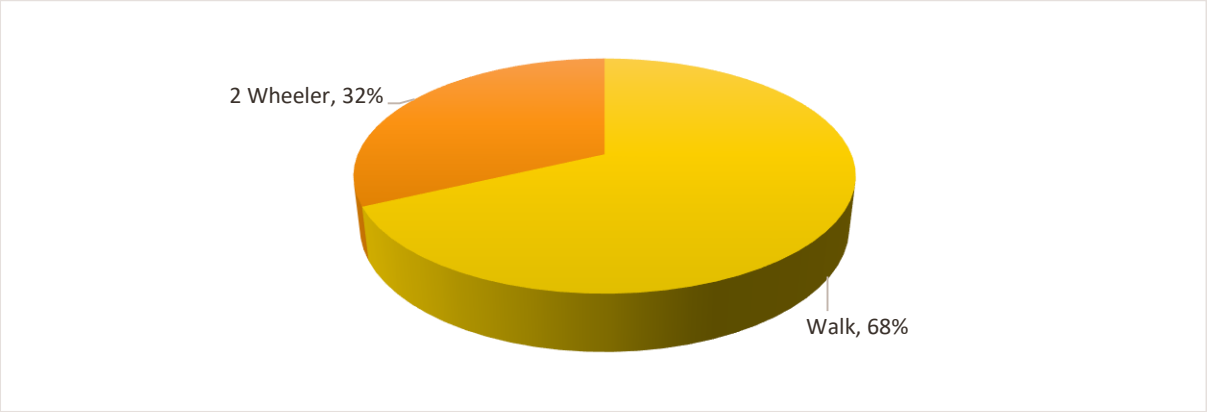


Figure 37: MODE WISE DISTRIBUTION OF ACCESS AND EGRESS TRIPS

In case of Ongole, it is observed that walk is the major mode for last mile connectivity. The modal distribution of IPT users access and egress trips are as shown in Figure. From the share it is visible that auto rickshaws provide end to end connectivity. The last mile walk trips for the surveyed IPT users constitute about 68% of the total trips. The trip characteristics of surveyed IPT passengers.

Table 27 IPT COMMUTER ACCESS AND EGRESS TRIPS TRAVEL CHARACTERISTICES

ACCESS/ EGRESS MODE	AVERAGE TIME TIME (MIN)
Two-wheeler	3.2
Walk	11.4

Key Inferences:

1 38% of the IPT commuter trips are work based trips, followed by educational trips.

2 The work based daily trips are made within a distance of 6.3km indicating interactions between Ongole and its immediate out growths.

3 Shared auto-rickshaws are observed to provide end to end connectivity ply on all major routes.

4 The average travel time for last mile trips is about 8.5 minutes.

5 The average distances of last mile walk trips of IPT commuters is about 2.3km.

PEDESTRIAN COUNT SURVEYS

Objective: The objective of the survey is to quantify the extent of pedestrian movement in order to design facilities for such movement

Conduct: The survey is conducted for a period of 16 hours on important locations where heavy pedestrian movement was observed during the reconnaissance survey.

Locations : The following 4 locations were identified for the same (Table and Figure).

Table 28 PEDESTRIAN COUNT LOCATIONS

CODE	LOCATION
TMC_1	Addanki Bus Stand Junction
TMC_2	Mastan Dargah Centre
TMC_3	Kolkata-Chennai Highway (NH5) Circle
TMC_4	Jayaram Hall Circle

Analysis: It is observed that Kolkata-Chennai Highway Circle has the highest volume of footfall due to its strategic location connecting various government organisations, healthcare and commercial centres. The pedestrian daily volumes and peak hour volumes are as shown in Table and the hourly variations in daily volumes is shown in figure.

Table 29 PEDESTRIAN VOLUMES

CODE	LOCATION	Daily Volume (Along+Across)	Peak Hour	Peak Hour Volume (Along+Across)
TMC_1	Addanki Bus Stand Junction	23536	9.45-10.45	1790
TMC_2	Mastan Dargah Centre	21157	10.00-11.00	1615
TMC_3	Kolkata-Chennai Highway (NH5) Circle	37400	9.00-10.00	4086
TMC_4	Jayaram Hall Circle	5773	06.00-07.00	482

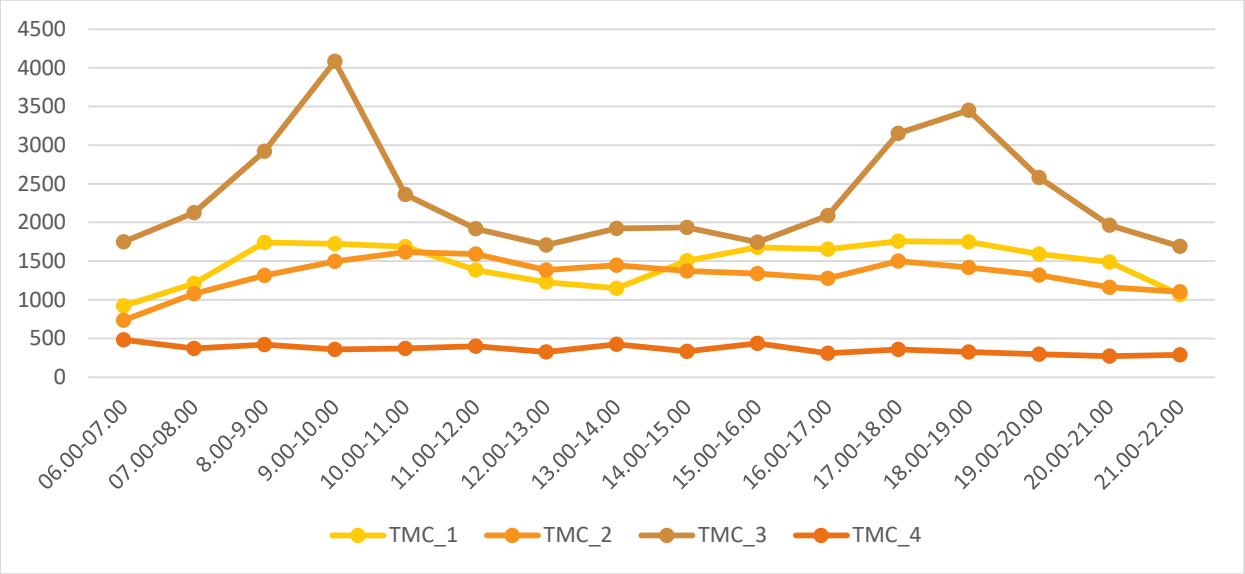


Figure 38: HOURLY VARIATIONS IN PEDESTRAIN VOLUMES

The degree of conflict between the pedestrians and the vehicles is analyzed and it is observed that Kolkata-Chennai Highway Circle requires immediate attention for pedestrian crossing infrastructure facilities followed by Addanki Bus Stand Junction. Table exhibits the values for the PV square analysis.

Table 30 PV SQUARE ANALYSIS VALUES

CODE	LOCATION	PV Square/10^8 Value
TMC_1	Addanki Bus Stand Junction	68.43
TMC_2	Mastan Dargah Centre	1.92
TMC_3	Kolkata-Chennai Highway (NH5) Circle	179.60
TMC_4	Jayaram Hall Circle	1.41

Key Inferences:

1. Kolkata-Chennai Highway Circle is observed to have highest footfall amongst all the surveyed locations.
2. The morning peak hour for the pedestrian is observed between 9am to 10am and evening peak between 6pm to 7pm.
3. It is analysed that Kolkata-Chennai Highway Circle requires immediate attention in terms of pedestrian crossing infrastructure facilities to improve the pedestrian safety.

GOODS OPERATOR SURVEYS

Objective: The survey aims to evaluate the travel patterns of goods vehicles in the study area.

Conduct: The study is conducted at major good focal points through manual interviews capturing the goods vehicle trip characteristics as show in the survey format in Annexure A.

Locations : The survey was conducted in the following three locations as shown in Figure and Table

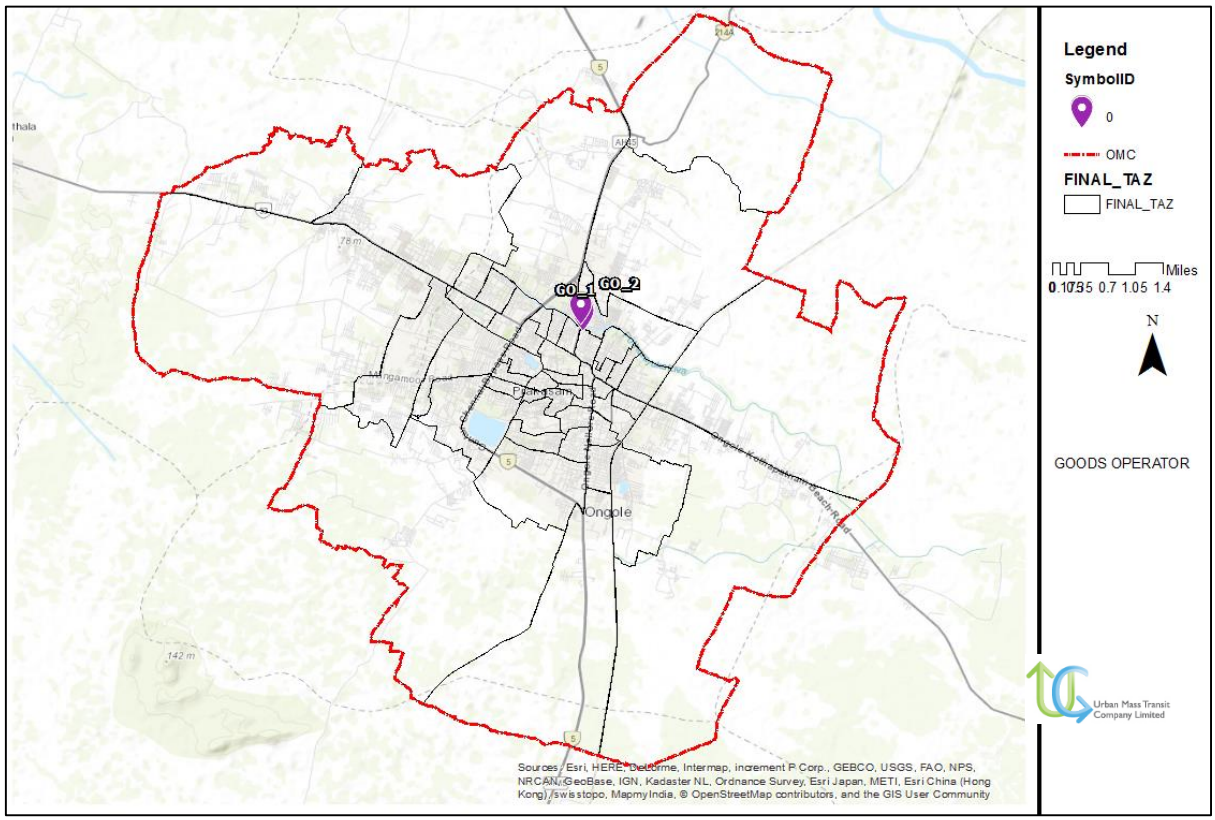


Figure 39: GOODS OPERATOR SURVEY LOCATIONS

Table 31 GOODS OPERATOR SURVEY LOCATIONS

CODE	LOCATION
GO_1	Near Vrl Logistics, Trunk Road
GO_2	ear Vijaya Lakshmi Traders, Chirala ongole Road

Analysis: It is observed that majority (65%) of the trips are weekly trips, largely carrying food grains and consumer goods travelling and an average distance of 205km. The trip frequencies of goods vehicles captured through Goods Operator Survey is as shown in Figure

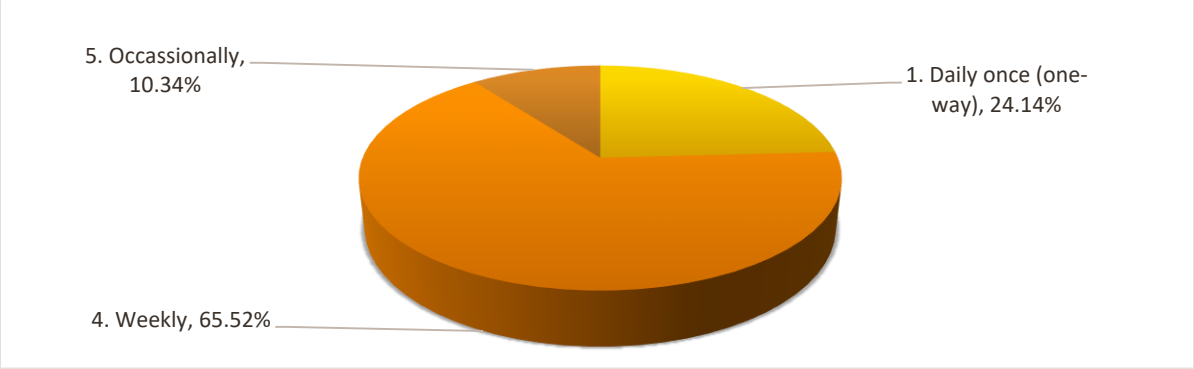


Figure 40: TRIP FREQUENCIES OF GOODS VEHICLES

The list of major routes used by goods operators are shown in Table

Table 32 FREQUENT ROUTES OPERATED FOR GOODS VEHICLES IN THE CITY

S.NO.	GOODS VEHICLE ROUTES
1	CHENNAI TO VIJAYAWADA
2	GULLAPALLI TO NELLORE
3	GULLAPALLI TO ONGOLE
4	GUNTUR TO NELLORE
5	GUNTUR TO RAM NAGAR
6	MANGALAGIRI TO ONGOLE
7	NANDYALA TO ONGOLE
8	NELLORE TO CHIRALA
9	NELLORE TO KAVALI
10	ONGOLE TO BABBATTLA
11	ONGOLE TO CHIRALA
12	ONGOLE TO GUNTUR
13	ONGOLE TO KURNOOL
14	ONGOLE TO MAHAPURAM
15	ONGOLE TO NELLORE
16	ONGOLE TO VIJAYAWADA
17	TIRUPATI TO ONGOLE
18	VIJAYAWADA TO NELLORE
19	VIJAYAWADA TO ONGOLE

The survey indicates that 56% of the goods operates do not own designated parking areas. It was observed 47% of the operators own vehicle parking area below 100sqft, while 53% of the operators own vehicle parking area over 100sqft. The nature of parking facilities employed by 53% of the surveyed

operators is on-street parking. It was stated that the average unloading time with the city is about 3 hours. The average number of goods trips per month in 31. The nature and share of commodity type are as shown in Table

Table 33 NATURE OF COMMODITIES

COMMODITY	SHARE
Chemicals&Fertilizers	6.6%
ConsumerGoods	10.0%
Empty	10.0%
FoodGrains(Rice/Wheat/Jowaretc)	20.0%
ForestProducts(Wood/Rubberetc)	3.3%
IndustrialGoods(Alloy/Machineetc)	16.6%
IronCoils/Sheets	6.6%
Others(Paper/Plastic/CableWireetc)	10.0%
Sand/Brick/Cement/Steel/Aggregate	3.3%
Textiles	6.6%
Vegetable/Fruit/Milk/Fish	6.6%

Key Inferences:

1. The majority of the trips observed are weekly trips commuting an average distance of 250km.
2. 53% of the operation are engaged in on-street parking of vehicles adjoin their plots.
3. The average unloading time within the city is observed to 3 hours.
4. Food grains contribute to the highest share (20%) in commodity type, followed by consumer goods.
5. The average number of trips made by the goods vehicle is observed to be 10 trips per month.

HOUSEHOLD INTERVIEW SURVEYS

Objective: The house hold survey aims to capture the data which is used for describing the travel patterns in the city and travel preferences of its residents.

Conduct: Collection of data on socio-economic characteristics, household members and their travel diary of study area residents was carried out by manual interview within the delineated traffic analysis zones. Details relating to Socio-economics, Household member characteristics, and travel diary of each individual member of the household was captured as shown in survey format in Annexure A.

Samples: A total cleaned sample set comprises of 2% of the total households in Ongole.

Analysis: The household survey data has been analysed under the following sections**,**

SOCIO-ECONOMIC CHARACTERISTICES

DEMOGRAPHIC DISTRIBUTION

The age wise distribution of population based on the house hold data is as shown in Table. It observed that, Ongole has a good share of younger population aged below 35. The working age group contribute to about 69% of the total population. The age-sex pyramid is as shown in Figure. The share of females is higher in age groups between 25 years to 45 years. The sex ratio derived from the house hold survey is 949 women for 1000 men. It is observed that ratio between the male and females across all the age groups is well distributed.

Table 34: AGE WISE DISTRIBUTION OF POPULATION

Code	Age	All	Male	Female
1	0-5	7%	7%	7%
2	5-17	18%	19%	17%
3	18-24	15%	13%	17%
4	25-34	21%	19%	23%
5	35-44	19%	19%	19%
6	45-58	14%	15%	13%
7	59-64	3%	3%	2%
8	65-74	2%	2%	2%
9	>75	1%	1%	1%

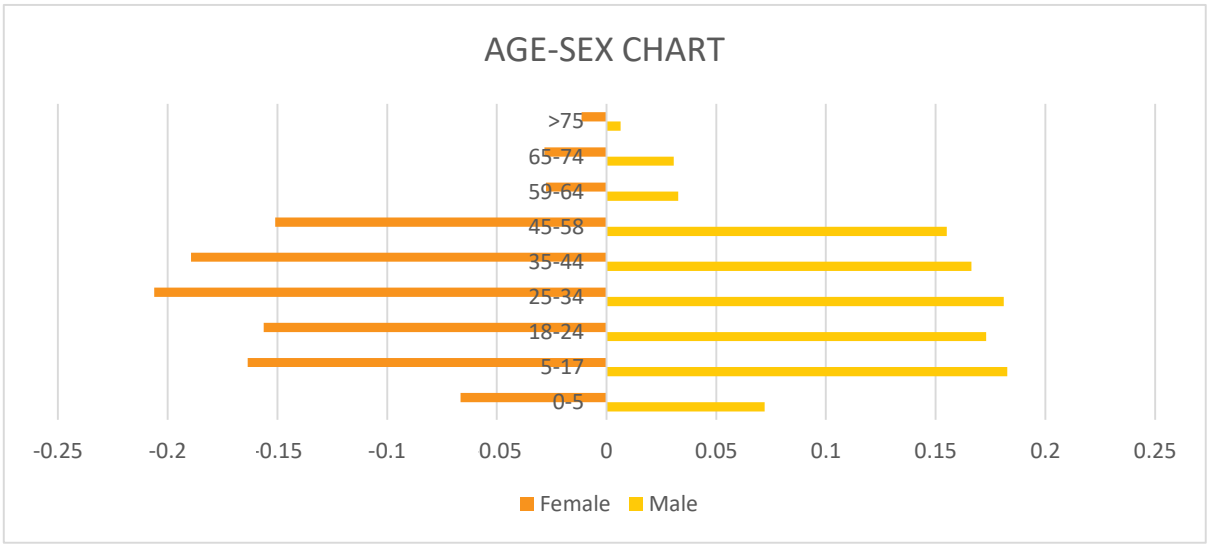


Figure 41 AGE-SEX PYRAMID

SOCIO ECONOMIC DISTRIBUTION

This section deals with the general socio-economic characteristics of the surveyed population. The distribution based on educational qualification is as shown in Figure. Similarly, the distribution based on occupational status and employment sector are shown below in Figures. It is observed that 38% of the population are students, 51% are employed in various sectors as shown in Figure and remaining share of population constitute retired, home-makers and unemployed members. The classification based on employment sector indicates that the highest share comprises the educational sector with 39% followed by service sector with a share of 18%. The manufacturing sector contributes to 5% while informal sector contributes about 1% and agricultural sector about 7%. This, service and educational sectors are the major sectors of employment in the city. The average number of students per household is observed to be 2.

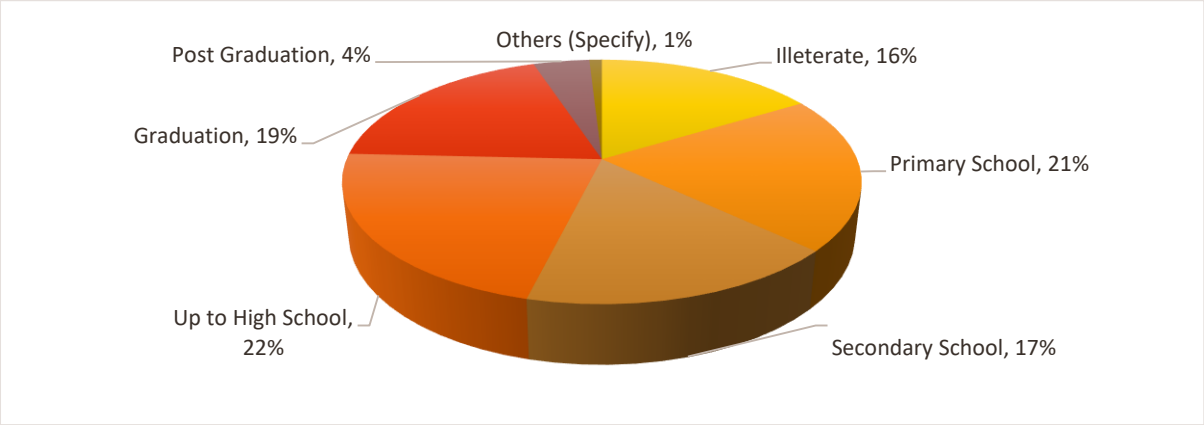


Figure 42: DISTRIBUTION BASED ON EDUCATIONAL QUALIFICATION

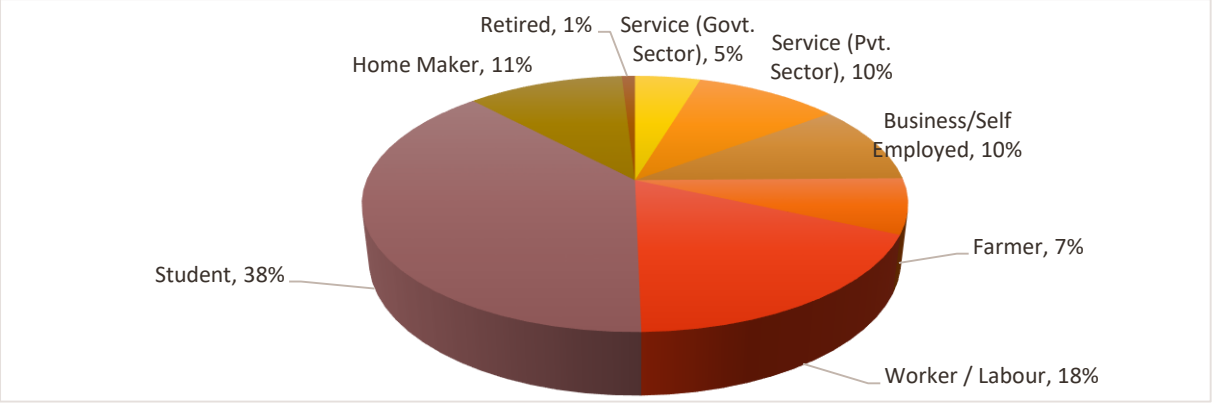


Figure 43 DISTRIBUTION BASED ON OCCUPATIONAL STATUS

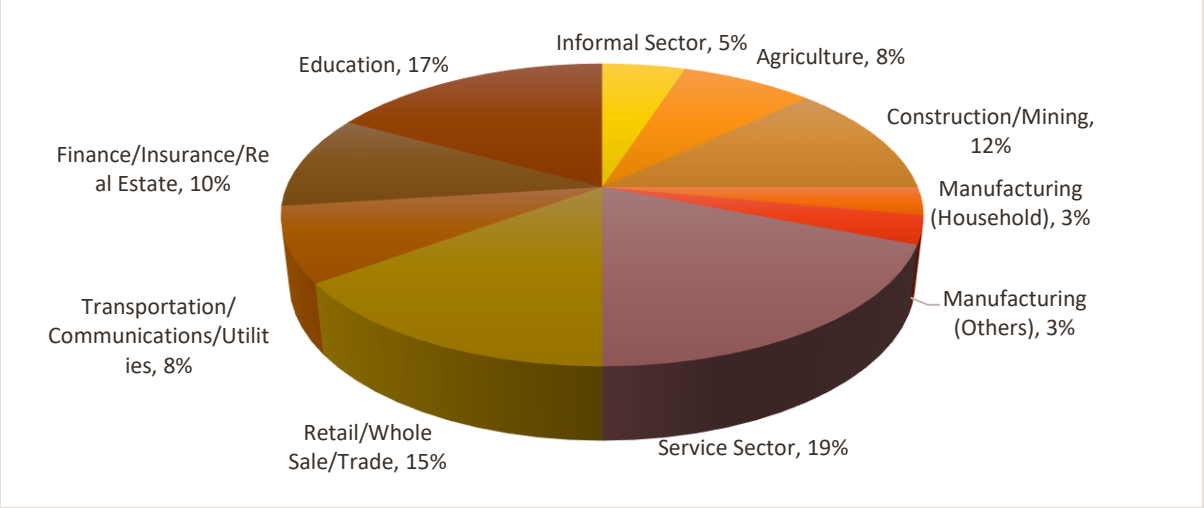


Figure 44 DISTRIBUTION BASED ON EMPLOYMENT SECTOR

The average monthly income as per the Household survey in Ongole is about INR 13,923. The distribution of households based on monthly income is as show in Table. About 27% of households have monthly income below INR 10,000 and 30% of the households earn more than INR 15,000 per month. The average number of earning members per house hold was observed to be 1 (Approx. 1.2). It was also observed that 83% of the households owning a vehicle own two wheelers while only 6% of the households own cars. The distribution is as shown in figure

Table 35 DISTRIBUTION BASED ON AVERAGE MONTHLY INCOME

Code	Category	Monthly HH Income	% Distribution	Avg. Monthly HH Income (INR)
1	EWS	<5000	7%	3305
2	LIG	5001-10000	19%	8856
3	MIG	10001-15000	43%	13419
4	HIG	>15000	30%	24114
Total			100%	**13923**

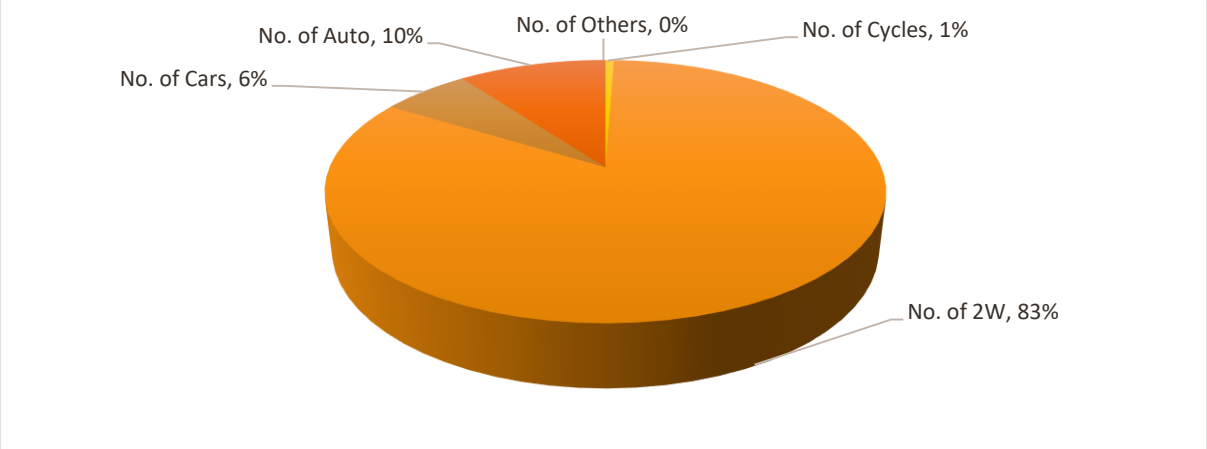


Figure 45 VEHICLE OWNERSHIP COMPOSITION

The classification based on the category of vehicles owned indicates that 68% of the households own only two wheelers, while only 4.5% of the households own only cars. 18% of the households do not any cycles while only 0.5% of the population own only cycles. The detailed classification is as shown in Figure

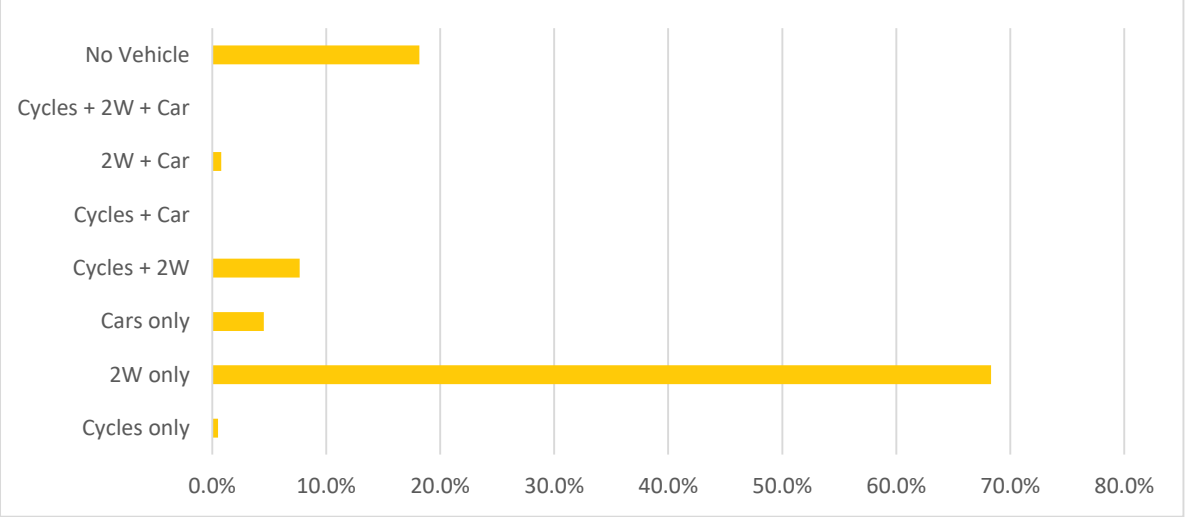


Figure 46 DISTRUTUBION HOUSEHOLDS BASED ON VEHICLE OWNERSHIP

It is observed that only 61.7% of the households have parking spaces available within their building or property premises. The remaining share of households utilize the space around the properties in the form of On-Street Parking.

Table 36 PARKING AVAILABILITY WITHINTHE PROPERTY PREMISES

Code	Parking Availability	% Dist.
1	**Yes**	61.7%
2	**No**	38.3%
Total		**100%**

Table 37 DISTANCE BASED DISTRIBUTION OF HOUSEHOLDS TO DAILY NEEDS

Code	Distance to Daily needs	To Shop	Educational Needs	Medical Needs
		% Dist	% Dist	% Dist
1	<250	56%	17%	19%
2	251 to 500	27%	31%	19%
3	501 to 750	5%	9%	25%
4	751 to 1000	8%	17%	7%
5	1001 to 1500	0%	10%	1%
6	>1500	4%	16%	29%
	Total	**100%**	**100%**	**100%**

It is observed that 83% of the households travel below 500m to access their daily household errands. 57% of the household travel up to 1km for their educational needs and the medical needs are majorly accessed over a distance of 1.5km. Thus, it id observed the longer trips are made for educational and medical needs. The detailed analysis on the trip purposes and travel distances is discussed in following Section 3.15.2.

TRAVEL CHARACTERISTICS

Based on the travel diary information collected as a part of the household survey, the Per Capita Trip Rate (PCTR) for Ongole was observed to be 1.24 including the walk trips and 1.04 excluding the walk trips. The PCTR for motorised trips is about 1.01. The distribution of trips based on the major mode of travel is as shown in Figure. The major modes of travel in Ongole are observed to be auto two wheelers, walk and auto rickshwas with a modal share of 41%, 15% and 13% respectively. The share of bus based public transport accounts to 23%. The Non-Motorised Transport comprises about 18.5% including 15% of walk trips. Thus, clearly indicating that two wheelers are the major mode of travel.

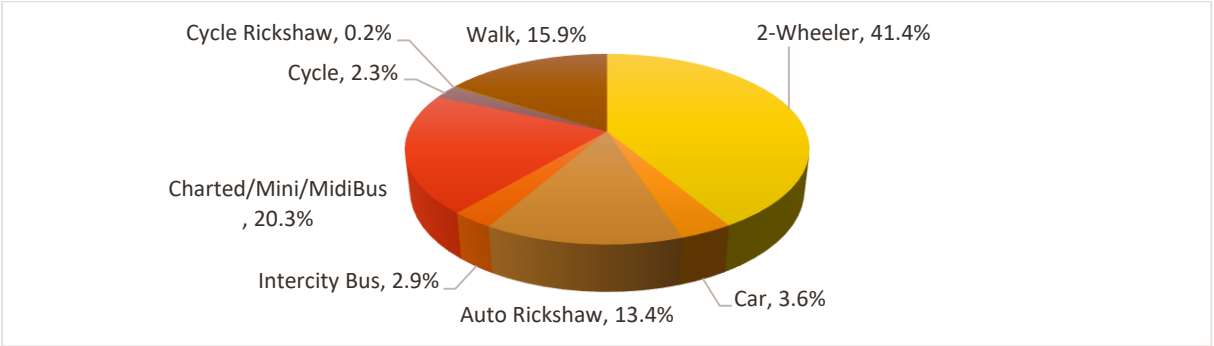


Figure 47 MODE SHARE

Table 38 AVERAGE TIME

Code	Mode	Avg. WT (Mins)
1	Public Bus	6.5
2	Auto Rickshaw	6.1
3	Cycle Rickshaw	5.0
Total		**5.9**

The average waiting time to access the public transport services is 5.9 minutes. The longest waiting time is observed for buses with a wait time of 6.5 minutes. The average wait times of all the public transport modes are shown in Table. The average trip length in Ongole is observed to be 4.6 including the walk trips and 5.1 excluding the walk trips. The mode wise trip length are as shown in Figure. The mode wise and distance based classification of trips are shown in Figure

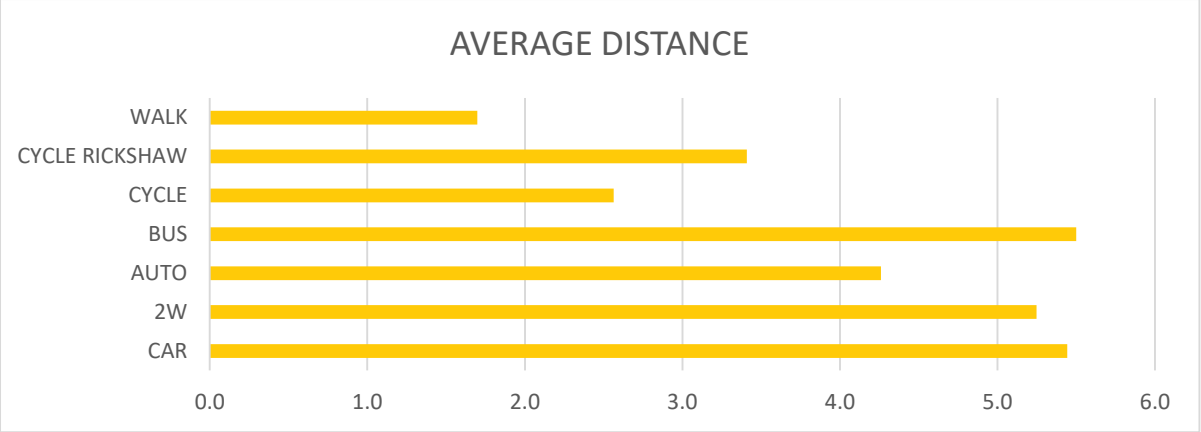


Figure 48: MODE WISE TRIP LENGHTS

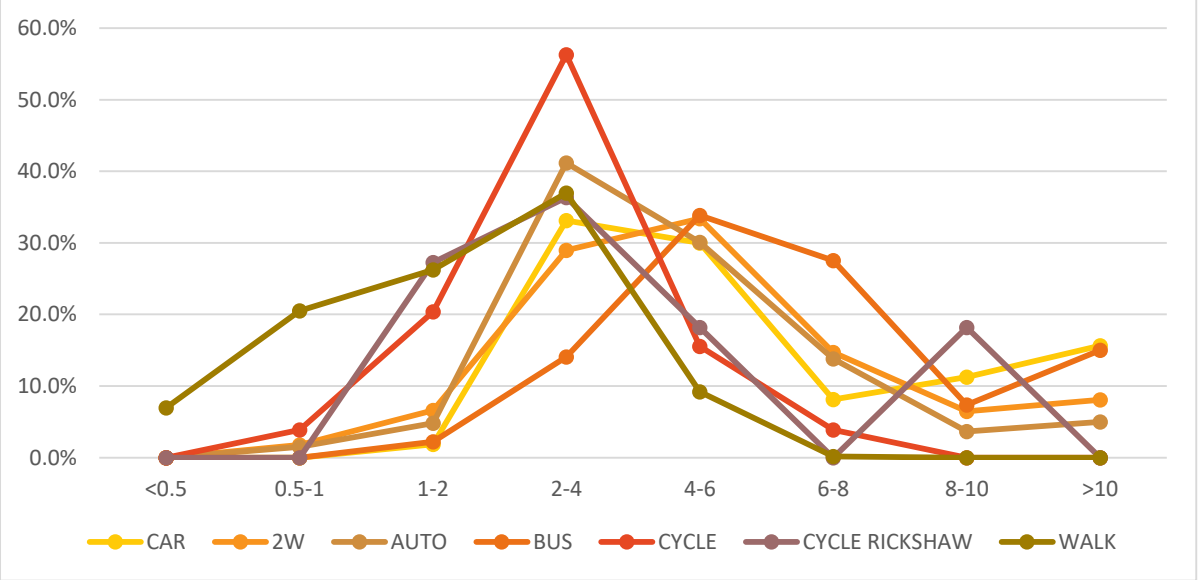


Figure 49: MODE-WISE AND DISTANCE BASED DISTRIBUTION OF TRIPS

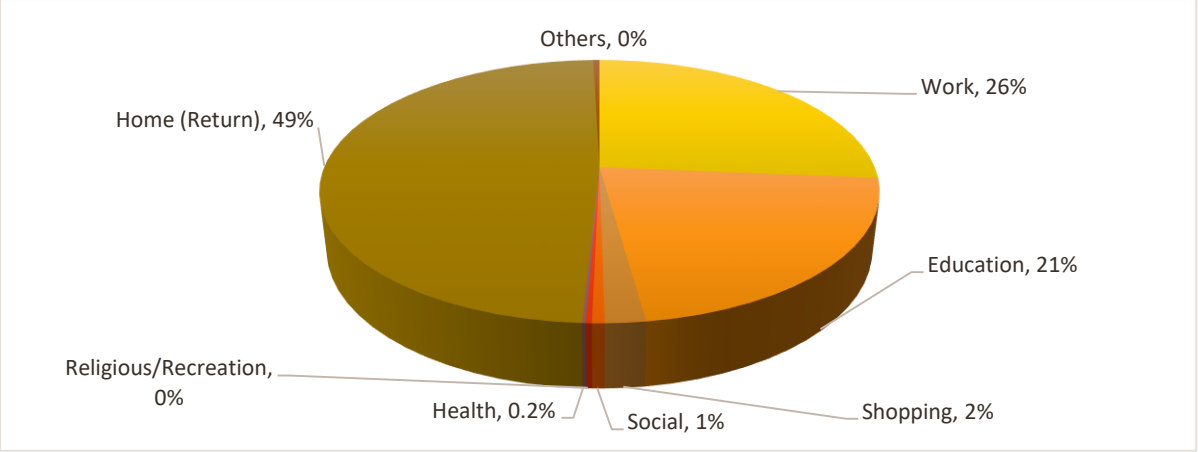


Figure 50: DISTRIBUTION OF TRIPS BASED ON TRIP PURPOSE

The purpose wise distribution of trips are as shown in Figure. It is observed that major share of trips are home (return), work based and education trips accounting to 49%, 26% and 21% respectively. A similar share is observed in the home (return) trips. The Average Trip Length (ATL) for work trips is observed to be 5.2 and 4.5 for educational trips. The Distribution of trips and ATL based on trip purpose are as shown in Figure and Figure respectively.

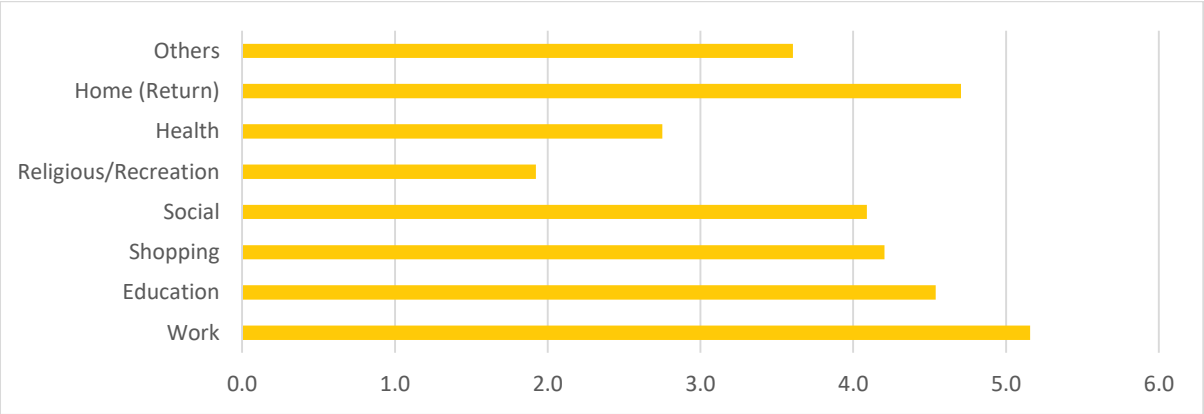


Figure 51: AVERAGE TRIP LENGHTS BASED ON TRIP PURPOSE

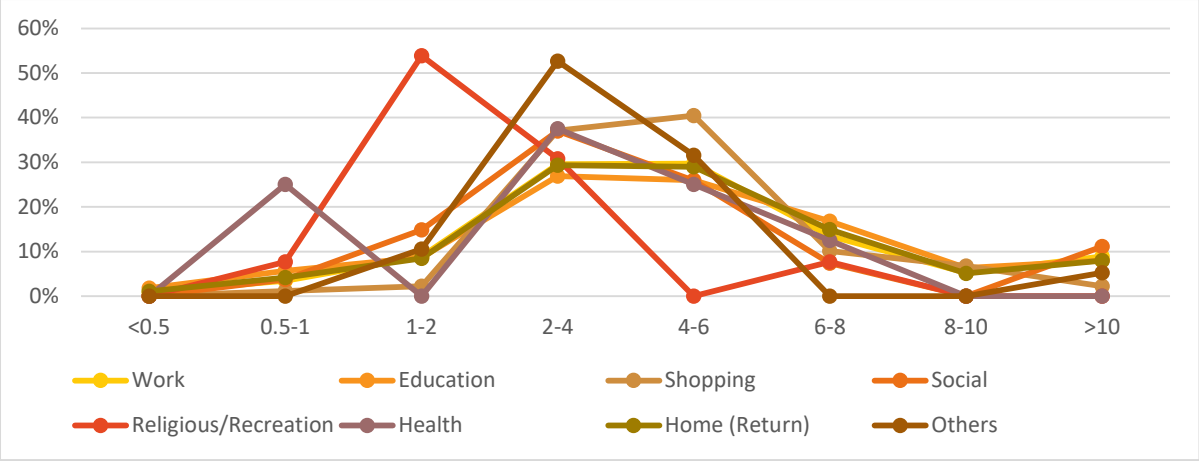


Figure 52: DISTRIPUTION OF TRIPS PF TRIPS BASED ON TRIP LENGHTS AND TRIP PURPOSE

The distribution of trips based on trip frequency are as shown in Figure. It is observed that a major share of trips are made on daily basis which are over 90%. The average trip length of daily trips is 5.0. The ATL based on trip Frequency is as shown in Figure.

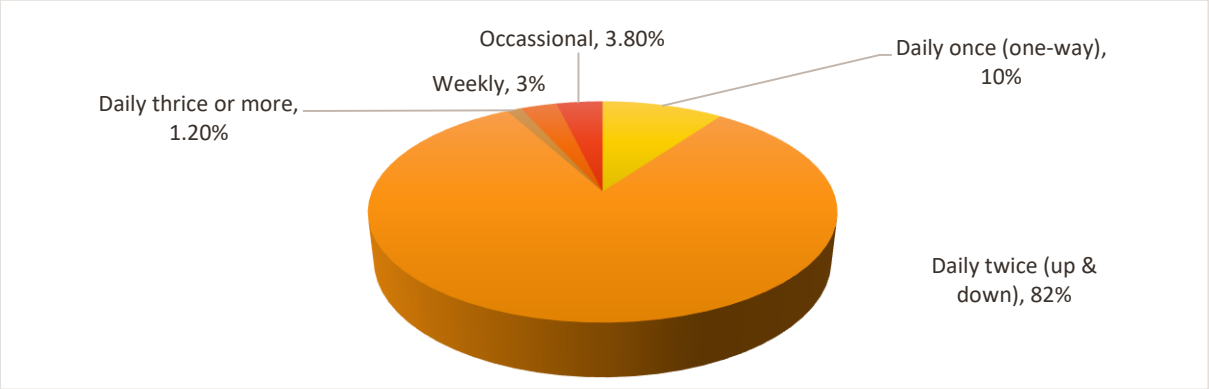


Figure 53: DISTRIBUTION OF TRIPS BASED ON TRIP FREQUENCY

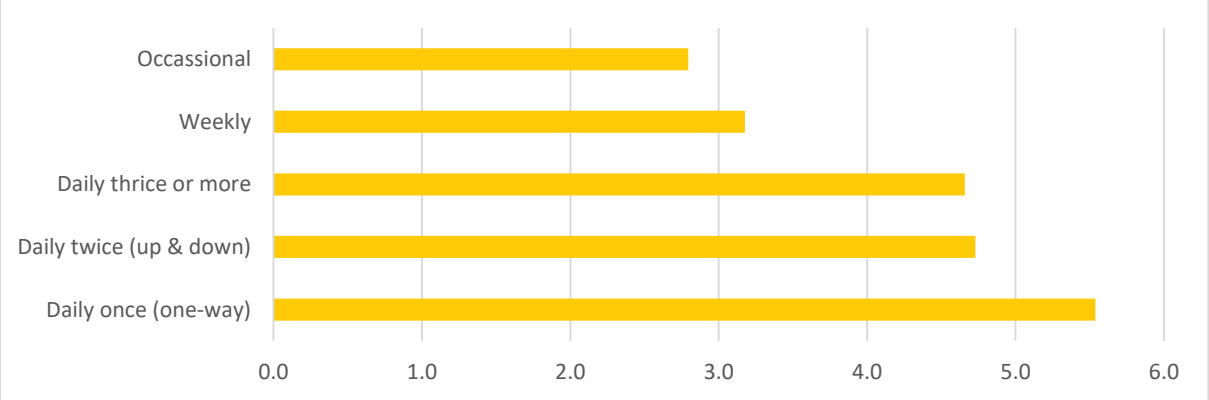


Figure 54: AVERAGE TRIP LENGHTS BASED ON TRIP FREQUENCY

HOUSEHOLD ACCESSIBILITY AND OPINION

The accessibility of households to Public Transit (PT) or Intermediate Public Transport (IPT) stops is as assessed in terms of distance and time. The average distance travelled by the house hold to access the near PT or IPT stop is 0.7km which is considered as a comfortable walking distance. Similarly, the average time taken to reach the PT or IPT stops in 9.1 minutes. The mode wise distances and access time to PT and IPT stops are as shown in Table and

Table 39 ACCESSIBILITY TO PT OR IPT STOPS

Code	Mode	Nearest Stop (km)	Time taken to reach (min)
1	Public Bus	0.8	11.8
2	Shared Auto	0.5	8.5
3	Cycle Rickshaw	0.6	7.1
	Total	**0.7**	**9.1**

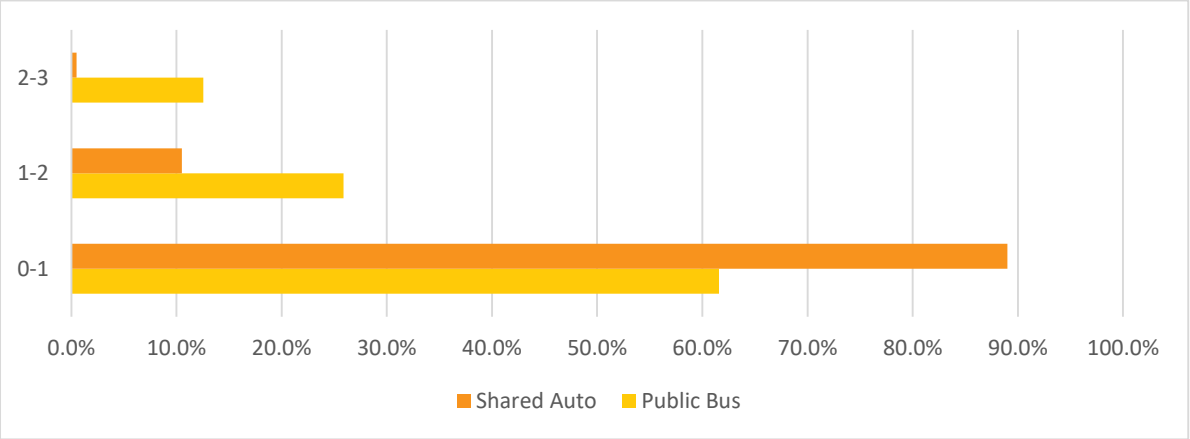


Figure 55 DISTRIBUTION BASED ON ACCESS TO IPT AND PT STOPS

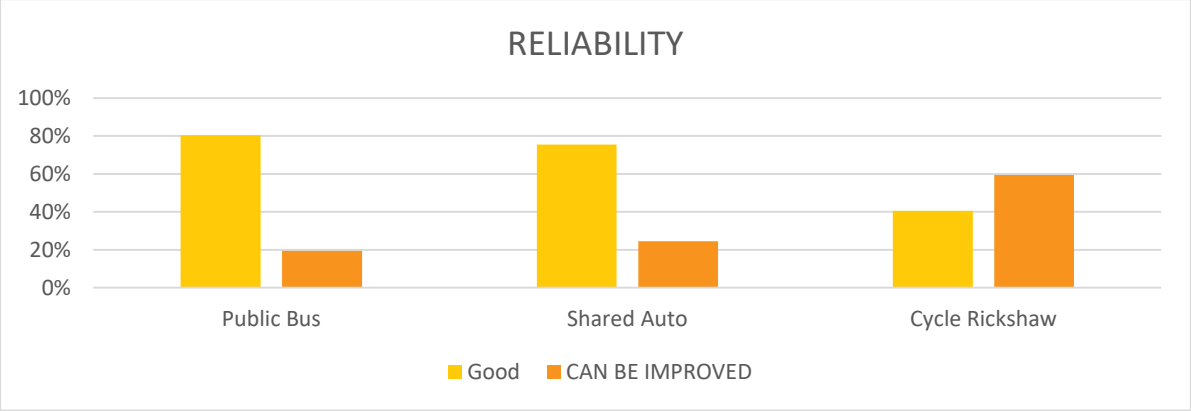


Figure 56: USERS OPINION ON RELIABILITY OF PT AND IPT MODES

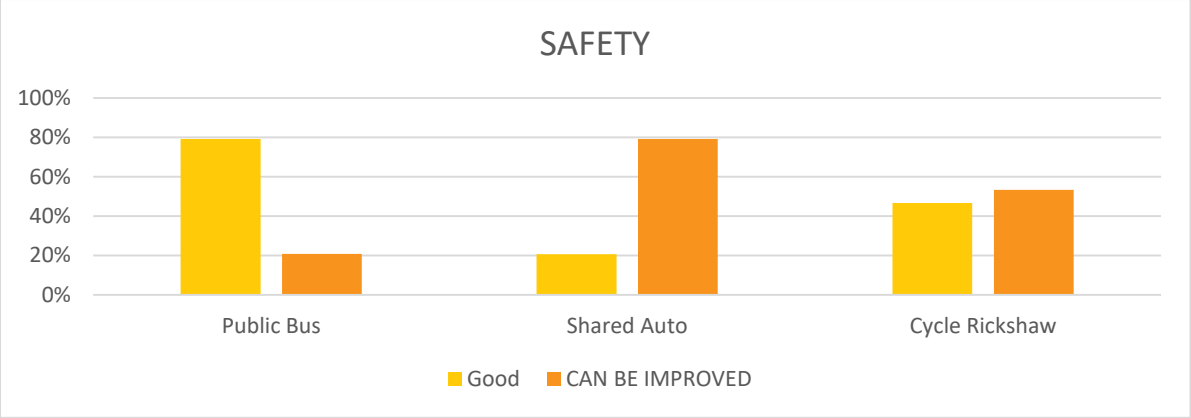


Figure 57 USERS OPINION ON SAFETY OF IPT MODES

The user opinion survey reflected a considerable performance in terms of reliability of Public Transit services along with the IPT services. Safety is perceived to a major concern in the intermediate public transit mode (auto rickshaw). The safety aspects of auto rickshaws especially in terms of driving is prioritized to be improved amongst the other modes. Similarly, the fares of buses are are perceived to be affordable compared to the share auto rickshaws and cycle rickshaws services.

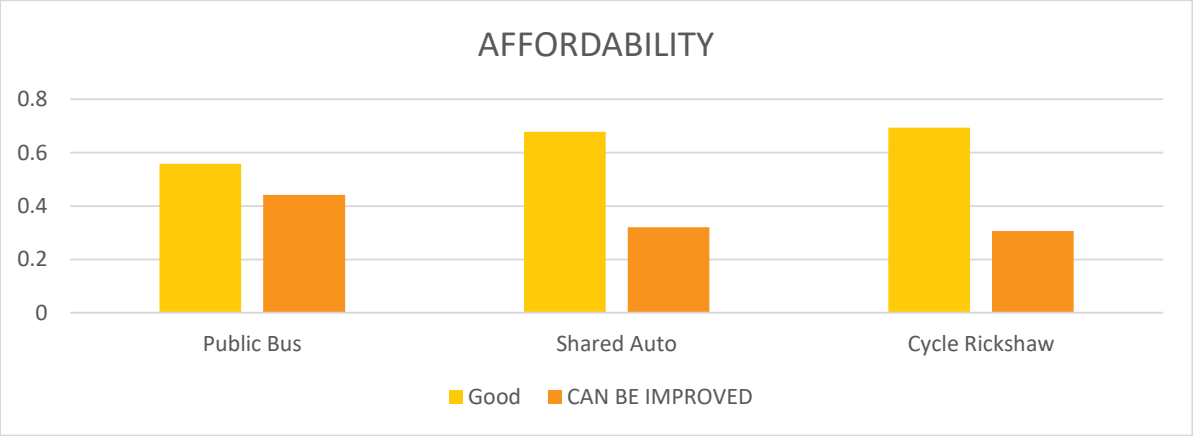


Figure 58 USERS OPINION ON AFFORDABILITY OF IPT MODES

It is observed that majority of the users perceive it somewhat inconvenient to travel using motorised modes in the city while a considerably larger share perceive the need to improve the travel conditions for the pedestrians in the city.

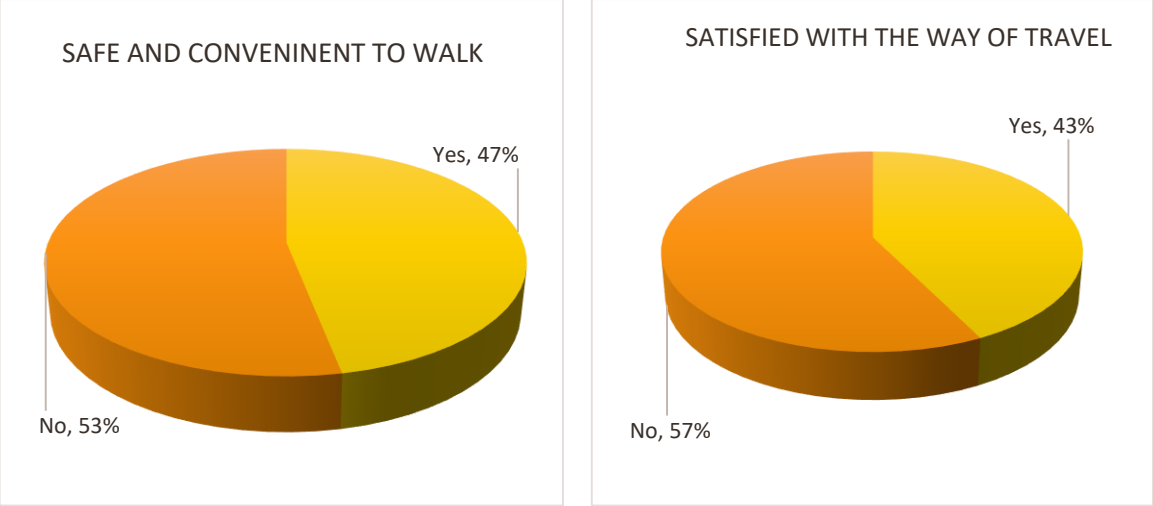


Figure 59 PECEPTION OF TRAVEL CONDITIONS IN THE CITY

Key Inferences:

1. The sex ratio derived from the house hold survey is 949 women for 1000 men.
2. The average monthly income as per the Household survey in Ongole is about INR 13,923 with the average number of earning members per house hold being 1 (Approx. 1.2).
3. The Per Capita Trip Rate (PCTR) for Ongole was observed to be 1.24 including the walk trips and 1.04 excluding the walk trips. The PCTR for motorised trips is about 1.01.
4. The major modes of travel in Ongole are observed to be two wheelers and walk with a model share of 41% and 15% respectively.
5. The Non-Motorised Transport comprises about 19% including 15% of walk trips.
6. The average trip length in the Ongole is observed to be 4.6km including the walk trips and 5.1km excluding the walk trips.
7. The Average Trip Length (ATL) for work trips is observed to be 5.2km and 4.5km for educational trips.
8. The average trip length on daily trips is 5km.
9. The average distance travelled by the house hold to access the near PT or IPT stop is 0.7km which is considered as a comfortable walking distance.
10. Safety is perceived to a major concern in regard to the intermediate public transit modes.
11. The fares of share auto rickshaws and cycle rickshaws are perceived to be higher compared to the bus services.
12. The other major concerns with respect to travel within the city are the bus based public transit connectivity, safety of pedestrians, chaotic intersections during peak hours.

ON STREET PARKING NUMBER PLATE SURVEYS

Objective: The principal objective of the study is to assess the demand for parking and characteristics of the parked vehicles.

Conduct: The survey is conducted for a period of 16 hours on important commercial areas where parking is predominant wherein the note the vehicle type and registration number of parked vehicles every 1/2 hour and associated parking fees data are collected as shown in survey formats in Annexure A.

Locations: The survey is conducted at the 3 on street Parking locations as shown in Figure and Table.

Table 40 PARKING LOCATIONS

CODE	LOCATIONS
ONSP_1	Gandhi Road
ONSP_2	Chinakurthy Road
ONSP_3	Trunk Road, Near KP Complex

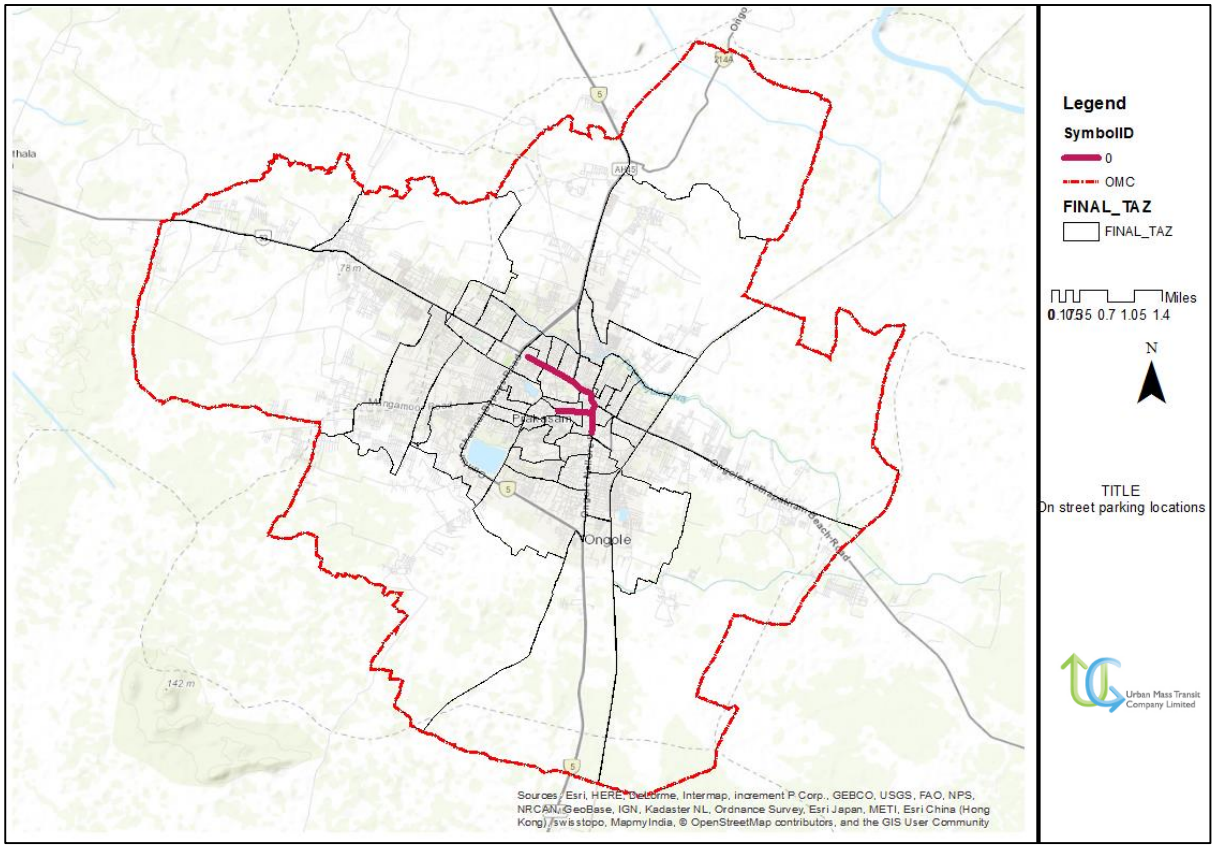


Figure 60 ON STREET PARKING LOCATIONS

Analysis: The location with highest accumulation of parking is observed to be Location 2 and Location 3 i.e. along Chinakurthy Road and Trunk Road. The peak hour accumulation is observed to be 12% to 21% of the daily accumulation. The parking durations is observed to vary between 10mins to 16min. The longest

parking duration at peak hour is observed at Chinakurthy and Trunk road due to the concentration of commercial and recreational activities. The details of the parking survey analysis is as shown in Table.

Table 41 ON STREET PARKING ANALYSIS

PARKING ANALYSIS	Location 1	Location 2	Location 3
	ECS	ECS	ECS
Parking Accumulation (Daily)	299.5	400.5	390
Parking Accumulation (Peak)	28.75	36.75	34
Peak Period	21.00-22.00	10.00-11.00	08.15-09.15
PH%	12%	19%	21%

OFF STREET PARKING NUMBER PLATE SURVEYS

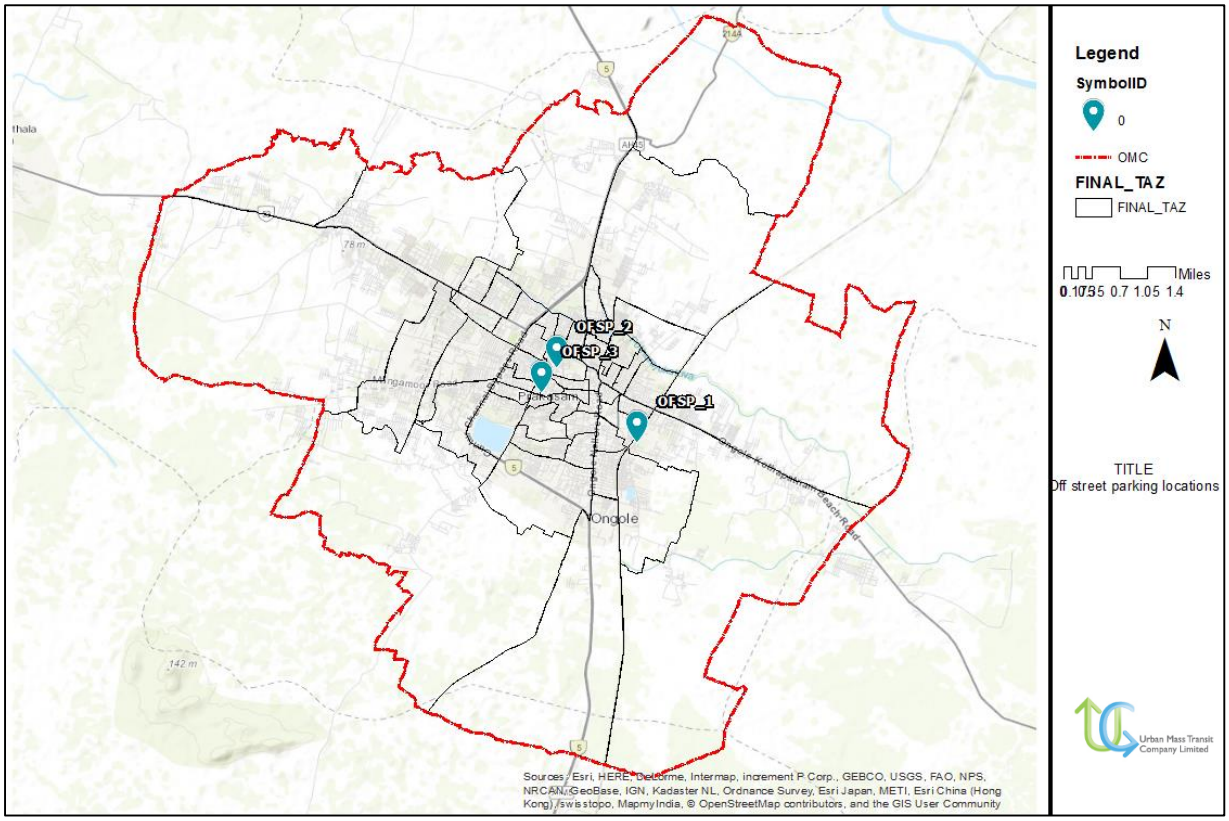
Objective: The principal objective of the study is to assess the demand for parking and characteristics of the parked vehicles.

Conduct: The survey is conducted for a period of 16 hours on important commercial areas where parking is predominant wherein the note the vehicle type and registration number of parked vehicles every 1/2 hour and associated parking fees data are collected as shown in survey formats in Annexure A.

Locations: The survey is conducted at the 3 off street Parking locations as shown in Figure and Table

Table 42: PARKING LOCATIONS

CODE	LOCATIONS
OFSP-1	Ongole Railway Station Parking Area
OFSP-2	Ongole Bus Stand Parking Area
OFSP-3	Parking Near Gandhi Park



Analysis: The location with highest accumulation of parking is observed at Ongole Railway Station Parking followed by RTC Bus Stand. The peak hour accumulation is observed to be 9% to 15% of the daily accumulation. The parking durations is observed to vary between 7mins to 50min which is higher than the On Street Parking. The longest parking duration at peak hour is observed at Railway Station Parking.

The details of the parking survey analysis is as shown in Table

PARKING ANALYSIS	Location 3	Location 2	Location 1
	ECS	ECS	ECS
Parking Accumulation (Daily)	115	294	302
Parking Accumulation (Peak)	16.75	29.5	25.75
Peak Period	18.15-19.15	13.00-14.00	09.30-10.30
PH%	15%	10%	9%

PASSENGER OPINION SURVEY

Objective: The objective of the survey is to assess the opinion of all the transport mode users.

Conduct: The survey was conducted at important locations like public transit nodes and parking areas. Information such as socio-economic characteristics, travel characteristics, issues, opinion of existing situation, existing travel modes etc. as shown in the survey format in Annexure A.

Locations: The following eight bus stop locations were identified as shown in Table and Figure

Table 43 PASSENGER OPNION SURVEY LOCATIONS

CODE	LOCATION
BS_1	Bus Stand Center, Trunk Road
BS_2	Kothapatanam Bus Stop
BS_3	Adanki Bus Stop
BS_4	Pranga Rayadu Cheruvu Bus Sop
BS_5	Bandla Mitla Center Bus Stop

Analysis: The results of the passenger opininon survey reflected that the major concerns with regard to travel in the city were

- Lack of public transport connectivity
- Irregular schedules of public transport
- Longer waiting time for buses
- Lack of clean and hygenic public transport vehicles

Due to the lack of city based public bus services, passengers especially aged below 20years (who are the dependent users) percive difficulty in accessing various places with in the city. The detailed analysis of the passenger perception with regard to travel experience concerns are shown in Figure.

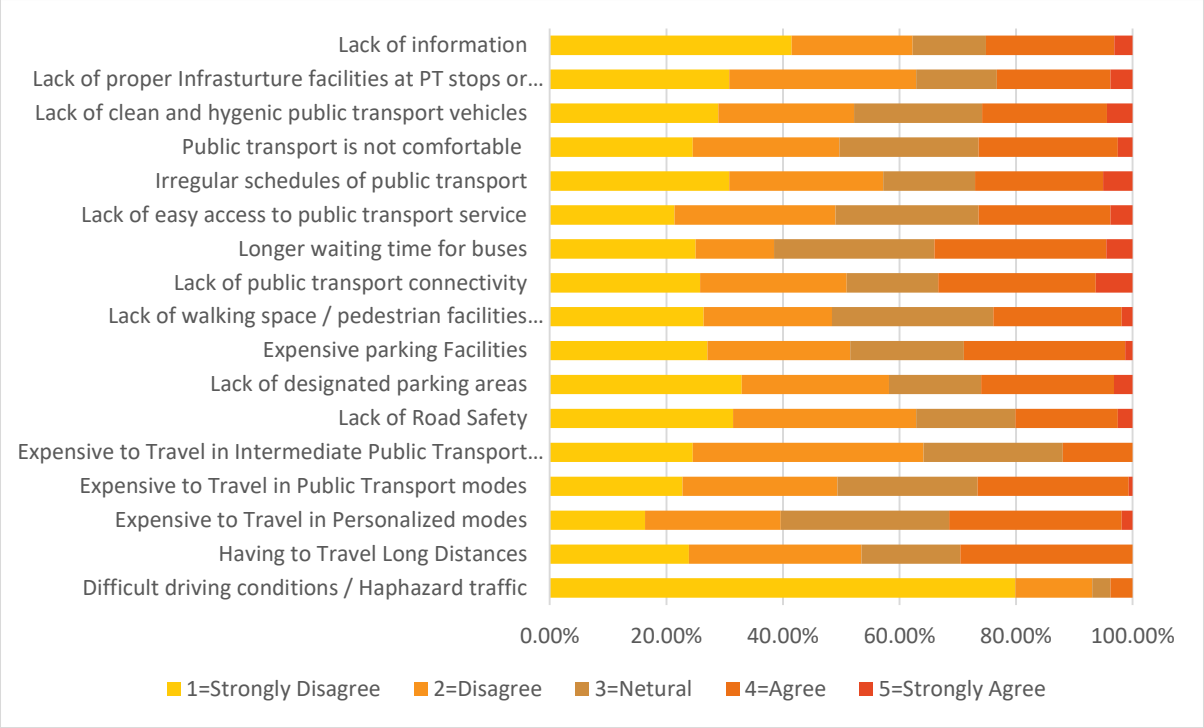


Figure 60: PERCEPTION OF PASSENGER TRAVEL CONCERNS

Similarly, the passenger's opinion in regard to the reasons for above experienced issues was assessed as shown in the Figure. The major reasons for the concerns in regard to the travel are,

- Lack of traffic sense
- Lack of travel information
- High growth of personalised modes

Thus, indicating the need for improved traffic and travel management along with strategies to refrain increasing the usage of private modes over the public transit modes.

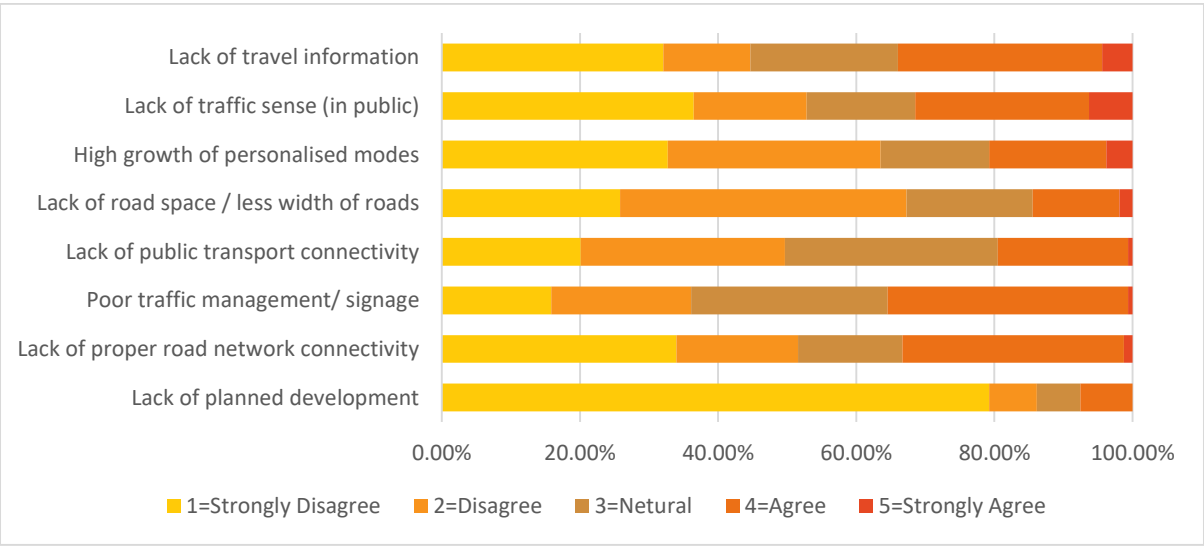


Figure 61 REASONS FOR TRAVEL CONCERNS AS PERCIEVD BY THE PASSENGERS

The passengers' perception in regard to improvement measures for enhancing the travel experience is as shown in Figure. The measures which are perceived of high importance by the users are as follows,

- Better Planning/Regulation of Development
- Road widening
- Traffic Education

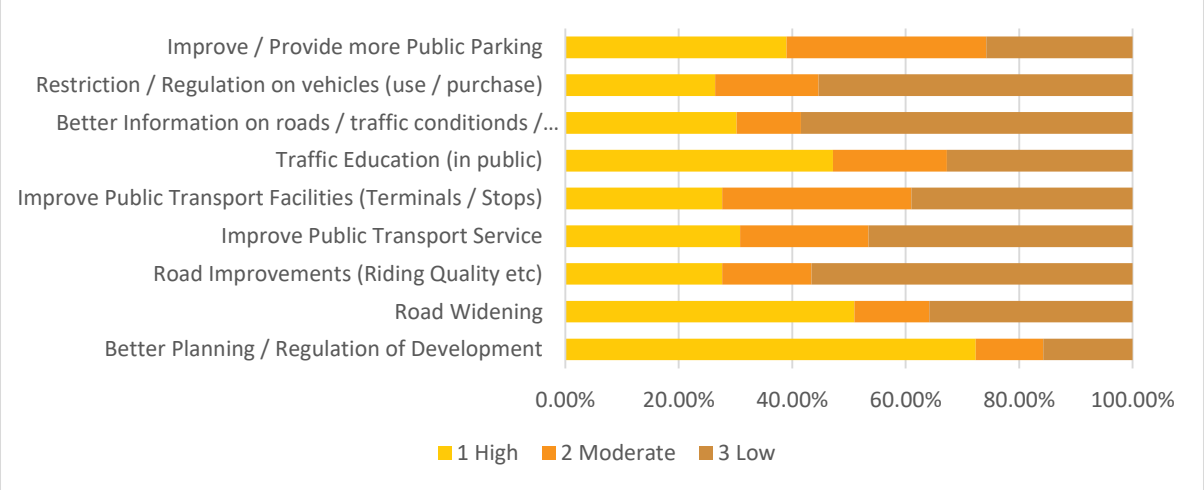


Figure 62: PASSENGER PERCEPTION IN REGARD TO IMPROVEMENTS

The passenger opinion on ways to promoted transport and traffic fund is as shown in Figure

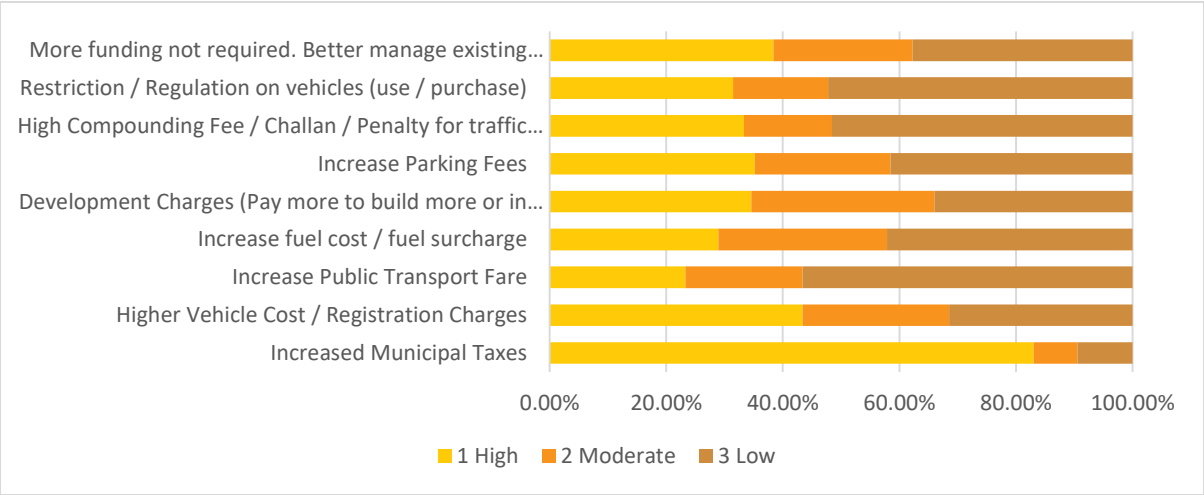


Figure 63 PASSENGERS OPINION ON WAYS TO PROMOTE TRAFFIC AND TRANSPORT FUND

The following measures are the highest perceived ways to promote travel and traffic fund,

- Increased municipal taxes
- Higher vehicle cost/Registration charges
- Better manage of existing funds

It is observed that majority of the users are inclined towards indirect funding. The overall experience of road traffic conditions as perceived by the passengers is as shown in Figure . It was observed that 19.50% of the users perceive it Reasonably Good, while 80.50% of the users perceive it somewhat congested but well managed.

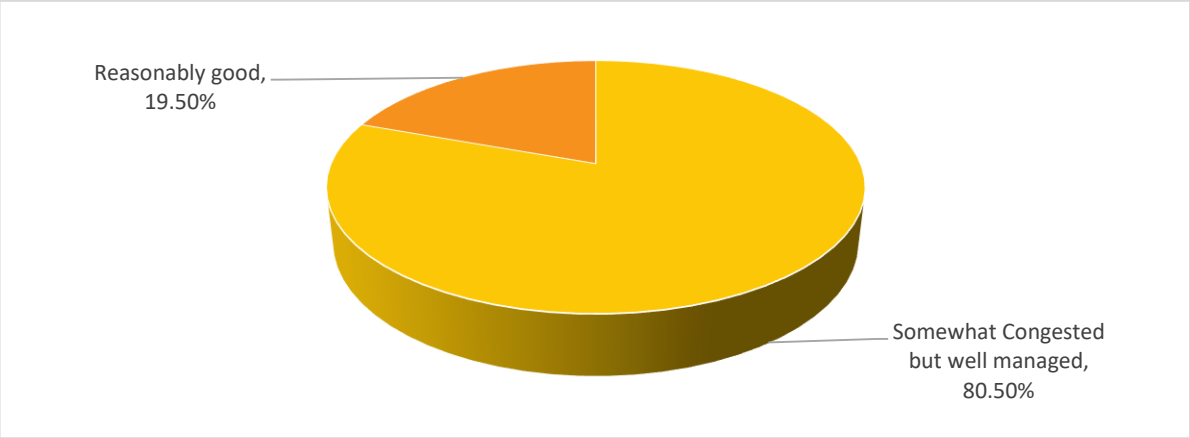


Figure 64: OVERALL EXPERIENCE OF ROAD TRAFFIC CONDITIONS

The perceptions regarding the need for dedicated lanes for buses and cyclists was collected and analysed as shown in Figure. 52% of the passengers perceive the need for dedicated bus lanes and about 51% of the users perceive the need for dedicated bicycle lanes.

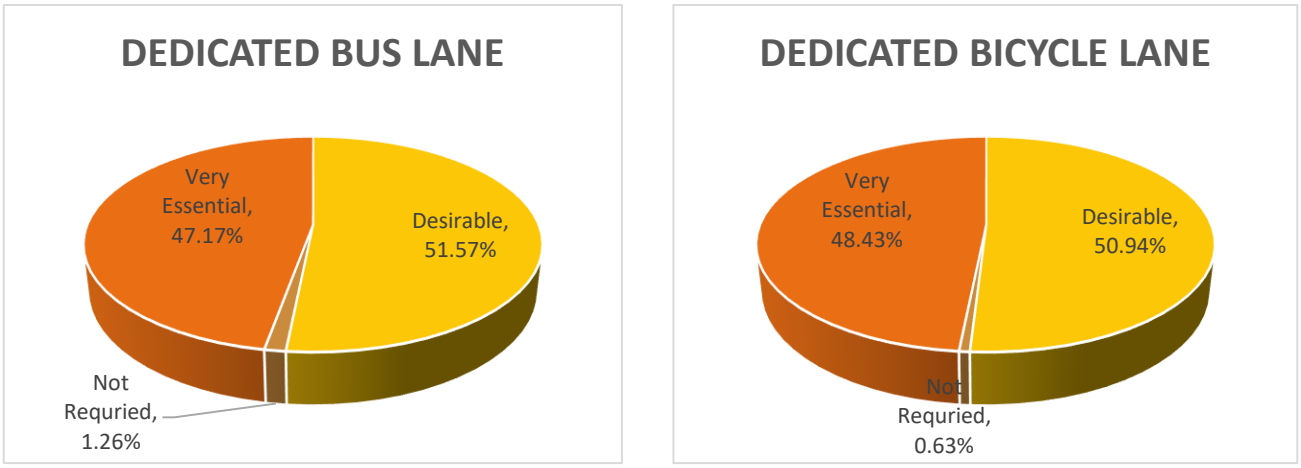


Figure 65: PERCEPTIONS REGARDING THE NEED FOR DEDICATED BUS AND BICYCLE LANES

Key Inferences:

1. The survey analysis indicates the need for improved traffic and travel management along with strategies to refrain increasing the usage of private modes over the public transit modes.
2. The majority of the responders are inclined towards indirect funding such as vehicle costs and registration charges, high compounding fee or high penalty for the traffic violators to promote travel and traffic fund.

3. 19.50% of the users perceive the overall experience of road traffic conditions reasonably good, while 80.50% of the users perceive it somewhat congested.

ANNEXURE 2– LIST OF ATTENDEES

Attendance Sheet

Preparation of Low Carbon Comprehensive Mobility Plan – Ongole

Date: 11.12.2018

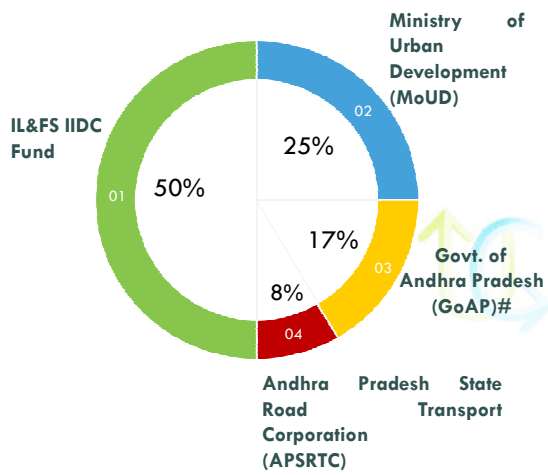
Sl.No.	Name	Designation	Phone No.	Email Id	Signature
1	B. Gopi Naik	Motor vehicle inspector	9010201472	gopi34500@gmail.com	
2	G. Vijaya Lakshmi	RM	9959225690	rmapsrtc@gmail.com	
3	S. RAMAKRISHNA	SVP, UMTC	9000265056	S.ramakrisha@ilfsindia.com	
4	Ankush Malhotra	VP, UMTC			
5	T. SIVA NIRANJAN	Manager, UMTC	9989437651	SIVA.NIRANJAN@UMTC.IN	
6	Harshita Sarma	Asst. Manager, UMTC	9573810022	harshita.sarma@umtc.in	
7	Sri Navya Annem	Sr. Officer, UMTC	9246776642	srinavya.annem@umtc.in	
8	Rakesh M Jinka	Asst. Manager, UMTC	9632794758	rakesh.jinka@umtc.in	
9					
10					
11					
12					
13					
14					
15					

ANNEXURE 3– STAKEHOLDER CONSULTATION PRESENTATION

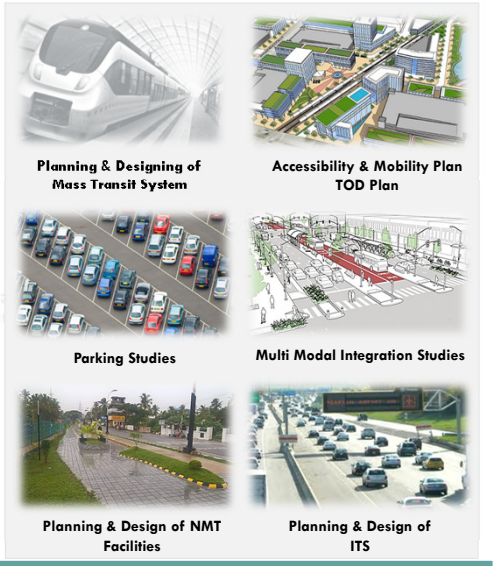
Preparation of
COMPREHENSIVE (LOW CARBON) MOBILITY PLAN
for
ONGOLE

DECEMBER 2018

About UMTC



 # Prior to bifurcation of the state of Andhra Pradesh pursuant to Andhra Pradesh Reorganization Act, 2014



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Secretary, Urban Development, GoI is the Chairman of UMTC

UMTC EXPERIENCE – METRO + BRTS

Experience with Metro Rail Organizations

- Delhi-Gurgaon-Rewari-Alwar Regional Rapid Transit System
- Rapid Metro Gurgaon
- Noida Metro Rail Corporation Limited
- MAHA Metro (Maharashtra Metro Rail Corporation Limited)
- Delhi Metro
- Kochi Metro Rail Limited
- Hyderabad Metro Rail Limited
- Lucknow Metro Rail Corporation
- Mumbai Metro Rail corporation Limited
- Amaravati Metro Rail Corporation Limited

Experience in Bus Rapid Transit System

- Pune (99 Km)
- Guwahati (28.4 Km)
- Delhi (16.6 Km)
- Ludhiana (40 Km)
- Amritsar (31.5 Km)
- Rajkot (11 Km)
- Surat (63.5 Km)

Assisted MouD in Appraisal of about 486 kms of Metro Corridors

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NEED FOR THE STUDY

- **Growth of Private Vehicles**
- **Growth of unorganised Intermediate Public transport**
- **Lack of Public Transport Systems**
- **Increasing rate of road accidents concerning the pedestrians**
- **Decreasing mode shares of sustainable transport**

To meet the objectives of Smart City (Smart Mobility)

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WHAT IS COMPREHENSIVE (LOW CARBON) MOBILITY PLAN? VISION - 2040

What It Covers

1. Vision for Future Sustainable Transport (Vision - 2040)
2. Focusses on moving people and goods
3. Establishes Service Level Bench Marking
4. Defines Mobility Corridor and Accessibility Solutions
5. Identifies Sustainable Mobility Projects
6. Identifies Phasing and Block Cost Estimates
7. Smart Mobility
8. Focusing on Minimizing Carbon Emissions

What It Doesn't Cover

1. Final System Configuration
2. Identify Station Location and Size
3. Alternative Analysis
4. Conduct Feasibility Analysis
5. Detailed Traffic Engineering
6. Detailed Cost Estimates
7. Detailed Impact Assessment

All the above issues would be covered in DPR

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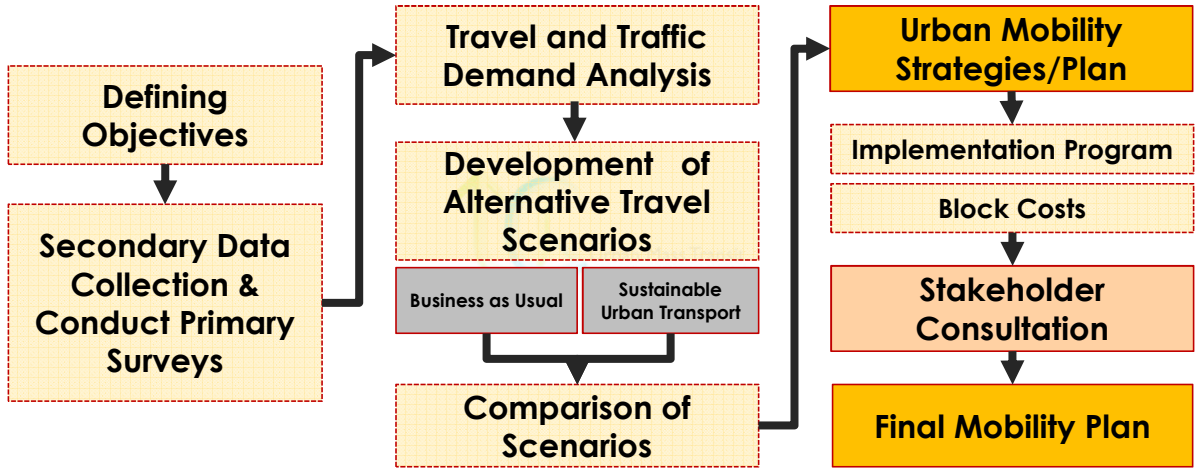
METHODOLOGY



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SECONDARY DATA COLLECTED
(EXISTING DATA COLLECTED FROM VARIOUS ORGANISATIONS)

S.NO.	SECONDARY DATA	SOURCE
1	Population Employment data	Census of India 2011/ District Industrial Centers
2	Bus route information, Shared Auto Route Information, Fare Details etc.	APSRTC, RTO Offices,
3	Bus Stops, Shared Auto Stops, Bus Depots & Terminal Infrastructure	MC & APSRTC
4	Master plan development plan etc.	MC, Town & Country Planning Department
5	Past study reports	MC
6	Committed transport proposals, future proposals	MC, Town & Country Planning Department, other Stakeholders
7	Vehicle Registration data - past 5 years	RTO office

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SECONDARY DATA COLLECTED
(EXISTING DATA COLLECTED FROM VARIOUS ORGANISATIONS)

S.NO.	SECONDARY DATA	SOURCE
8	Accident Data - past 5 years	Traffic Police
9	Pollution data	AP State Pollution Control Board
10	Zone map, Ward map Study area road network map	MC
11	Major development activities-SEZ, Smart City Etc..	MC, Other Stakeholders
12	One way corridors	Traffic Police
13	Road Infrastructure such as Footpaths, Street Lighting, etc	MC
14	Signalized intersections	Traffic Police

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PRIMARY SURVEYS CONDUCTED
(As per MoHUA, GOI Guidelines)

S. NO.	SURVEYS	EXPECTED OUTCOMES
1	Classified Traffic Volume Counts at Outer Cordon Location, Screen Line Locations & Turning Movement Counts at Intersections	Traffic flow characteristics in terms of modal composition, peak hour traffic at each survey location (OC, SC & Intersections)
2	Origin – Destination Surveys along with Mode Wise Occupancy Surveys	Information on Travel Patterns of Vehicles at the Outer Cordon & Screen Line Locations in terms of the Desire Line Pattern for the base year.
3	Road Network Inventory Surveys	Network characteristics such as, RoW, carriageway width, Footpaths, Surface Quality, etc which would be used in the Travel Demand Model
4	Speed and Delay Surveys	Congestion levels in the city and to validate the journey speeds predicted by the transport model

PRIMARY SURVEYS CONDUCTED
(As per MoHUA, GOI Guidelines)

S. NO.	SURVEYS	EXPECTED OUTCOMES
5	Bus Passenger Boarding & Alighting Surveys	Assess the passengers using Buses for their travel patterns and sectional loads to be used for service planning.
6	Bus & Rail Terminal Counts	Time, No. of Passengers entering & existing the terminal.
7	Bus & Rail Terminal Origin & Destination Surveys	Assess the travel patterns of passengers entering & exiting the Bus Terminals & Rail terminals.
8	Vehicle Operator Surveys –Auto Rickshaws & Goods Vehicles	To capture the needs of the IPT operators and the details of the IPT trips operated within the City To establish the commercial vehicle quantum and OD patterns within the city

PRIMARY SURVEYS CONDUCTED

(As per MoHUA, GOI Guidelines)

S. NO.	SURVEYS	EXPECTED OUTCOMES
9	Household Interviews	Information on the demographic and socio-economic data at the household and individual levels, and behavioural data that defines the travel pattern on a daily basis
10	Stated Preference & Opinion Survey	Assess Passengers Willingness to Shift and Willingness to Pay for the improved public transport system.
11	NMT Surveys	Pedestrian Count Survey to identify critical locations for pedestrian/NMT Movements NMT Opinion Survey to identify the needs & trip characteristics of the NMT Users
12	Parking Surveys (On Street & Off Street)	To assess the demand for parking characteristics of the parked vehicles, present parking supply etc within the city.

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CITY PROFILE

Strategic location between

State Capital Amaravati and Vijayawada (150km) and Major Cities of Hyderabad & Chennai (~300 km)

Emerged is a crucial **retail hub in Prakasam District**

POPULATION

2.52 LAKH (2011) **2.89 LAKH (2018)**

42% WORKING POPULATION (1.01 Lakhs)

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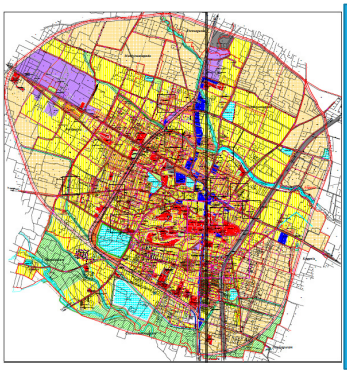
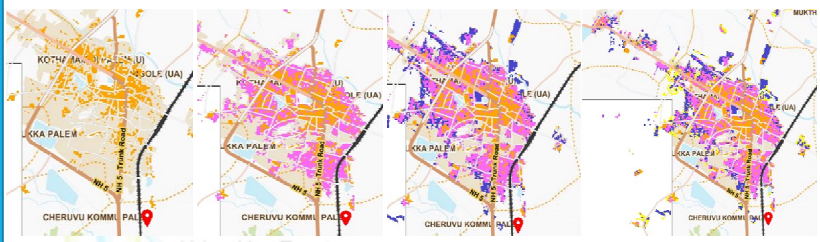
CITY PROFILE

LANDUSE



GROWTH PATTERN

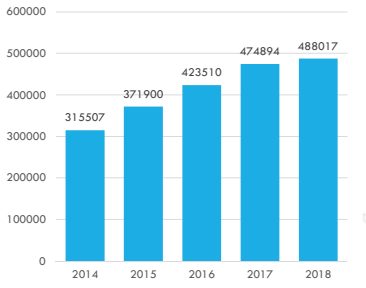


Population	Area	Population Density	
2.89 LAKH	132.4 Sqkm	GROSS 69 PPH / NET 100 PPH	15% Area Under Transportation
Municipal Limits	Municipal Limits	Municipal Limits	

CITY PROFILE

Increasing Auto-Rickshaws and PVT

REGISTERED VEHICLES



Increasing Vehicles
Increasing Safety Concern

No City Bus Services Operated Either By RTC Or Private Agencies	24,400 Auto Rickshaws (Registered Vehicles, 2017)	12% CAGR – Vehicular Strength	3.4 Fatality Rate (per 1 Lakh Population)

TRAVEL AND TRAFFIC CHARACTERISTICS

1.24
Per Capita Trip Rate
Including walk trips

1.04
Per Capita Trip Rate
Excluding walk trips

4.6 Km
Average Trip Length
Including walk trips

5.1 Km
Average Trip Length
Excluding walk trips

0.92
Average Volume / Capacity Ratio

25.7 kmph
Average Network Speed

	+				
MODE SHARE	36.6%	41.4%	3.6%	15.9%	2.5%
TRIPS (in lakhs)	1,31,160	1,48,361	12,900	56,979	1,433

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CITY PROFILE

Lack of City based Public Transport

↓

Increasing **Dependency** on **Private Modes**

Drastic **increase** in **Auto Rickshaws** strength

Congestion along **Major Roads**

Safety Concerns amongst Pedestrians and cyclists

Increasing levels of **Air Pollution**

Increasing Vehicles
Increasing Safety Concern

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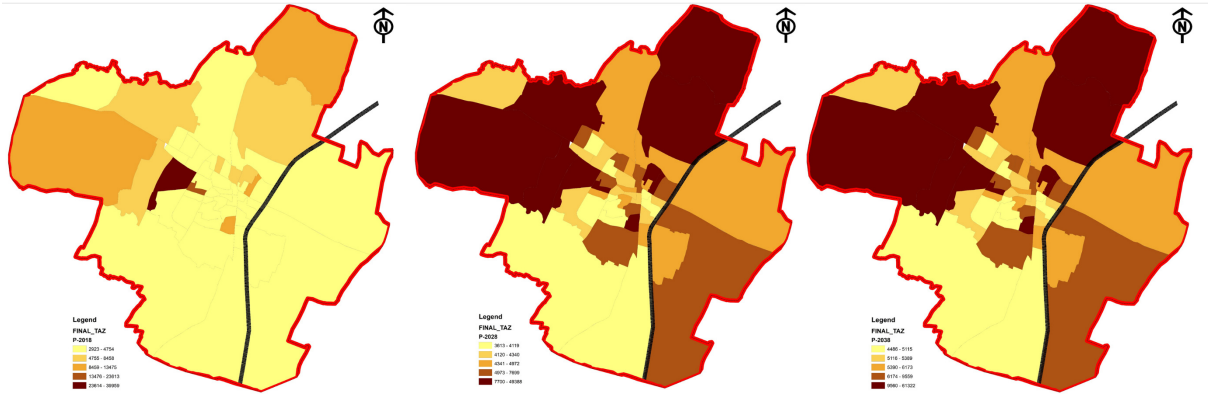
POPULATION PROJECTIONS



Population 2018
2.89 lakhs

Population 2028
3.58 lakhs

Population 2038
4.44 lakhs

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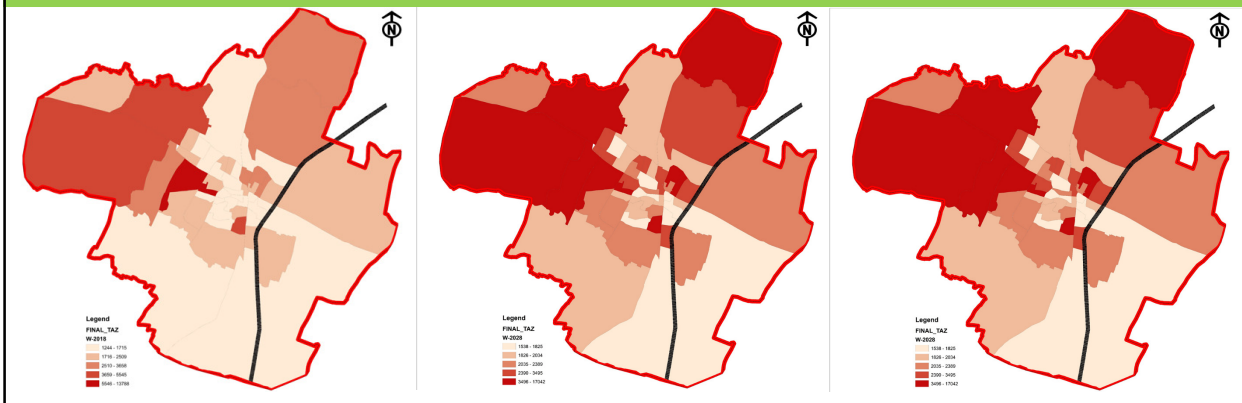
EMPLOYMENT PROJECTIONS



Worker Population 2018
1.21 lakhs

Worker Population 2028
1.50 lakhs

Worker Population 2038
1.87 lakhs

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SUSTAINABLE TRANSPORT STRATEGIES

Sustainable Transport Strategies

- *Land Use and Transport Strategy*
- *Mobility Corridor Strategy*
- *Public Transit Strategy*
- *Non-Motorized Transport Strategy*
- *Parking strategy*
- *Traffic Engineering & Management Measures*

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Strategy 1

INTEGRATED LANDUSE TRANSPORT STRATEGY

- Multi-Nodal Transit Network
- Transit Oriented Development

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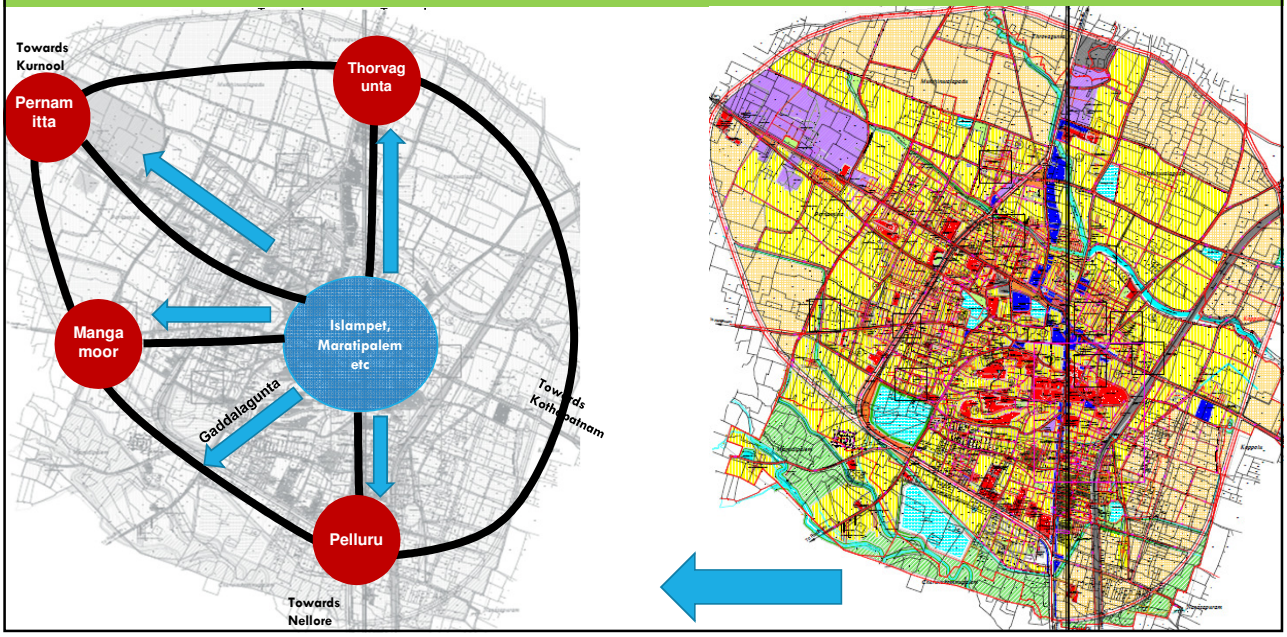
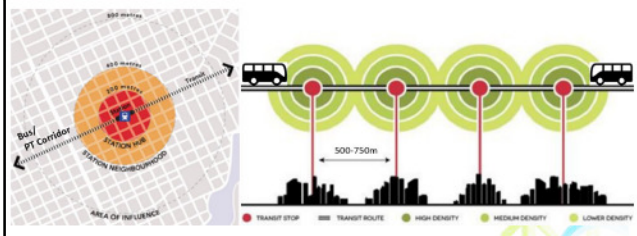
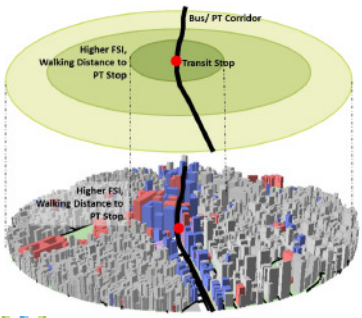
LANDUSE AND TRANSPORT STRATEGY



TRANSIT ORIENTED DEVELOPMENT





- To maximize the passenger throughput.
- Mixed-use development along the Transit Corridors
- To create environments where walking and transit are viable transportation options
- Components to Improve in TOD Zones
  - Travel Connections
  - Building Scale and Orientation
  - Public Spaces
  - Parking

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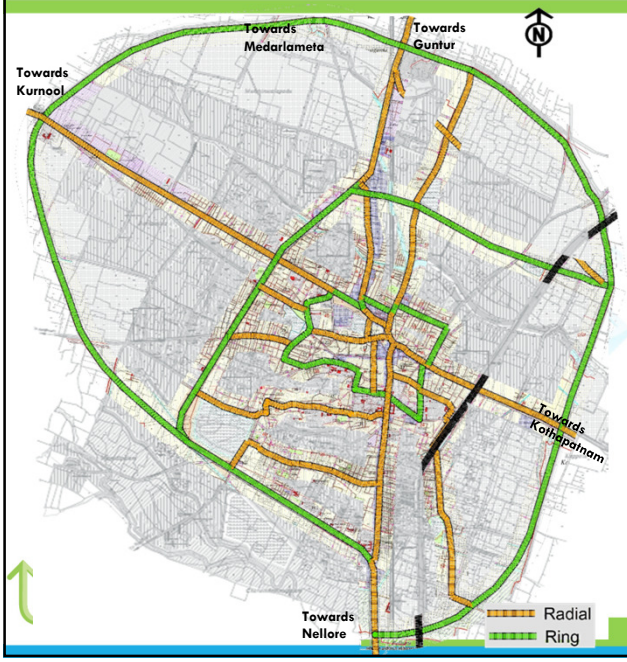
TRANSIT ORIENTED DEVELOPMENT



Corridors Identified for Densification

INNER RING

1. RANGA RAYADU ROAD
2. CSR SARMA COLLEGE ROAD
3. BHAGYANAGAR 4TH LANE
4. RAILWAY STATION ROAD
5. BHARAT NAGAR ROAD

OUTER RING

1. NORTH BYPASS
2. SOUTH BYPASS
3. NEW BYPASS

RADIALS

1. KURNOOL ROAD
2. KP BUS STAND ROAD
3. GUNTUR ROAD
4. TRUNK ROAD

Strategy 2

ROAD NETWORK IMPROVEMENT STRATEGY

- Road Widening/Upgradation
- Development of Missing Links/ New Links
- Road Infrastructure improvements

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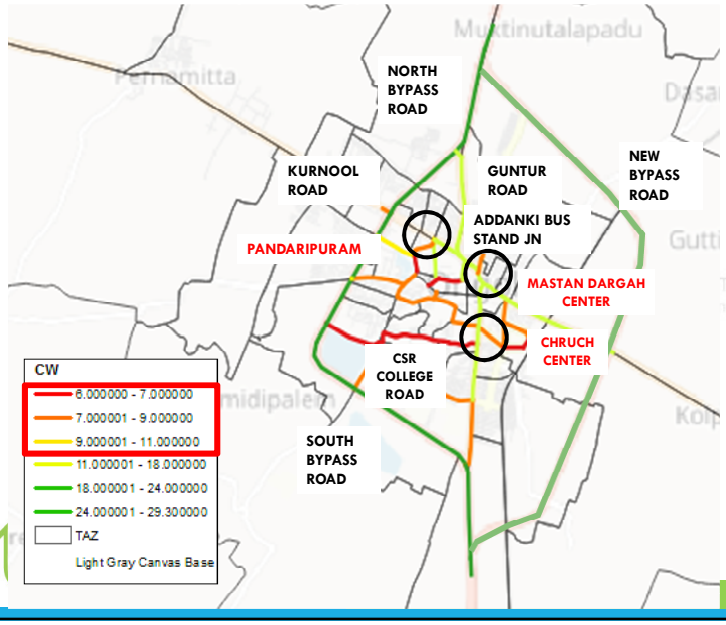
Amaravati Metro Rail Corporation Limited

EXISTING ROAD NETWORK SCENARIO

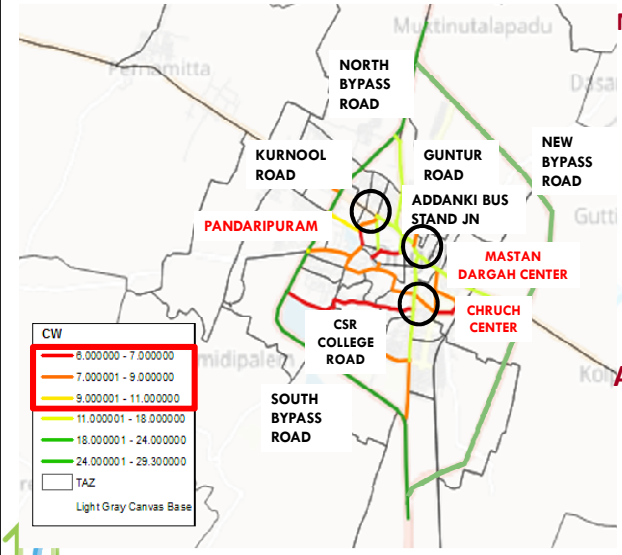


50 Kms Road Network Surveyed in Ongole City

48% Network Carriage way below 12m

ROW	Road Network (Kms)	Share
Upto 9 M	21.5	43%
9 M to 12 M	2.5	5%
12 M to 18 M	7.0	14%
18 M to 24 M	9.5	19%
Above 24 M	9.0	18%

EXISTING ROAD NETWORK SCENARIO



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Network Hierarchy Jumps

Bottle Necks

NTR Statue Junction, Mastan Dargah Junction, APSRTC Bus Stand

Average V/C Ratio

0.97 (2018) → 1.40 (2038)

Average Network Speed

20.1 km/hr (2018) → 18.2 Km/hr (2038)

V/C Ratio

Road Name	2018	2038 (BAU)
Kothapatnam Road	1.2	1.74
Kurnool Road	1.3	1.885
Grand Trunk Road	0.85	1.19
Guntur Road Bypass	0.55	0.798

PROPOSED ROAD NETWORK STRATEGY

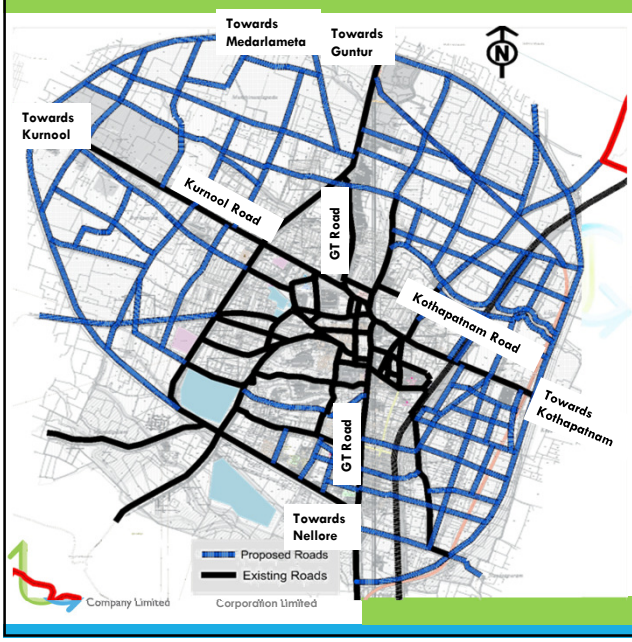
RING RADIAL NETWORK

INNER RING
1. RANGA RAYADU ROAD
2. CSR SARMA COLLEGE ROAD
3. BHAGYANAGAR 4TH LANE
4. RAILWAY STATION ROAD
5. BHARAT NAGAR ROAD

OUTER RING
1. NORTH BYPASS
2. SOUTH BYPASS
3. NEW BYPASS

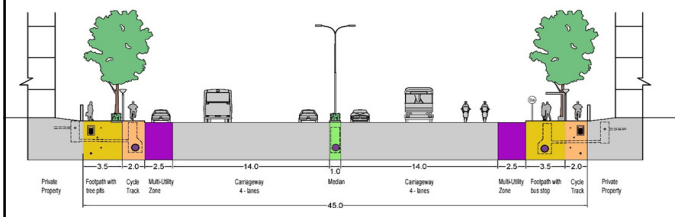
RADIALS
1. KURNOOL ROAD
2. KP BUS STAND ROAD
3. GUNTUR ROAD
4. TRUNK ROAD

PROPOSED ROAD NETWORK STRATEGY

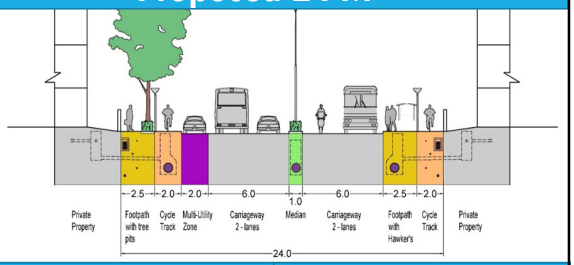


PROPOSED ROAD NETWORK STRATEGY

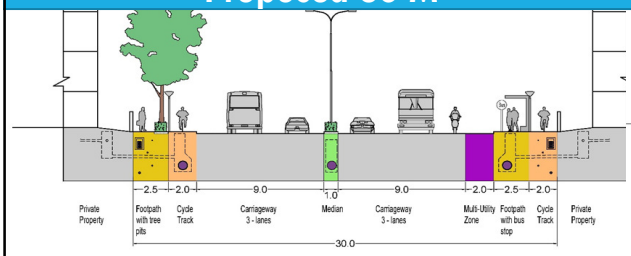
Proposed 45 M



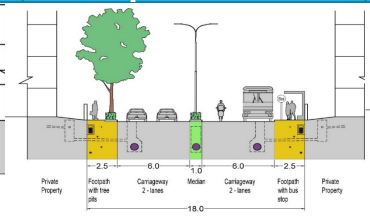
Proposed 24 M



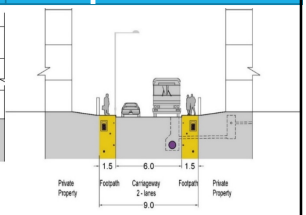
Proposed 30 M



Proposed 18 M



Proposed 09 M



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PROPOSED ROAD NETWORK STRATEGY

Sl. No.	Rail Over /Under Bridges
1	NH16 Bypass Road near Koppulu rural
2	Railway Crossing near Santhapet
3	Railway Crossing Near Ambedkar Colony
4	Railway Crossing near Narsapuram

Urban Mass Transit Company Limited

Strategy 3

PUBLIC TRANSPORT IMPROVEMENT STRATEGY

- City Bus Systems
- Public Transport Terminals
- Intermediate Public Transport/Feeder Systems
- Multi-Modal Integration Nodes
- Promoting Public Transport-Outreach Programs

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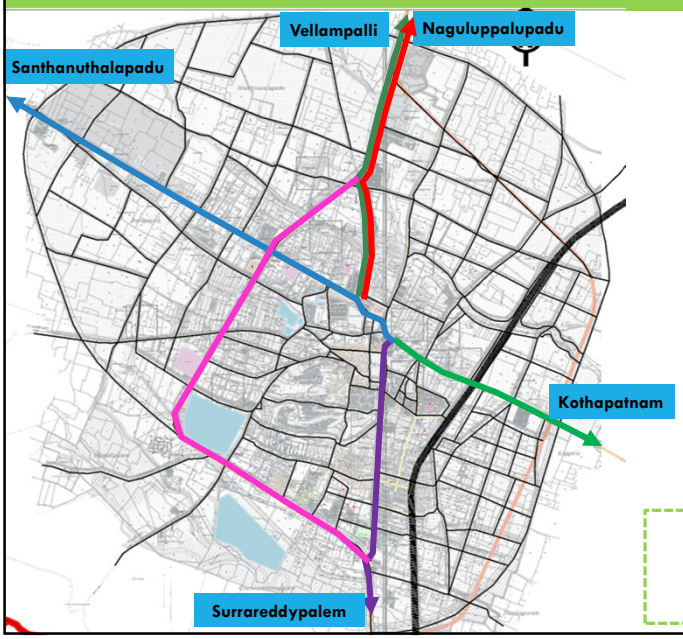
PROPOSED CITY BUS NETWORK



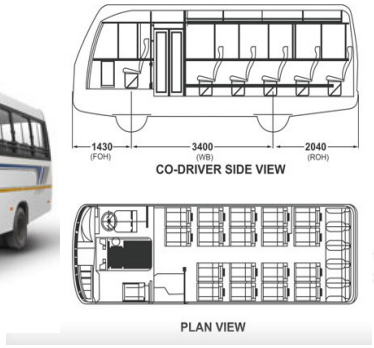
S. No.	Name	Route Length (km)	Proposed Peak Hour Headway (min)	Proposed Fleet
1	Ongole Bus Stand to Santhanuthalapadu	11.8	15	5
2	Ongole Bus Stand to Vellampalli	16.0	15	5
3	Ongole Bus Stand to Naguluppalapadu	18.7	15	5
4	Ongole Bus Stand to Kothapatnam	16.6	15	5
5	Ongole Bus Stand to Surareddipalem	14.5	15	5
6	Ongole Bus Stand to Ongole Bus Stand via Nellore Bypass Road	11.6	15	5
				30

6 Routes

30 Buses(2019)

95 Buses(2038)

VEHICLE TYPE- MINI BUSES



Characteristics	Mini Bus
Seating Capacity	15 to 25
Turning Radius (m)	13
Overall Length (mm)	~ 7000
Overall Width (mm)	~ 2000
Life Cycle	12 Years or 10,00,000 kms

The smallest vehicle in the bus category vehicles,
with a passenger capacity (seating + standing) ranging between 15 to 25 passengers.
These vehicles are extensively used on Roads With Smaller ROW.

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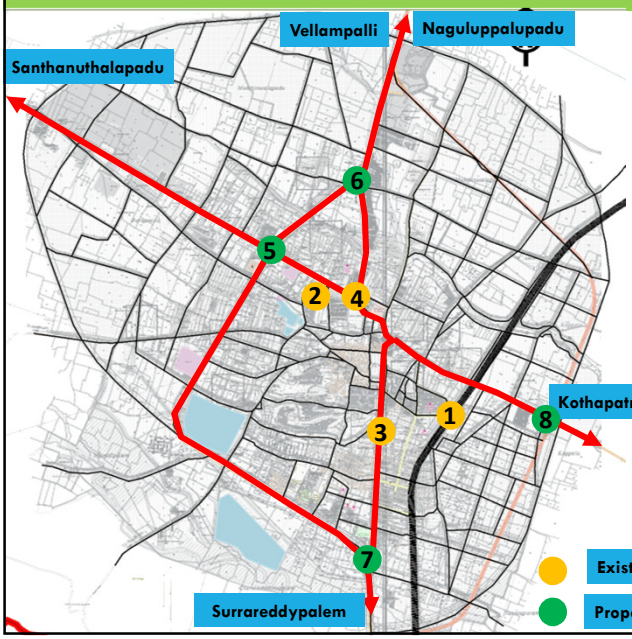
PUBLIC TRANSPORT TERMINALS



Sl. No.	Existing Terminals
1	Ongole Railway Station
2	Ongole APSRTC Bus Stand
3	Nellore Bus Stand
4	Addanki Bus Stand
Sl. No.	**Proposed Terminals**
5	Near Pandaripuram Jn. Along Kurnool Road
6	Along KP Road near NTR Colony
7	Near Venkateshwara Colony near Guntur Bypass
8	Near Ongole ZP office, along Nellore Raod

INTERMEDIATE PUBLIC TRANSPORT

ANY VEHICLE LESS THAN 10 SEATER IS CONSIDERED TO BE INTERMEDIATE PUBLIC TRANSPORT

Intermediate Public Transport - **ONGOLE**

↓

Auto-Rickshaw

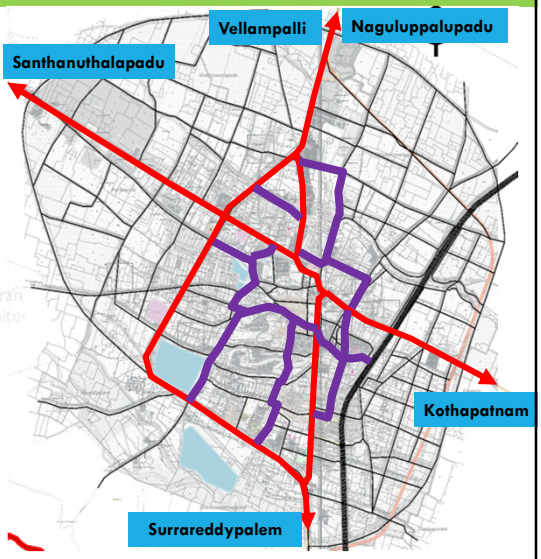
MAJOR ISSUES

- Lack of safety regulations
- Competition of Auto-Rickshaw Services with Public Transport
- No regulation of fares

IMPROVEMENTS

- Transparency of fares
- Driver behaviour and road safety training
- Integrating the System

- Promoting use of E-Rickshaws on Proposed Routes
- Auctioning of IPT Routes/ Zones
- Provision of infrastructure for physical integration with the bus/rail systems



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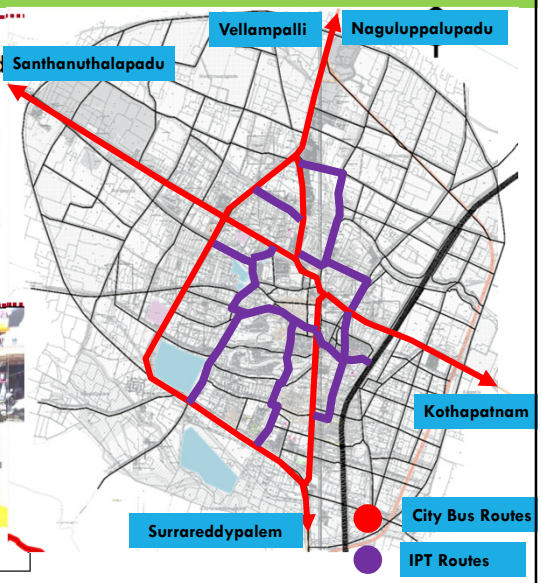
INTERMEDIATE PUBLIC TRANSPORT

PROPOSED PHASE-WISE CONVERSION TO E-RICKSHAWS

Year	E- Rickshaws	
	No.	Share
2023	4,880	20%
2028	9760	40%
2038	9760	40%

- Promoting use of E-Rickshaws on Proposed Routes
- Auctioning of IPT Routes/ Zones
- Provision of infrastructure for physical integration with the bus/rail systems



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INTERMEDIATE PUBLIC TRANSPORT

Characteristics	E-RICKSHAW
Seating Capacity	4-6 Seater
Maximum Speed	25kmph (as per MV Act 2015)
Moto Output Power	850 Watt
Duration for Fully Charged Batteries	8 Hours
Mileage with 100% charge	80km
Mileage with 80% charge	60km
Vehicle Life Cycle	7-8 Years
Battery Life	5 Years
Overall Efficiency	80%

The smallest vehicles providing intermediate public transport facilities and last mile connectivity, with a passenger capacity (seating) ranging between 4 to 6 passengers. These vehicles are extensively used as alternative sustainable modes.

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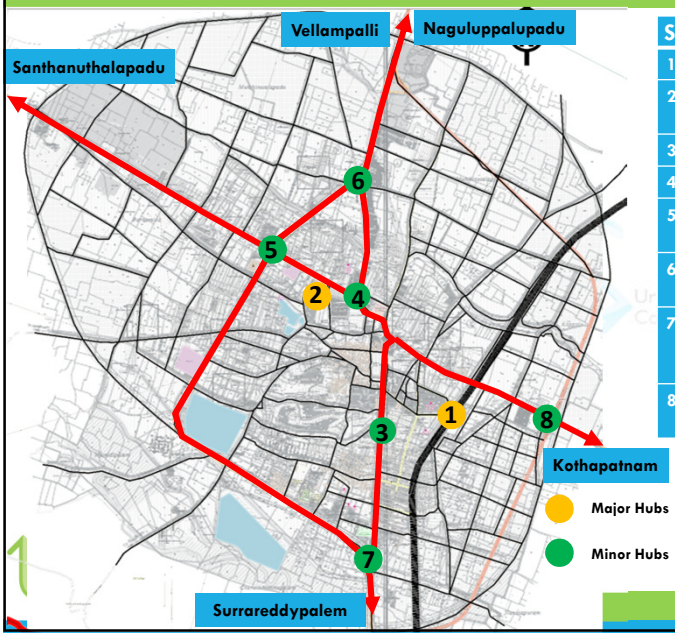
MULTI MODAL INTEGRATION NODES



S.NO.	LOCATION	TYPE	INTEGRATION
1	Ongole Railway Station	Major	Train Bus, IPT, NMT
2	Ongole APSRTC Bus Stand	Major	Bus, IPT, NMT
3	Nellore Bus Stand	Minor	Bus, IPT, NMT
4	Addanki Bus Stand	Minor	Bus, IPT, NMT
5	Near Pandaripuram Jn. Along Kurnool Road	Minor	Bus, IPT, NMT
6	Along KP Road near NTR Colony	Minor	Bus, IPT, NMT
7	Near Venkateshwara Colony near Guntur Bypass	Minor	Bus, IPT, NMT
8	Near Ongole ZP office, along Nellore Raod	Minor	Bus, IPT, NMT

PROMOTING PUBLIC TRANSPORT OUTREACH

- Create a network of allies and provide platforms for them to actively participate as disseminators of project benefits.
- Use proactive and creative communication media to promote key messages. Communication media can be print, broadcasts, short films, event marketing etc.
- Programmes can be conducted in schools and colleges advocating the need for public transport. Events like Car Free Day, Cycle Day can also be promoted.

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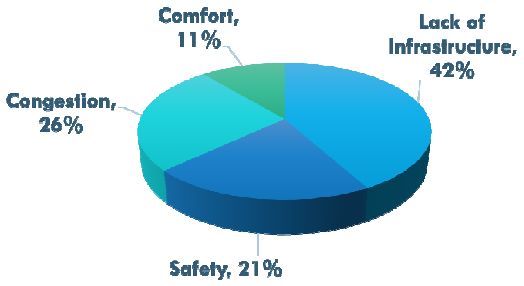
Strategy 4

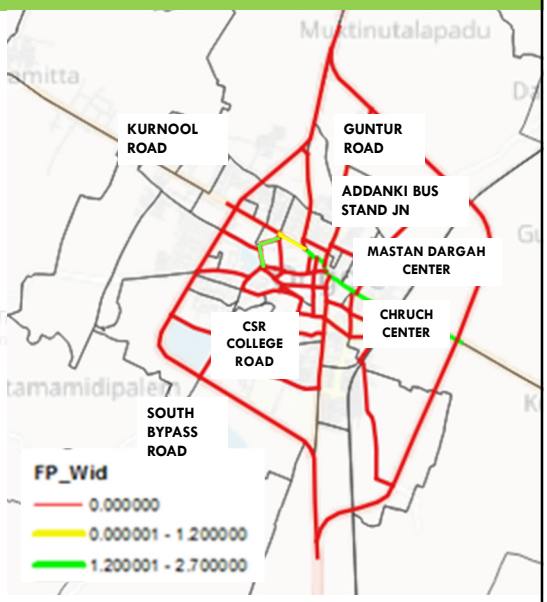
NON-MOTORISED TRANSPORT STRATEGY

- Development of Footpath
- Development of Bicycle Friendly Streets

NON MOTORIZED TRANSPORT SCENARIO

12% network has facilities (footpath) to support safe pedestrian movement





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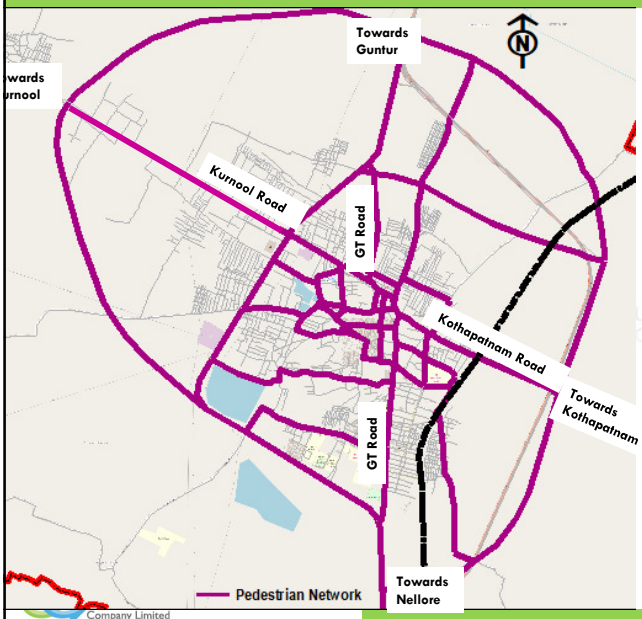
NON MOTORIZED TRANSPORT SCENARIO



65 Kms

Pedestrian Pathways

Minimum 2m

Clear Width for Walkways

INNER RING

1. RANGA RAYADU ROAD
2. CSR SARMA COLLEGE ROAD
3. BHAGYANAGAR 4TH LANE
4. RAILWAY STATION ROAD
5. BHARAT NAGAR ROAD

OUTER RING

1. NORTH BYPASS
2. SOUTH BYPASS

RADIALS

1. KURNOOL ROAD
2. KP BUS STAND ROAD
3. GUNTUR ROAD
4. TRUNK ROAD

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NON MOTORIZED TRANSPORT SCENARIO

37 Kms Cycle Network

- **22.52 Kms** Dedicated Cycle Track
- **14.56 Kms** Shared Cycle Track

Dedicated Cycle Tracks

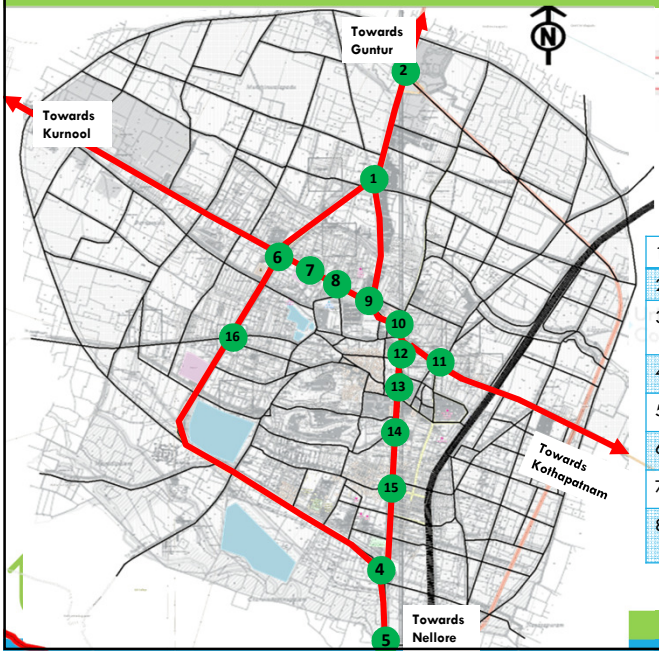
1. **GT Road**
2. **Kothapatnam Road**
3. **Kurnool Road**
4. **Guntur Bypass Road**
5. **Bhagyanagar 4th Lane Road**
6. **CSR Sarma College Road**

Strategy 5

TRAFFIC ENGINEERING AND MANAGMENT

- Junction Improvements
- Traffic Management Plans
- Parking Proposals

JUNCTION IMPROVEMENT PLANS

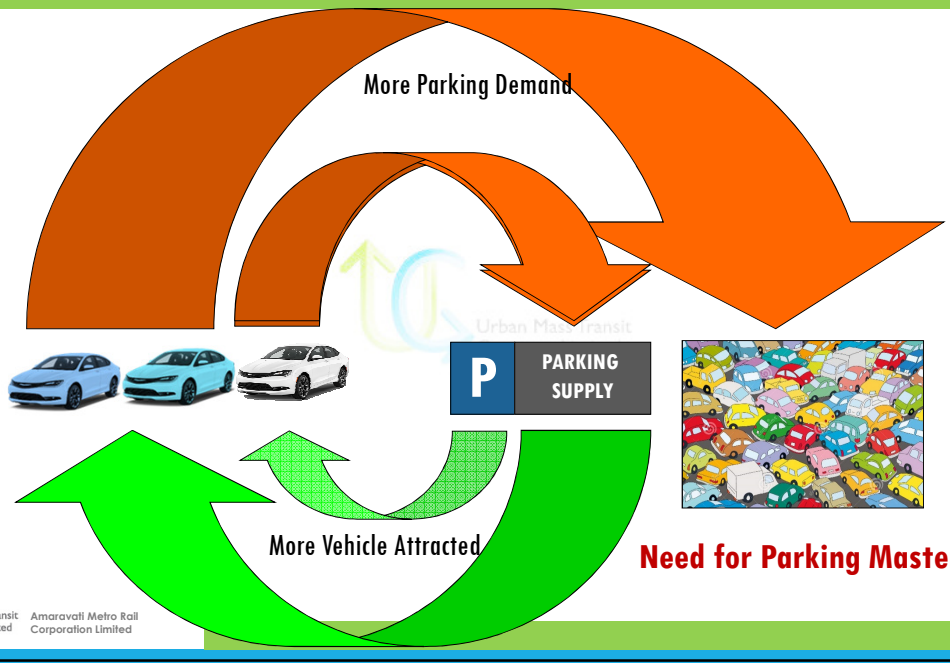


16 JUNCTIONS for Immediate Improvement considering Geometric Design and Pedestrian Safety Parameters

1	Ongole Bypass Junction	9	NTR Statue Junction
2	NH5 Guntur Road	10	KP Road Junction
3	Outer Ring Road – FCI Road Intersection	11	Kothapatnam Bus Stand Junction
4	Tobacco Board Junction	12	Mastan Dargah Circle
5	Kargil Petrol Bunk Junction	13	Bandlametla Junction
6	SP Office Pandaripuram Junction	14	Chruch Center
7	Bus Stand Intersection	15	Bhagyanagar 4th lane Junction
8	Satyanarayana Puram 60'.0" & 40'.0" Kurnool Road Junction	16	Mangamur Donka Junction

PARKING MANAGEMENT

Source: ITDP-Presentation Vibrant Gujarat



Need for Parking Master Plan

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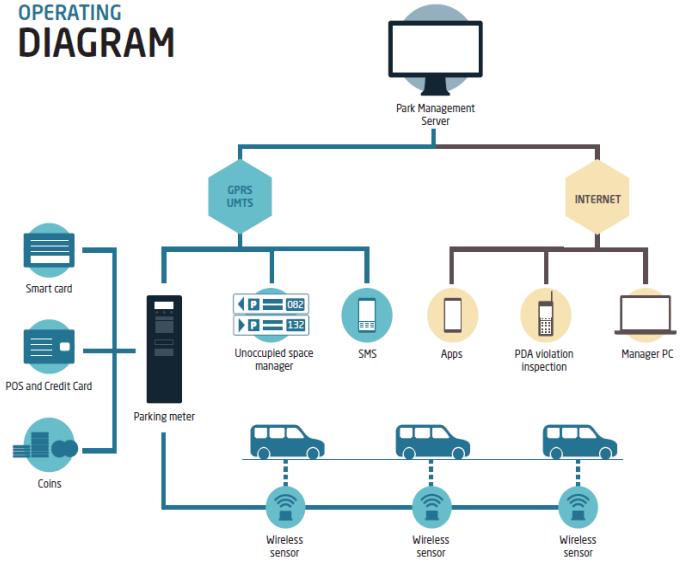
ON-STREET PARKING MANAGEMENT

OPERATING
DIAGRAM



Parking Meter

In-road Parking Sensor

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ON-STREET PARKING MANAGEMENT

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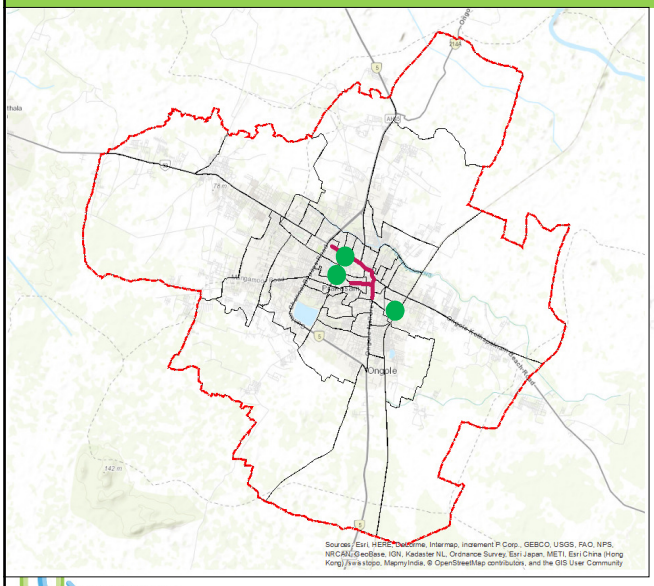
ON-STREET PARKING MANAGEMENT



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OFF STREET PARKING

No	Location	Area (m^2)	ECS (Proposed)	TYPE
1	Gandhi Road	1750	70	Surface
2	Chinakurthy Road	750	30	Surface
3	Trunk Road Near KP Complex	1350	50	Surface

ON STREET PARKING

No	Location	Length (m)	Type
1	Ongole Railway Station Parking Area	1000	30 Degree Angular
2	Ongole Bus Stand Parking Area	500	MCLP
3	Parking Near Gandhi Park		30 Degree Angular

INTELLIGENT TRANSPORT SYSTEMS

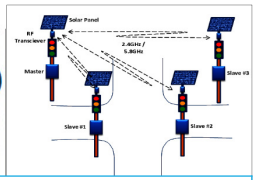
1 Advanced Traveller Information Systems (ATIS)

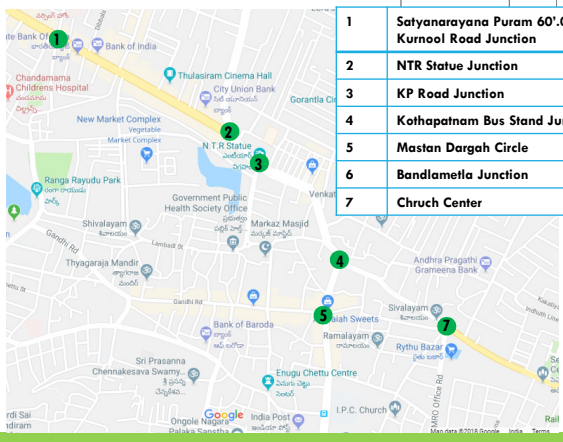
Provides users of transportation systems travel related information regarding routes, estimated travel times etc.

Proposed to RTC Complex, Kotipalli Bus Stand, Gokavaram Bus Stand and Bus Stops.

2 Vehicle-Actuated Control Systems (VACS)

Signals controlled by traffic demand, obtained from detectors





1	Satyanarayana Puram 60'.0" & 40'.0" Kurnool Road Junction
2	NTR Statue Junction
3	KP Road Junction
4	Kothapatnam Bus Stand Junction
5	Mastan Dargah Circle
6	Bandlametla Junction
7	Chruch Center

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VEHICLE TECHNOLOGIES

80% Buses are proposed to be **Diesel (BS-IV) Buses** and **20% Buses** are proposed to be **Electrical Bus.**

E-rickshaws are highly recommended in the city along with CNG Vehicles. As a part of the old city rejuvenation, **only E-Rickshaws shall be allowed to ply in the core** area to provide connectivity during the restricted vehicle hours.

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Strategy 6

FREIGHT MANAGMENT

- Freight Policy
- Freight Terminals

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FREIGHT STRATEGY

Proposed Truck Terminals

S. No	Name of the Junction
1	Near Thorvagunta along Guntur Bypass
2	Near Pernamitta along Kurnool Road

Existing Goods Parking along the Highway

Envisioned Truck Terminal Facilities

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COMMENTS AND SUGGESTIONS

IMPACT ON TRAVEL CHARACTERISTICES		Public Transport	Intermediate Public Transport	Private Modes	Non-Motorised Modes	Average Network Speed	Average V/C Ratio
Base Year (2018)		4%	32.6%	45%	18.4%	25.7 kmph	0.97
Business as Usual Scenario (2038)	Similar growth patterns with ongoing projects	1%	40%	57%	3%	18.2	1.40
Sustainable Urban Transport Scenario (2038)	Sustainable Improvements in PT, NMT, Freight and Network	30%	14%	19%	37%	27	0.87

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PROJECT PRIORITIZATION

PHASE-1	PHASE-2	PHASE-3
SHORT TERM PROJECTS (2018-2023)	MEDIUM TERM PROJECTS (2023-2032)	LONG TERM PROJECTS (2032-2038)
Junction Improvements	Upgradation of Existing Roads	Development of New Links Rail Over Bridges
Footpath	Flyover	
Bicycles Stands	Shared Cycle Tracks	
Bus Shelters	Dedicated Cycle Tracks	
Improvement of Existing Bus Terminals	New Bus Terminal	
Parking Management Plan	Improved Bus System	
Improved Bus System	Proposed Truck Terminals	
	Off-Street Multi-Level Parking	
	ITS Systems	

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TOTAL PROJECT COST (As per 2018 prices)

Sl.No	Projects	Total Cost (Rs in Crores)	Phasing (Rs in Crores)		
			2018-2022	2022-2032	2032-2038
1	Improvement of Road Network	304.34	9.60	187.02	116.95
2	Improvement of Non-Motorised Transport Facilities	102.03	99.41	2.80	0.00
3	Improvement of Public Transport System	85.03	69.41	13.07	2.55
4	Improvement of Freight Transportation System	38.21	0.00	16.98	21.23
5	Intelligent Transportation System Facilities	44.79	10.82	19.06	6.37
6	Improvement of Parking Facilities	0.72	0.46	0.26	0.00
Overall LCMP Proposals		575.11	189.71	239.20	147.09

Urban Mass Transit Company Limited Amaravati Metro Rail Corporation Limited

COMMENTS AND SUGGESTIONS

COMMENTS AND SUGGESTIONS FROM MEMBERS/ STAKEHOLDERS…

Urban Mass Transit Company Limited

Thank You

Urban Mass Transit Company Limited

Urban Mass Transit Company Limited

2nd Floor, Corporate Tower, Ambience Mall, Gurgaon 122002 .

Ground Floor, Mani Mansion, Behinde Tarnaka Welfare Assossiation, Tarnaka, Secunderabad 500017

Tel: +91 1244716300 Fax: +91 124 4716248

Email: umtc@ilfsindia.com Website: www.umtc.co.in

Amaravati Metro Rail Corporation Limited

Amaravati Metro Rail Corporation Limited (AMRCL), H.No. 40-3-8,

Gummadi Rao Street, Labbipet, Vijayawada

Urban Mass Transit Company Limited

2nd Floor, Corporate Tower, Ambience Mall, Gurgaon 122002 .

Ground Floor, Mani Mansion, Behinde Tarnaka Welfare Assossiation, Tarnaka, Secunderabad 500017

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