Comprehensive Mobility Plan for Various Cities of Punjab State (Package – I)

Amritsar City

Draft Final Report

March 2012
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Figure 17.1 : Comparison of Total Emission (gm) in Amritsar

ANNEXURES
EXECUTIVE SUMMARY

E1 The study on preparation of Comprehensive Mobility Plan for Amritsar has been initiated by Punjab Municipal Development and Industrial Corporation (DMDIC). The study is supported by funds from JNNURM, Ministry of Urban Development and Government of India. The Amritsar Municipal Corporation is the main stakeholder. The study is being carried out by M/s Consulting Engineering Services (I) Private Limited, New Delhi (CES) in association with Systra MVA Consulting (I) Private Limited, Navi Mumbai. The summary of Draft Final Report is presented.

E2 A comprehensive study methodology has been devised and followed in the preparation of CMP for Amritsar. It comprises 6 modules detailed into a number of activities and tasks. The modules and activities are discussed in detail in the Inception Report.

E3 The Study Area is the Amritsar Local Planning Area (LPA) as defined in Amritsar Master Plan (Draft, 2010). It extends over 1394.19 sq.kms and contained a population size of 2.02 million (2011, est.). It includes Amritsar Municipal Corporation, 4 Urban Settlements and 310 Rural Settlements. The Study Area is identified into 77 Traffic Analysis Zones (TAZ). The external areas are identified into 34 TAZs.

E4 Amritsar City is one of the largest cities of the Punjab state in India. It is the administrative headquarters of the Amritsar district. The city is well known as spiritual center for the Sikh religion. It is home to Golden Temple (Harmandir Shahib) the spiritual and cultural center for the Sikh religion. This important Sikh shine attracts 1,00,000 visitors on week days. The Ram Tirath in Amritsar is near and dear to Hindus as it is believed that the twin sons of King Rama lived here. The other places of interest includes; Jallianwala bagh, Wagha Border, Durgiana Temple, Gurudwara Baba Attal, Gurudwara Baba Deep Singh, etc.

E5 Amritsar city lies in the main Grand Trunk Road (G.T.Road) from Delhi to Amritsar connecting to Lahore in Pakistan. The G.T.Road runs through the whole of the northern half of the Indian subcontinent. The road network of the Amritsar City is radial-cum-circumferential covering an area of 139 sq. km. The total road length is about 525 km as per the city development plan of Amritsar. This city is well connected to Delhi, Mumbai, and Kolkata by an extensive network of rail system. Amritsar city provides Air connectivity to major Indian cities, as well as international cities such as Birmingham, Toronto, Dubai, Singapore, Tashkent, London etc. from Sir Guru Ramdas Jee(Old name Raj Sansi) International Airport. More than 100 domestic and international flights are operated during a week.

E6 The future urbanisable area required is calculated assuming gross developed area density and the immense growth potential of Amritsar city. Considering gross developed area density of 125 persons per hectare for Amritsar (M.C.) including Rajasansi and
Jandiala, the future urbanisable area required is 16,594 hectares in 2031. In the two settlements of Rayya and Majitha the gross density considered is 75 persons per hectare with required urbanisable area 353 hectares and 263 hectares respectively. Therefore, the total proposed urbanisable area is 17,210 hectares in 2031. A comparative scenario of land use in Amritsar M.C. of the developed area is given in Figure.

E7 In order to rationalize the growth and to ensure provision of adequate parking and other supportive infrastructure, it is proposed to permit mixed land use development along the major road network. This includes: Outer Ring Road (R1), Middle Ring Road (R2), City Ring Road (R2), Other Roads (R2 & R3), all other roads falling in the category of R2 and R3 will have mixed land use zone of 500 meters on either side of the road in the portion falling between the municipal limits and the Local Planning Area boundary in order to regulate/ minimize the haphazard and unplanned growth along these roads.

E8 All the categories of vehicles, except the buses/ mini buses, have shown considerable increase in their numbers during the period 2005-2006 to 2009-2010. There is considerable growth in the number of 2-wheelers and 3-wheelers in the city since the year 2005-2006. Increasing vehicles is a concern for transportation related issues in the city.

E9 The expenditure on transport is higher than the expenditure either on housing or education or on health. It is next only to expenditure on food, which is a cause for concern. The probable reason for this high expenditure on transport (about Rs. 2090 per household), is absence of adequate Public Transport service in Amritsar City. The travel by private modes or even by IPT involves higher expenditure, when compared to mass public transport system.

E10 CMP programs play an important role on promoting tourism in Amritsar. For a tourist, accessibility to places of interest and connectivity are important. As tourists are of different income levels, the city transport services must meet the needs of all groups and interests. The Transport Network Plan proposed in the CMP connects all places of tourist
E11 Appreciation of a city’s transport system and traffic characteristics is the first essential step to plan for its future development and operation. As part of CMP, extensive surveys and studies were carried out in Amritsar. The surveys conducted include, road network inventory, speed & delay, traffic volume count at outer, Inner & screenline, mid-block volume count, Origin& destination survey, Intersection Turning Movement count, Household Interview survey.

E12 The Right-of-way ranges between 10 m to 60 m. 71% of the road length has less than 30m ROW. 60% of the road length has less than 15m carriageway (average) width. 40% of the roads have undivided CW. 93% of roads have no service roads. On-street parking is predominant (over 63% of road length) resulting in capacity reduction. Pavement condition ranges from good to very good (50%). Pedestrian facilities are either poor or absent. 87% of road length has no footpaths. Road markings are not adequate. 37% of roads have no markings. Road signages are poor, 59% have no signage.

E13 The average speed ranges between 11 and 40 kmph on arterial roads and between 8 and 30 kmph on sub arterial roads. Only 12% of arterial roads have speeds of 40 kmph and above. 50% of sub arterial roads have speeds less than 20 kmph. Divided CW roads have higher speeds compared to undivided CW roads.

E14 The average household size was 5.47 amongst TAzs. If ranged between 4.5 and 6.4. The literacy rate is moderate (81.9%). The high share of illiterates calls for a major thrust in education program including provision of physical infrastructure. Weighted average monthly household income was moderate at Rs. 17,392. It ranged between Rs. 8,533 to Rs. 55,504 amongst the 65 wards in AMC. “Food” (25.3%) and “Transport” (14.2%) account for a major share of household. If 10% of household income is taken as affordable expenditure on “transport”, then the actual expenditure is very high.

E15 A total of 14,20,158 person trips were generated in AMC on an average day. The mobility rate (per capita trip rate [PCTR]) works out to 1.20 including “walk” trips and 0.88 excluding “walk” trips. “Walk” trips accounted for nearly 27% of all trips. Auto Rickshaws play a major role in modal share (22.03%). Share of Bus was very low (4.64%). “Cycle trips accounted for 12%.

E16 The overall vision of the Comprehensive Mobility Plan for Amritsar is to “Plan, Develop, Operate and Manage an Integrated Multi-Modal Transport System (IMMTS) for the LPA of Amritsar which is efficient, inclusive, affordable, safe, sustainable and which enhances the brand image of Amritsar as a “World Class City”.

E17 Restructure the city development pattern from a radial, mono-nuclear into a radial-cum-corridor, nodal, multi-nuclei one. Increase the arterial/sub-arterial road multifold (from 499.4 Lane km to 1861 lane km). Double the share of Public Transport modes from 30% to 60%. Of the Public Transport share, increase the share of Public Mass Transport System (PMTS) from 4% to 40%. Plan and operate modernized, medium capacity, public mass transport technology systems of about 233 Km. Construct and Operate
multi-storied parking complexes (about 17Nos). Double the average journey speed of traffic on arterial roads/corridors.

E18  To enable to evaluate and select the optimal development growth pattern, 3 alternate development growth scenarios (DGS 1 to 3) are conceptualized. DGS 1: Master Plan Scenario, DGS 2: Poly Nodal scenario, and DGS 3: Nodal cum corridor scenario. To support and service the conceptual development growth scenarios, 5 alternative Transport Network and Systems (TNS 1 to 5) have been conceptualized. They are, “Do Nothing”, “Master plan Transport system”, “Master plan Transport system Moderated, “High Capacity Bus System (BRTS), and “High Capacity rail Road System (LRTS)”.  

E19  The base year model has been calibrated. The model is then forecasted for Horizon year (2031). The model has been forecasted for three development growth scenarios and five transport system alternative scenarios. In all, total fifteen scenarios has been prepared. The assumptions made in the future year critical sections (Year 2031) are; capacity increase by 10 %, network change-Outer ring roads, peak factor 9 %, light goods vehicle increase by 2 times, heavy goods vehicle increase by 2 times and special generator increase by 3 times. Based on the various out puts received from the model, the scenarios have been prioritized based on Indexation. The DGS 3 and TNS 5 scenario has been selected for further analysis.

E20  The Amritsar Transport Model has predicted a modal share of 40% by PMTS. The travel demand, by 2031, will be 1.04 million trips per day. Generally in a city, on a PMTS, a trip is performed by transfer from one PMTS to another or by one route to another of the same PMTS. The trip to passenger relation is generally of the order of 1:1.5. The average trip length, on the PMTS, is estimated to be 6.52km (2031). The total travel demand, by PMTS, is estimated to be 1.56trips and 10.17 million passenger-km per day.

E21  The following corridors are identified for planning, development and operation of BRTS:  
- Corridor 1: Walled City Orbital Road (7.3 km)  
- Corridor 2: Inner Ring Road (42.5 km)  
- Corridor 3: Middle Ring Road (74 km)  
- Corridor 4: Bus Stand to Majitha along Majitha Road (15.2 km)  
- Corridor 5: Bus Stand to MRR along Fathegarh Churian Road (7.2 km)  
- Corridor 6: Lahori Gate to Middle Ring Road along Khemkaran Road (7.6 km)

E22  Light Rail Transit System is proposed along the following corridors.  
- **Line 1**: Green Line - From Transport Nagar (Lahorimal) to Jandiala via Bus Stand along NH-1 (34.1Km)  
- **Line 2**: Red Line - Verka to Mandiala Industrial via Bus Stand and Through Walled City along NH-15 (17.5 km)  
  (Note: The Stretch through Walled City will be underground)  
- **Line 3**: Yellow Line - Bus Stand to Airport along Ajnala road (11.5km)
E23 The Road Network hierarchy includes 8 (eight) levels, designated as R1 to R8. R1 and R2 roads cater to intercity (National and International) traffic. R3 to R8 roads meet the traffic requirement within the city while R7 and R8 are dedicated to cycle and pedestrian traffic. The 11 radial roads, starting from Orbital road around walled city, are classified as arterial roads and are proposed to be upgraded. It is proposed to develop the southern stretch of bye-pass road, to complete the orbital system and re-designate as Inner Ring Road. Amritsar Master Plan (Draft) has proposed the Middle Ring Road (MRR) development. The same is accepted and included. To improve the quality of and balance in the road network nine missing links are identified for new construction/upgrading. They are to be planned and managed as sub-arterial roads. As a policy, the major wholesale markets need to be shifted out to the proposed Integrated Freight Complex (IFC) /Transport Nagar on a time bound basis. All streets are to be reconstructed to provide priority for movement of pedestrians and NMTs with utmost safety.

E24 It is recommended that all the major intersections are signalised and then be linked and integrated and brought under a central Area Traffic Control scheme (ATCs). SSSS chowk, Putligarh chowk is proposed to be improved immediately. The 23 important intersections where grade separators, based on traffic intensity in 2032, may be necessary are prioritized. Flyovers are proposed at 6 locations. 16 ROB’s/RUB’s are proposed for improvement/ new construction.

E25 In Amritsar, walk is an important mode of travel. With the affordability levels still very low, walking has become the means of mobility for a large number of people. While with increasing income levels, the share of walking trips would come down, walking as a mode still would be the choice for a large number of people. Walking in Amritsar, accounts for a share of 26.75% of all trips. Per Capita Trip Rate (PCTR), including persons of all age groups, works out to 1.2 (with walk trips) and 0.88 (without walk trips). The average trip length of ‘Walk’ trips is 1.65 km. The ‘Walk’ trip demand expressed in terms of trip-kms is 6,27,020 pkm compared to 56,29,393 by motorized modes. ‘Walk’ trips upto 1.0 km in length accounted for a large share (77%) of all ‘walk’ trips. Trips longer than 2 km accounted for 6.2%. This indicates the need for providing a better walking environment than to expect transfer to other modes.

E26 The Short Term Plan, proposed as an important component of CMP, focuses attention of a provision of pedestrians and NMT facilities. Following improvement proposals are provided in order to ensure pedestrian safety: provision of footpath, of required minimum width, along 20 identified road stretches, summing up to 67 km in length, modification in traffic signal plan to accommodate the pedestrian phase at Albert Road Junction, Ram tirath Junction, Putligarh Junction and Neroda Chowk, and owing to the high pedestrian movement across Old G.T Road near the Crystal Chowk, mid-block pedestrian crossing of 4 m wide is proposed. Blinker signals have been proposed to be provided at zebra crossing across Old G.T Road in between bhandari Bridge and railway station to alert vehicular traffic. Pedestrian grade Separated facilities are proposed at 23 locations.
E27 Bicycles and Cycle Rickshaws form the main NMV modes serving passenger trips. In Amritsar their share is reasonable. Bicycles account for a share of 11.15% and cycle Rickshaws for 2.53% of passenger trips generated. Together they cater about 1,94,337 trips on an average day. NMV Lanes are proposed along all arterial and sub arterial roads. Where the road ROW is constrained, then NMV lane may be integrated with footpaths with innovative design features.

E28 Terminals need to be planned, developed and managed with care and sensitivity. 3 directional Inter State Bus Terminals, of 5 ha each, as proposed at: between MRR and IRR along Pathankot Road (NH 15), at Jandiala Urban Node along Jalandhar Road (NH-1), between IRR and MRR, along Tarn Taran road in the Industrial Area.

E29 In Amritsar, at the Outer Cordon, 14,856 goods vehicles, of various types, entered and exited, on an average day. A total of 50,280 tonnes of goods moved in and out of Amritsar on an average day. A legal organization which may be called as the ‘Amritsar Integrated Freight Complex Corporation (AIFCC)’ may be set up with equity contribution by AMC, Government of Punjab and the stakeholders. 4 IFCs are proposed at the following locations: at Lahorimal, between MRR & ORR (Extend : 200 ha), at Mudhal Near Verka, along NH-15 - between MRR & ORR (Extent 100 ha), at Rayya Node, along NH-1 (Extent 100 ha), and at Industrial use Zone, along NH-15 (Extent 100 ha).

E30 The Policy and programs need to be implemented over a long period with continuity and consistency. Proper institutional framework is important. Presently the Amritsar Municipal Corporation is the only city based institution looking after one component of the total transport system that of city road construction and maintenance. Immediately to streamline the city bus operations, Amritsar Bus Transport Service (ABTS) Company may be set up to operate and manage to city bus services. It is recommended that Amritsar Unified Metropolitan Transport Authority (AUMTA) may be constituted, with necessary statutory backing, to plan, develop, operate and manage the transport system of Amritsar. A Transport Engineering and Management Unit (TEMU) as one of the functional technical departments of AMC need to be established. A number of special vehicles, under PPP mode, may be set up to develop, operate and manage a number of components of CMP like Integrated Freight Complexes, Terminals, Parking Complexes, etc. Intensive traffic management of the road and transport system is very important to optimize the investments made, ensure efficient services and promote safety. It is suggested that Amritsar Traffic Management Group (ATMG) comprising representatives of Municipal Corporation (Engineering Wing), Head of TEMU. To overcome the resource constraints, and to ensure availability of money at the right time, it is recommended that the ADA or the Govt. of Punjab may set up Amritsar Transport Development Fund (ATDF).

E31 The city management should be alert and equipped to minimize the impact of disaster if it should take place. The types of disasters are earthquake, flooding, fire, terrorism, etc. Amritsar has the potential to be a victim if any of them and hence needs to be vigilant. The city transport system needs to be disaster proof and needs to play a critical role in relief operations post disaster.
E32 There is a need to formulate a comprehensive parking policy for Amritsar. The parking policy needs to be use-wise such as, Central Commercial Areas, Institutional Areas, Industrial Areas, Wholesale Markets, Warehousing Areas, Recreational Areas and Residential Areas. Amritsar will contain about 12 lakh two-wheelers and 1.5 lakh cars. This will be a large number demanding space for parking both at residential and activity ends. All on-street parking, where permitted, should be clearly identified, fee prescribed and charged.

E33 The Amritsar CMP has been prepared in the framework of NUTP and the objectives of CMP.

E34 A general programme, including phasing, is suggested to meet the immediate problems and fit into long range needs. The phasing has been developed on an appreciation of inter-sectoral priorities under overall policy framework for development of Amritsar and its urban transport system. The IMMTTP is proposed to be implemented in 4 phases, each of 5 years, and are conterminous within 5 year plans, starting from year 2012-2017 to 2027-2032.

E35 The cost of implementation of IMMTTP is estimated to be Rs.79,025.9 million over a 20 year period. A development programme in 4 phase periods has been formulated.
Chapter 1.0 : Introduction
CHAPTER 1.0

INTRODUCTION

1.1 The Study

The study on preparation of Comprehensive Mobility Plan for Amritsar has been initiated by Punjab Municipal Infrastructure Development Company (PMIDC). The study is supported by funds from JNNURM, Ministry of Urban Development and Government of India. The Amritsar Municipal Corporation is the main stakeholder. The study is being carried out by M/s Consulting Engineering Services (I) Private Limited, New Delhi (CES) in association with Systra MVA Consulting (I) Private Limited, Navi Mumbai.

1.2 Objectives of the Comprehensive Mobility Plans (CMP)

Module 1: Comprehensive Mobility Plans (CMPs) – Preparation Toolkit, Ministry of Urban Development and ADB (August 2008), notes that the ultimate objectives of a Comprehensive Mobility Plan (CMP) is to provide a long-term strategy for the desirable mobility pattern of a city’s populace and lists the other main objectives as under:

1. To provide a long-term vision(s) and goals for desirable urban development in the city
2. To illustrate a basic plan for urban development and include a list of proposed urban land use and transport measures to be implemented within a time span of 20 years or more; and
3. To ensure that the most appropriate, sustainable and cost effective implementation program is undertaken in the urban transport sector.

The tool kit further lists the main features of CMPs as under:

1. To optimize the mobility pattern of the people and goods rather than of vehicles;
2. To focus on the improvement and promotion of public transport, NMU’s and pedestrians, as important transport modes in Indian cities;
3. To provide a recognized and effective platform for integrating land use and transport planning; and
4. To focus on the optimization of goods movement

The key outcomes of CMPs are:

- Statement of Vision and Goals with a preferred form of urban growth
- List of proposed measures and projects
- List of priority projects with project sheets
1.3 Study Methodology

A comprehensive study methodology has been devised and followed in the preparation of CMP for Amritsar. It comprises 6 modules detailed into a number of activities and tasks. The modules and activities are discussed in detail in the Inception Report.

1.4 Study Area

The Study Area is the Amritsar Local Planning Area (LPA) as defined in Amritsar Master Plan (Draft, 2010). It extends over 1394.19 sq.kms and contained a population size of 2.02 million (2011, est). It includes Amritsar Municipal Corporation, 4 Urban Settlements and 310 Rural Settlements. The area and population distribution in the study area is as under:

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Component</th>
<th>Area (Sq.km)</th>
<th>Population (Million) (2011, est.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Amritsar MC</td>
<td>142.37</td>
<td>1.274</td>
</tr>
<tr>
<td>2.</td>
<td>Rajasansi (NP)</td>
<td>15.51</td>
<td>0.015</td>
</tr>
<tr>
<td>3.</td>
<td>Majitha (MCI)</td>
<td>3.87</td>
<td>0.015</td>
</tr>
<tr>
<td>4.</td>
<td>Jandiala (MCI)</td>
<td>14.54</td>
<td>0.028</td>
</tr>
<tr>
<td>5.</td>
<td>Rayya (NP)</td>
<td>6.55</td>
<td>0.016</td>
</tr>
<tr>
<td>6.</td>
<td>Villages (Rest of LPA)</td>
<td>1211.35</td>
<td>0.668</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1394.19</td>
<td>2.016</td>
</tr>
</tbody>
</table>

1.5 Traffic Analysis Zones

The Study Area is identified into 77 Traffic Analysis Zones (TAZ). The external areas are identified into 34 TAZs.

1.6 Reports Submitted

Since the start of the study, the following reports have been submitted:

1. Inception Report (details the study objectives, scope and methodology)
2. Interim Report (details the surveys carried out, the traffic and travel characteristics and other features of the Study Area)
3. Short Term Plan (identifies the short term improvement plans with focus on pedestrians, public transport, parking and traffic management)

1.7 Stakeholders Meetings and Presentations

A number of meetings have been held with the office of the Amritsar Municipal Corporation and presentations made to them as detailed in Annexure 1.1.
1.8 Report Structure

This Draft Final Report (DFR) details the proposed Comprehensive Mobility Plan for Amritsar. The report, apart from the Introduction Chapter, includes 17 other chapters which present the different components of the CMP as under:

PART I: EXISTING SITUATION

Chapter 1.0 : Introduction
Chapter 2.0 : City Profile
Chapter 3.0 : Review of Land Use System
Chapter 4.0 : Existing Transport System
Chapter 5.0 : Analysis of Existing Traffic / Transport Situation

PART II: DEVELOPMENT OF URBAN LAND USE AND TRANSPORT STRATEGY

Chapter 6.0 : Development of Vision and Goals
Chapter 7.0 : Future Urban Growth Scenario
Chapter 8.0 : Future transport network Scenarios
Chapter 9.0 : Development of Urban Land Use and Transport Strategy

PART III: PLANS AND PROJECTS

Chapter 10.0 : Public Transport Improvement Plan
Chapter 11.0 : Road Network Development Plan
Chapter 12.0 : NMT Facility Improvement Plan
Chapter 13.0 : Inter Modal facilities
Chapter 14.0 : Regulatory and Institutional measures
Chapter 15.0 : Fiscal measures
Chapter 16.0 : Mobility Improvement Measures and NUTP Objectives
Chapter 17.0 : Environmental and Social Considerations

PART IV: IMPLEMENTATION PROGRAMS

Chapter 18.0 : Implementation programs

ANNEXURE

Survey Data
Details of Traffic Demand Modeling
Project Profile Sheets
Minutes of Stakeholders Consultation
CHAPTER - 2.0

CITY PROFILE

2.1 General Background

Amritsar City is one of the largest cities of the Punjab state in India. It is the administrative head quarters of the Amritsar district. The city is well known as spiritual center for the Sikh religion. It is home to GOLDEN TEMPLE (Harmandir Shahib) the spiritual and cultural center for the Sikh religion. This important Sikh shine attracts 1,00,000 visitors on week days. The Ram Tirath in Amritsar is near and dear to Hindus as it is believed that the twin sons of King Rama lived here.

The city of Amritsar is a trading city of the state of Punjab. The city has traditionally been a trade link to central Asia, Europe and China for the Indian subcontinent.

2.2 Geography & Climate

Amritsar is located at 31.63° N 74.87° E with average elevation of 234 meters. It has a semiarid climate and experiences four seasons primarily: winter (November to March), summer (April to June), monsoon (July to September) and post-monsoon season (September to November). Annual rain fall is about 681 millimeters.

2.3 Transport

Amritsar city lies in the main Grand Trunk Road (G.T.Road) from Delhi to Amritsar connecting to Lahore in Pakistan. The G.T. Road runs through the whole of the northern half of the Indian subcontinent; connecting Peshawar, Pakistan to Sonargaon, Bangladesh. NH -1 connects the city to Jalandhar and NH-15 links the region with Tarn Taran District towards Southern side. These two national highways connect the city to other nearby urban centers. The road network of the Amristar City is radial-cum-circumferential covering an area of 139 sq. km. The total road length is about 525 km as per the city development plan of Amritsar.

This city is well connected to Delhi, Mumbai, and Kolkata by an extensive network of rail system. Amritsar city provides Air connectivity to major Indian cities, as well as international cities such as Birmingham, Toronto, Dubai, Singapore, Tashkent, London etc. from Sir Guru Ramdas Jee (old name Raj Sansi) international Airport. More than 100 domestic and international flights are operated during a week.
2.4 Socio-Economic Profile

Amritsar is mainly a trade and religious tourism centre. It is one among the 20 focal point industrial estates identified by State Government of Punjab. The commercial activities include carpets, fabrics, farm produce, handicrafts, service trades and light engineering.

2.4.1 Demographic Profile

The 2001 Census of India reported the population of the city of Amritsar to be 10.11 lakh, giving it metropolitan status. The city has witnessed high rate of international migration mostly to countries like Canada, USA, UK, Singapore etc., The disturbances the city experienced, also negatively affected the growth prospectus. However, during 1991 to 2001, the rate of growth has been high. Figure 2.2 presents population in Amritsar Municipal Corporation from 1901 to 2001.

![Figure 2.2: Population in Amritsar MCA 1901-2001](source: CDP Amritsar - 2025)

Sikhism is the main religion followed in Amritsar with Hindus and other religions minorities. Males and females constitute 55% and 45% of the population, respectively. Amritsar has an average literacy rate of 77.2% (National average 59.6%). The main spoken language in Amritsar is Punjabi dialect of Maajhi. Other languages spoken in the city are English and Hindi.

Decadal growth of population in Amritsar is shown in Table 2.1
Table 2.1: Decadal Growth of Population in Amritsar 1881 - 2001

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TOTAL POPULATION</th>
<th>DECADAL VARIATION IN %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1881</td>
<td>1,51,896</td>
<td>11.84</td>
</tr>
<tr>
<td>1891</td>
<td>1,36,766</td>
<td>-10.87</td>
</tr>
<tr>
<td>1901</td>
<td>1,62,429</td>
<td>18.77</td>
</tr>
<tr>
<td>1911</td>
<td>1,52,756</td>
<td>-05.96</td>
</tr>
<tr>
<td>1921</td>
<td>1,60,218</td>
<td>04.88</td>
</tr>
<tr>
<td>1931</td>
<td>2,44,840</td>
<td>65.30</td>
</tr>
<tr>
<td>1941</td>
<td>3,91,211</td>
<td>47.64</td>
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<tr>
<td>1951</td>
<td>3,36,114</td>
<td>-14.64</td>
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<td>1961</td>
<td>3,90,055</td>
<td>16.05</td>
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<td>1971</td>
<td>4,54,805</td>
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<td>1981</td>
<td>5,94,844</td>
<td>30.79</td>
</tr>
<tr>
<td>1991</td>
<td>7,08,835</td>
<td>19.16</td>
</tr>
<tr>
<td>2001</td>
<td>10,11,327</td>
<td>42.67</td>
</tr>
</tbody>
</table>

Source: CDP Amritsar - 2025

2.4.2 Work Force Participation

In the period of 1971-2001, the number of total workers has increased almost three times from 1,22,038 to 3,22,214. The work participation rate according to Census of India 2001 is 34.33 %. Around 89 % of the people are engaged in the secondary and tertiary sector / service sector.

The following percentage distribution of major activities has emerged for Amritsar according to the study conducted by the “Economic Intelligence Services, Centre for monitoring Indian Economic Private Limited”:

- Primary activities 9%
- Industrial activities 32%
- Service activities 59%

It can be observed that service activities pre-dominate in Amritsar.

2.4.3 Trade and Commerce

Trading sector absorbs 59% of the workforce. The important retail and wholesale business centers in Amritsar are Talhi, Sahib Bazaar, Katra, Jamalsingh, Majith Mandi, Hall Bazaar, Shastri market and Kathan Bazaar etc.

Amritsar is also one of the biggest grain markets in Punjab. The important items include wheat, maize, gram, rice and gur. The city is also famous for rich cuisine and milk products.
2.4.4 Industries

The main industries of Amritsar are wool, cotton and textile mills as well as dairy and light engineering works. Farming is a major employer in the region producing crops including cotton, barley, oilseed, pulses, potatoes, rice, sugarcane, wheat and tobacco.

Amritsar has witnessed several historical events leading to changes in the character of the city over the years.

2.4.5 Heritage Resources

The city of Amritsar has developed around the most sacred religious place for the Sikhs, namely the Golden Temple. The 12 gates in the city wall are the entry points to a rich heritage zone composed of katras, courtyard houses, bustling bazaars. The other places of interest includes; Jallianwalabagh, Wagha Border, Durgiana Temple, Gurudwara Baba Attal, Gurudwara Baba Deep Singh, Ram Tirath Temple etc.

2.4.6 Other Amenities

The city has one major university, Guru Nanak Dev University, one medical college, two Dental colleges, 10 higher educational establishments and around 200 schools. City also has 15 hospitals, 26 clinics, 9 public libraries and 2 stadiums.
Chapter 3.0 : Review of Land Use System - Overview of Master Plan Amritsar (2010-2031)
CHAPTER - 3.0

REVIEW OF LAND USE SYSTEM - OVERVIEW OF MASTER PLAN AMRITSAR (2010-2031)

3.1 Introduction

The Master Plan for Amritsar comprises Local Planning Areas (L.P.A.) covering area of 1394.19 sq.km, with a total population of 16,60,466 persons (Census of India 2001). It consists of Municipal Corporation Amritsar with an area 142.37 sq.km (including Amritsar Cantonment), four urban settlements namely Jandiala (M.Cl), Majitha (M.Cl), Rayya (Nagar Panchayat) and Rajasansi (Nagar Panchayat) and 310 rural settlements.

The Punjab Urban Planning and Development Authority (PUDA), has assigned the job to SAI Consulting Engineers Private Ltd. The agency has prepared the Master Plan, for the period 2010 to 2031.

3.2 Historical Background

The epic stories of Golden Temple and Jallianwala Bagh have given a unique place to Amritsar in the history of the nation. But, Amritsar positioned on hostile international boundaries, initially faced perpetual neglect and lower level of investment and development. With redrawing the boundaries in 1947, the geographical mosaic of India in general and state of Punjab in particular, underwent drastic transformation. Amritsar is a great center of trade and commerce, a magnificent seat of learning and literature, the oldest of holy Sikh places, the highest Centre of Sikh politics and the strongest post on country's northwestern frontier.

3.3 Objective of Master Plan

The preparation of Master Plan for Amritsar is under the Punjab Regional and Town Planning and Development Act, 1995 [P.R.T.P.D Act 1995 (amended 2006)], has been defined in Chapter X of the said Act.

The main objective of the Amritsar Master Plan is to formulate a long-term vision and strategy to make the L.P.A. vibrant, livable and creditworthy. It will endorse growth in the desired direction, promote economic development, improving service delivery and providing amenities to its people. Master Plan ensures rational policy choices besides providing a flexible framework based on ground realities for a defined time span. Besides rationalizing the land use pattern, the Master Plan will also facilitate the identification of sectoral investments and reform areas needed to transform the L.P.A. in Amritsar.

---

1 Amritsar Local Planning Area (LPA) has been notified under section 56 (i) of the Punjab Regional and Town Planning and Development Act, 1995 (amended 2006), vide notification no. 12/65/2006-4HGI/5599, dated 18th July, 2007. (Exercising the power vested under Section 56(7) of the Act.)
3.4 Master Plan

3.4.1 Population

The estimated population in the LPA is given in Table 3.1.

Table 3.1: Projected Population for Amritsar LPA

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Location</th>
<th>2001</th>
<th>2011</th>
<th>2021</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Amritsar (MC)</td>
<td>1016079</td>
<td>1272044</td>
<td>1598570</td>
<td>2012213</td>
</tr>
<tr>
<td>2</td>
<td>Raja Sansi (NP)</td>
<td>12176</td>
<td>15260</td>
<td>19068</td>
<td>23823</td>
</tr>
<tr>
<td>3</td>
<td>Majitha (M Cl)</td>
<td>12992</td>
<td>14953</td>
<td>17193</td>
<td>19747</td>
</tr>
<tr>
<td>4</td>
<td>Jandiala (M Cl)</td>
<td>23834</td>
<td>27909</td>
<td>32662</td>
<td>38191</td>
</tr>
<tr>
<td>5</td>
<td>Rayya (NP)</td>
<td>12631</td>
<td>15971</td>
<td>20484</td>
<td>26502</td>
</tr>
<tr>
<td>6</td>
<td>Villages in L.A.P.</td>
<td>582754</td>
<td>668489</td>
<td>772643</td>
<td>897460</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1660466</td>
<td>2014626</td>
<td>2460620</td>
<td>3017936</td>
</tr>
</tbody>
</table>

Source: Study by SAI Consulting Engineers Private Ltd.

The total population estimated for Planning Area in Amritsar is 30 lakh by the year 2031.

3.4.2 Work force

The workforce projections for nine industrial workers classification has been made for Amritsar M.C. based on the category wise employment data available from the Census 2001.

The distribution of estimated work force (main workers) in 2031 is given in Figure 3.1. Main workers consist of 30.33% of total population.

3.4.3 Infrastructure

3.4.3.1 Physical Infrastructure

Physical infrastructure consists of water supply, sewerage, storm water drainage, solid waste and power. For domestic uses UDPFI Guidelines has been used, while for non-domestic uses CPHEEO manual is comprehended. Refer Table 3.2.
### Table 3.2: Existing and Proposed - Physical Infrastructure

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit</th>
<th>2001</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water Supply</td>
<td>MLD</td>
<td>24.89</td>
<td>463</td>
</tr>
<tr>
<td>Sewerage</td>
<td>MLD</td>
<td>197</td>
<td>322</td>
</tr>
<tr>
<td>Storm Water Drainage</td>
<td>Coverage %</td>
<td>20</td>
<td>100</td>
</tr>
<tr>
<td>Solid Waste</td>
<td>MT/day</td>
<td>611</td>
<td>1006</td>
</tr>
<tr>
<td>Power</td>
<td>No. of 11 KV Stations</td>
<td>68</td>
<td>134</td>
</tr>
</tbody>
</table>

*Source: Study by SAI Consulting Engineers Private Ltd.*

#### 3.4.3.2 Social Infrastructure

Education and health are the two major components of social infrastructure. Refer **Table 3.3**.

### Table 3.3: Existing and Proposed - Social Infrastructure

<table>
<thead>
<tr>
<th></th>
<th>Existing</th>
<th>2031</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Education:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nursery School</td>
<td>191</td>
<td>628</td>
</tr>
<tr>
<td>Primary School</td>
<td>626</td>
<td>152</td>
</tr>
<tr>
<td>Sr. Sec. School</td>
<td>116</td>
<td>88</td>
</tr>
<tr>
<td>Integrated School</td>
<td>95</td>
<td>20</td>
</tr>
<tr>
<td>Handicapped School</td>
<td>--</td>
<td>46</td>
</tr>
<tr>
<td>College</td>
<td>16</td>
<td>6</td>
</tr>
<tr>
<td><strong>Health:</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>General Hospital</td>
<td>172</td>
<td>6</td>
</tr>
<tr>
<td>Intermediate Hospitals</td>
<td>--</td>
<td>80</td>
</tr>
<tr>
<td>Maternity &amp; Child Welfare</td>
<td>--</td>
<td>32</td>
</tr>
<tr>
<td>Dispensaries</td>
<td>112</td>
<td>131</td>
</tr>
<tr>
<td>Veterinary Dispensaries</td>
<td>--</td>
<td>16</td>
</tr>
</tbody>
</table>

*Source: Study by SAI Consulting Engineers Private Ltd.*

#### 3.4.4 Land use

The future urbanisable area required is calculated assuming gross developed area density and the immense growth potential of Amritsar city because of its importance as religious and cultural center, industrial and commercial hub, upcoming development spread over different parts of the city and along the major road corridors, the city is expected to grow well beyond the calculated areas.

Considering gross developed area density of 125 persons per hectare for Amritsar (M.C.) including Rajasansi and Jandiala, the future urbanisable area required is 16,594 hectares in 2031. In the two settlements of Rayya and Majitha the gross density considered is 75 persons per hectare with required urbanisable area 353 hectares and
263 hectares respectively. Therefore, the total proposed urbanisable area is 17,210 hectares in 2031.

A comparative scenario of land use in Amritsar M.C. of the developed area is given in Figure 3.2.

![Land use Amritsar M.C. 2010 and 2031](image)

**Figure 3.2: Land use Amritsar M.C. 2010 & 2031**

### 3.4.4.1 Residential

A three-tier structure for the residential area is evolved based on net density pattern. This includes:

1. High Density Residential Zone RD 1 (within walled city) with 300 Persons Per Acre
2. Medium Density Residential Zone RD 2 (Outside walled city and within urbanisable limits) with 200 Persons Per Acre
3. Low Density Residential Zone RD 3 (Area falling outside urbanisable limit) with 100 Persons Per Acre

### 3.4.4.2 Commercial

Existing commercial area has been estimated at 393.22 ha. It is proposed to develop an additional area of 436.48 ha in a planned manner with total of 830 ha which is 5% of total land use.

### 3.4.4.3 Mixed Land use

In order to rationalize the growth and to ensure provision of adequate parking and other supportive infrastructure, it is proposed to permit mixed land use development along the major road network. This includes:
1. Outer Ring Road (R1): A 500 meters deep mixed landuse zone has been proposed along the entire length of the proposed Outer Ring Road, outside/ beyond the urbanisable area.

2. Middle Ring Road (R2): A 500 meters deep mixed landuse zone has been proposed on either side of road along the portion starting from Ajnala Road to G.T Road (towards Jalandhar) in the eastern part of the Local Planning Area. Further, 300 meters deep mixed land use zone have also been proposed along the portion starting from Amritsar-Ranian Road to G.T. Road (towards Attari) in the western part of the Local Planning Area.

3. City Ring Road (R2): A 300 meters deep mixed landuse zone has been proposed on either side of the road along its entire length, starting from Daburji on G.T Road towards Jalandhar in the east to the Naraingarh on G.T. Road towards Attari. This zone will be developed on the concept of Aero-city followed in S.A.S Nagar by G.M.A.D.A. First right to develop the zone shall vest with Amritsar Development Authority.

4. Other Roads (R2 & R3): All other roads falling in the category of R2 and R3 will have mixed landuse zone of 300 meters on either side of the road in the portion falling between the municipal limits and the Local Planning Area boundary in order to regulate/ minimize the haphazard and unplanned growth along these roads.

3.4.4.4 Industrial

The proposed industrial zone includes:

1. Existing industrial development along the Majitha Road, Tarn Taran Road and Sri Hargobindpur Road.
2. Industrial Focal Point along Mehta Road, Cheharta, East of Mohan Nagar

The total area under industries in 2031 is 1825 Ha. i.e. 11% of the total land use.

3.4.4.5 Public and Semi Public

An area of 1,825.34 hectares has been proposed under Public and Semi Public land use that works out to be 11% of the future urbanisable area.

3.4.4.6 Government Land

Amritsar has 882.14 hectares of city's developed area owned by the Govt. of India. It mostly consists of land under defence. It is almost 5% of the total land use in Amritsar in 2031.

3.4.4.7 Recreation

The total area proposed under recreational use is 2,489 hectares, which works out to be 15% of the total urbanisable area of the city.
3.4.4.8 Rural and Agriculture Zone

With the objective of preserving the valuable agricultural land and maintaining rural character, non-urbanisable area falling within L.P.A. has been proposed as rural/agricultural zone. In existing land use, area under agriculture use occupies 44.46% of the total land use of the Amritsar L.P.A.

3.4.4.9 Conservation Areas

The city of Amritsar has rich heritage that needs to be preserved, conserved and promoted. There are several identified heritage structures and green spaces within the city and surroundings. A detailed survey of the city heritage needs to be carried out by an inter-disciplinary group comprises experts in order to identify its heritage. Further, effective steps needs to be taken on priority in order to conserve, preserve and promote the ambiance of the heritage buildings and the areas adjoining such buildings. Considering the special character of the walled city, special development regulations needs to be framed on priority for the walled city and construction taking place in the area in order to preserve its character and reduce further destruction.

3.4.4.10 Tourism

The major tourist destinations include:

1. Within walled city
2. Within Amritsar Municipal Corporation. This includes:
   • Procession Route of Maharaja Ranjit Singh from Ram Bagh Garden to walled city via Ram Bagh Gate
   • Heritage walks around Sri Harimandir Sahib including Gurudwara Baba Atal Sahib to Gurudwara Lohgarh
   • Lohgarh Gate to Gobindgarh and Durgiana Mandir
   • Gurudwara Ramsar to AmritSarovar (via Bibeksar, Santokhsar, Kaulsar)
3. Within L.P.A., it covers destinations such as Ram Tirath (which takes us back to the times of Ramayana), tomb at Sarai Amanat Khan and Wagha Border.
4. Regional level tourist circuits
   • Amritsar-Baba Bakala-Khadur Sahib-Goindwal-Tarn Taran-Amritsar
   • Amritsar-Dera Baba Nank- Kalanaur-Qadian-Gurdaspur-Pathankot
   • Amritsar-Tarn Taran-Hari KePattan-Goindwal Sahib-SultanpurLodhi- Kapurthala (Kanjli Lake)- Jalandhar

3.4.4.11 Traffic & Transportation

The road network in Amritsar has a distinct character dominated by a ring and radial pattern. The proposed Traffic and Transportation Plan of Amritsar L.P.A. is based on a well-defined road network of hierarchy in order to cater to the traffic needs of the urban centers and population living and working. This includes:
1. Outer Ring Road (R1) - ROW 80m
2. Inner Ring Road/ City Ring Road/ Middle Ring road (R2) - ROW 60m
3. District Road (R3) - ROW 45m
4. Circular Road around Walled city (R4) - ROW 30m
5. Distributor Roads (R5) - ROW 18m
6. Roads providing access to individual houses (R6) - ROW 12m
7. Cycle Tracks (R7) - ROW 2-5 m
8. Pavement/ Footpath for Pedestrian Movement (R8) - ROW 1.5-2.5 m

The major proposals:

1. Widening and strengthening of roads
2. Junction improvements
3. Improving public transport system
4. Construction of ROBs/ RUBs
5. Shifting the existing Bus terminal (ISBT) from within the city to Southern part of the city
6. Transport Nagar/ Truck terminal near the proposed Industrial Zone on the South Amritsar
7. Upgrading Railway Station
8. Rajasansi Airport to get a status of International Airport
9. Parking facilities
10. Pedestrianization of the Walled City

3.5 Zoning Regulations

The proposed land use plan incorporated in the Master Plan of LPA, Amritsar follows Zoning Regulations under section 57 of the Punjab Regional and Town Planning and Development Act, 1995 as amended in 2006, for the Local Planning Area, Amritsar declared under section 56 of the said Act, following the requirement under clause (d) of sub section 1 of section 70 of the said Act.

The major Land use Zoning Regulations, Amritsar L.A.P. includes:

A. Housing
B. Trade & Commerce
C. Manufacturing
D. Transport, Storage and Ware-housing
E. Offices
F. Education, Training and Research Institutes
G. Health care facilities
H. Recreation & Entertainment
I. Public Utilities & Services
J. Agriculture, Forestry and Fishing
3.6 Master Plan - Issues/ Concerns

The major concerns in the Master Plan for Amritsar include:

**Land use category incompatible with the Zoning Regulations**

The proposed land use distribution for the Amritsar city for the horizon year 2031 reflect a nine (9) class land use/ land cover analysis. In the Zoning regulations section of the same plan, there is a ten (10) class land use/ land cover provision. There is a requirement of compatibility between the two land use classifications to meet the requirement of Punjab Regional and Town Planning and Development Act.

Moreover, there is absence of clear policy for development of the Walled City, the historic old core of Amritsar city. The heritage structures; existence of mixed land use pattern within the core; huge vehicular congestion; absence of parking and others need regulation.

**Population density pattern**

The proposed population density pattern is not reflected in the proposed land use plan of Amritsar. The future urbanisable areas are along major transportation corridors. There is a requirement to prepare detailed site planning exercise with statuary provisions in these areas to prevent unplanned and unregulated future development. A multi-functional intensive land use, with mixture of residential, leisure and retail functions will be self-sustaining.

**Employment structure**

The Master Plan represents employment structure with nine category main workers classification for Amritsar Municipal Corporation. The spatial distribution and quantification of the primary, secondary and tertiary workers/ work zones needs to be identified and reflected in the Master Plan.

**Civil amenities**

Post-partition Amritsar faced with the lack of the infrastructure necessary to accommodate large number of displaced persons. This forced migration lead to emergence of several refugee camps, institutions and other available structures in insanitary conditions. The housing and construction established during the period, for the resettlement of these displaced persons, within and outside the existing settlements has continued to guide the path of development in the state till today. For optimal use of portable water supply there is requirement of water pricing policy. A policy guideline needs to be addressed.

Moreover, to tackle the urban insanitary conditions and pollution of water bodies, an integrated approach covering all works such as, internal sewerage system, sewage
treatment plants, low cost toilets, organized solid waste management and management of other hazardous wastes is necessary. Economic use of waste needs attention.

**TOD not considered**

Transit-oriented Development (TOD) is moderate to higher-density development, located within an easy walk of a major transit stop, generally with a mix of residential, employment and shopping opportunities designed for pedestrians. TOD can be new construction or redevelopment of one or more buildings whose design and orientation facilitate transit use.

There is a requirement to develop Action Area Development Plan along the Corridor Area of the transit identified corridor in Amritsar to integrate an economically efficient, socially cohesive, and environmentally sustainable transit corridor; and to provide high quality transport service to people and goods on an efficient, productive and equitable basis.

**Disaster mitigation and management**

In India, at the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. At regional level, the State Government is primarily responsible for management of disasters. The State Government has constituted a State Disaster Management Authority headed by the Chief Minister to coordinate all disaster management activities among all line departments. In terms of disaster management, city area is covered under the (Urban Earthquake Vulnerability Reduction Project) UEVRP project, which is under Govt. of India-UNDP Disaster Risk Management Programme.

There should be provisions in the Master Plan related to disaster management. All new built-up to be made earthquake resistant in the first instant. This will not add to the stock of existing unsafe buildings. This will also include mitigations related to flood, water logging, fire, defence ammunition depot and others. The concerned local bodies should keep updating the building by-laws to safeguard against disasters and ensure effective and impartial enforcement. Following policies and strategies for disaster management are proposed:

**Pre-Disaster Preparedness**

- Micro-zonation surveys should be referred for land use planning and be considered while preparing the Zonal Plans and Layout Plans.
  - Seismic micro-zonation for selected areas having high growth rates should be taken up on priority.
  - On the basis of vulnerability studies and hazard identification, which includes soil conditions, probable intensity of earthquake, physiographic conditions of the
area, fault traces, etc., local level land use zoning and planning should be undertaken.

- Building by-laws should incorporate the aspects of Multi Hazard Safety, and Retrofitting.
  - Priority should be given to public buildings (such as hospitals, educational, institutional, power stations, infrastructure, heritage monuments, lifeline structures and those which are likely to attract large congregation) for their ability to withstand earthquake of the defined intensity.
  - Suitable action should be taken for retrofitting and strengthening of structures identified as vulnerable as per earthquake manuals and National Building Code. A techno-legal regime has to be adopted for provisions on Multi Hazard Safety aspects.
- Sensitize people, particularly school children, about after effects of disaster.
- Make people aware through media campaigns and advertisements about emergency procedures and location of emergency shelters etc.

**Post Disaster Management**

It has been observed that any disaster is generally followed by break down of communication lines and disruption of essential services. Therefore, the key communication centres should be protected from natural disasters i.e. flood, fire and earthquake etc. and services restoration should be taken up on top most priority. Necessary setup should be created in each of the concerned department for such eventualities.

Standard type designs and layout should be prepared by the local bodies and made available to the people so that crucial time is not lost in approval of layout plans and building plans after disaster. Disaster Management Centres have been proposed to serve people in the case of disaster and provide emergency shelters.

**3.7 Conclusion**

Rapid urban growth has overtaken the planning process in Amritsar. Often enforcement is weak and the planning is seen as lacking capacity, leading to loss of credibility. Land use and transport planning are conducted as separate exercises, leading to new development without transport, and transport infrastructure that fails to further cities long term visions. Responsibility for land-use and transport planning is fragmented between different agencies and different tiers of government, despite recent constitutional changes aimed at rationalizing local government structures.
CHAPTER 4.0

EXISTING TRANSPORT SYSTEMS

4.1 Existing Reports and Proposals

The reports and documents reviewed by the Consultants include, City Development Plan Amritsar (CES), Comprehensive Traffic and Transportation Study Amritsar (RITES), Master Plan (SAI CE).

The proposals listed in the CDP are given in Table 4.1.

Table 4.1: List of Proposals

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Project</th>
<th>Projects Description</th>
<th>Amount (Rs. Crores)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestrianisation/ road development</td>
<td>Developing “Pedestrian friendly precincts” with the traffic being rerouted. Besides, 1.5 to 2 meter wide pedestrian pathway. 2.5 /3.0 meter wide Bicycle way and amenities, sit-outs, toilets, trees and shrubs, street vending places etc. Bus stops, Benches, Dust Bins, Splitoons, Signages and information Kiosks.</td>
<td>15</td>
</tr>
<tr>
<td>2</td>
<td>NMV Support</td>
<td>Developing “No vehicles Zones” inside the walled city, facilities for non-motorised mobility, demarcation of zones for informal activities of vendors so that traffic is not hindered.</td>
<td>10</td>
</tr>
<tr>
<td>3</td>
<td>Parking Management</td>
<td>Organised parking and multi storied parking lots to be introduced at four locations. Other places to be identified.</td>
<td>30</td>
</tr>
<tr>
<td>4</td>
<td>Visual Intrusion (Cables, poles, advertisement, etc.)</td>
<td>Making of overhead wires underground, removal of Electric / Telephone poles and street signage’s etc.</td>
<td>40</td>
</tr>
</tbody>
</table>

Development of Personal Rapid Transit (PRT) system at Amritsar, on DBOT basis is initiated by the Punjab Infrastructure Development Board (PIDB).

The PRT system is an innovative transportation system which uses automatically driven small vehicles to carry individuals or small groups non-stop from the origin station to the destination station, wherever the station lie on the network of guide ways. The Amritsar PRT project shall encompass PRT system from railway station & Bus stand to Golden Temple with 3.3 KMS length and 7 stations.

Beautification & widening of the Historical Ring Road of Amritsar, at a cost of Rs.15 crores, project was inaugurated by the Honorable Chief Minister of Punjab.
4.2 Existing Transport Infrastructure

Road

Amritsar is well connected at regional level with the road network. NH -1 connects the city to Jallandhar and NH-15 links the region with Tarn Taran District towards Southern side. These two national highways connect the city to other nearby urban centres. The city also has a good linkage to Lahore, Pakistan through Wagha Border towards the west direction. Amritsar Bus Stand is shown in Figure 4.1

Railway

The city of Amritsar is well connected by rail network with other parts of country. It is also connected to the Wagha border and Pakistan. There are total three stations located within the municipal limits of Amritsar. Amritsar Railway Station is shown in Figure 4.2

Airport

Amritsar is Punjab’s interface to the world. Being a major religious destination and also an important link of the Non-Resident Indian (NRI) population to their native land, International linkages are very important for the city. The city has an international airport, which is located on Ajnala Road, 15 km from the Amritsar Railway Station, near Raja Sansi Village. International airport of Amritsar is shown in Figure 4.3.

4.2.1 Transportation Network

The road network of the Amritsar City is radial-cum-circumferential. The total road length is about 525 km as per the city development plan of Amritsar. The G.T.
Road passes through the centre of the city connecting both ends of the National Highways bypass.

- The other important roads that connect to other parts of the city are mentioned below
- Ram Tirath Road connecting the city with Chogawan
- Airport Road connecting the city with Ajnala
- Fatehgarh Churian road connecting to Fatehgarh Churian town
- Majitha Road to Majitha town, Kashmir road leading towards Batala connects Batala, Gurdaspur, Pathankote and finally Jammu & Shrinagar.
- The G.T. Road connects Amritsar with the Wagha (Pakistan Border) on one end and to Jalandhar on the other end.
- The southern connection of the city viz. Tarn-Taran links the city to Ferozpur and parts of Rajasthan. Khem Karan Road connects the city with Khem Karan (Border)

### 4.2.2 Vehicular Growth

All the categories of vehicles, except the buses/ mini buses, have shown considerable increase in their numbers during the period 2005-2006 to 2009-2010. There is considerable growth in the number of 2-wheelers and 3-wheelers in the city since the year 2005-2006. Increasing vehicles is a concern for transportation related issues in the city. **Table 4.2** represents number of registered vehicles.

#### Table 4.2: Number of Registered Vehicles 2006 to 2010

<table>
<thead>
<tr>
<th>Type of Vehicles</th>
<th>Upto March 2006</th>
<th>Upto March 2007</th>
<th>Upto March 2008</th>
<th>Upto March 2009</th>
<th>Upto March 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auto Rickshaw</td>
<td>13,928</td>
<td>14,879</td>
<td>15,806</td>
<td>16,724</td>
<td>18,874</td>
</tr>
<tr>
<td>Buses/ Mini Buses</td>
<td>2,207</td>
<td>2,289</td>
<td>2,379</td>
<td>2,466</td>
<td>2,541</td>
</tr>
<tr>
<td>Cars</td>
<td>50,649</td>
<td>55,232</td>
<td>59,261</td>
<td>63,024</td>
<td>66,800</td>
</tr>
<tr>
<td>Jeeps</td>
<td>3,250</td>
<td>3,814</td>
<td>4,348</td>
<td>4,853</td>
<td>5,254</td>
</tr>
<tr>
<td>Two Wheeler</td>
<td>431,995</td>
<td>458,202</td>
<td>485,227</td>
<td>517,427</td>
<td>549,506</td>
</tr>
<tr>
<td>Other Vehicles</td>
<td>43,912</td>
<td>45,461</td>
<td>46,892</td>
<td>48,408</td>
<td>49,816</td>
</tr>
<tr>
<td>Total</td>
<td>545,941</td>
<td>579,877</td>
<td>613,913</td>
<td>652,902</td>
<td>692,791</td>
</tr>
</tbody>
</table>

*Source: RTO Office-Amritsar*
4.3 Public Transport System

4.3.1 Public Transport Systems

The Public Transport System in Amritsar is predominantly a road based. In addition, there is rail system for catering to long distance and intercity/interstate traffic. Further, Amritsar city has an international airport, namely “Rajasansi International Airport” also known as Guru Ram Das International Airport or Amritsar International Airport. It handles around 150 flights a week to different locations within India and abroad. The major destinations abroad include London, Toronto, Abu Dhabi, Dubai, Muscat, Sharjah, Doha, Tashkent, Ashgabat etc. Thus, conceptually the public transport systems could broadly be categorized into three sub-systems viz; Road, Rail and Air.

However, for the intra city trips in Amritsar the Intermediate Public Transport (IPT) i.e. Auto Rickshaw System is widely used as there is no formal Bus System to serve the city commuters.

Considering the special features and characteristics of Amritsar City, the transport system had to be studied in three distinct areas viz.

i) Walled City
ii) Municipal Corporation of Amritsar (Outside Walled City) and four urban settlements (Jandiala, Rayya, Rajasansi & Majitha)
iii) Villages in Local Planning Area (LPA)

4.3.2 Transport System in Walled City

The total area of Walled City is of the order of 350 hectares with 2.4 kms of length and 1.5 kms of width. It houses nearly 1/6th of the population (nearly 16%) of Amritsar. The Walled city was built on human scale i.e. a pedestrian city, nearly 430 year back. Considering the compactness and character, the whole walled city area can be covered on foot within a time span of 20 minutes, from one end to other end.
The transport modes used are two categories:

i) Non-motorized transport – cycles and cycle rickshaws

ii) Motorised vehicles – Motor cycles, cars and auto rickshaws

The narrow streets and road encroachments have degraded the aesthetics and potential of the area. The markets of the walled city are highly congested and have high density of population. Due to absence of adequate parking and organized commercial area, the movement in these areas have been hamp. The roads are the main constraints and there are proposals to build multi-level parking lots at the major entry gates of walled city. The ground floor of these parking lots should be left for ‘Public Transport’ operations to serve as ‘Bus Stand’ (bus Stop) for the residents of Walled City.

4.3.3 Transport System in Municipal Corporation of Amritsar & four urban Centres (Jandiala, Rayya, Rajasansi & Majitha)

This area is about 180 sq. kms with about 9 lakhs of population (2001). This area is about 7% of Amritsar District, and 41% of the population of the District. There are eleven radial roads leading to the core city like spokes of a wheel; besides two national highways, three state highways and others. These urban areas do not have any Mass Public Transport service such as Bus System, and the population depends on either personal modes (cycles, cars & two wheelers) or Intermediate Public Transport modes such as cycle/auto rickshaws for their mobility.

Though the city is characterized by wide roads, absence of Public Transport, brought phenomenal growth in small occupancy vehicles i.e. private vehicles, such as two wheelers and cars. The people who do not own any vehicle depend upon ‘Auto Rickshaws, (about 18,000 in 2010) for their travel needs. Thus 99 percent of vehicles are small occupancy vehicles, which cause congestion and pollution besides problems of safety and traffic management. Further, the transport expenditure is also very high, about 15% of household expenditure, compared to about 10% in cities where public transport services are available.
The bus operators in Amritsar, operate large number of intercity and interstate buses as their operations are profitable. Generally, the urban bus operations are perceived as loss making financially, hence even the State Transport Undertakings (Punjab Roadways & PRTC) do not venture into that segment of business. Further, as the auto rickshaws operate under ‘shared auto system’ providing bus like services, the competition is very high and any bus operator venturing into this segment is very remote as long as share Auto System competes with the Bus System.

4.3.4 Transport System in Villages in Local Planning Area (LPA)

This area is about 1200 sq. km. with about 6 lakhs of population. This area is about 50% of Amritsar District, and 27 percent of population.

The transport modes used are two wheelers and cars as private modes, but as people cannot afford them mostly they depend upon Public Transport. For public transport, mostly mini buses are operating connecting the villages to the city. The connectivity is good, where the village is located near the National Highway, State Highway or other major roads.

The bus connectivity to the villages in Amritsar LPA is detailed in Table 4.3.

### Table 4.3: Bus Service in Village in LPA, Amritsar

<table>
<thead>
<tr>
<th>Villages in Amritsar LPA</th>
<th>Bus Service Facility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Available</td>
<td>Not available</td>
</tr>
<tr>
<td>270 (87%)</td>
<td>31 (10%)</td>
</tr>
</tbody>
</table>

Source: Town and Village Directory - Amritsar

The Public Transport facility to villages in LPA needs lot of improvement, as there are no frequent, reliable and convenient services. Consequently, people are forced to own private modes, which increase not only personal expenditure to the individual but also causes environmental damage of the city.

Summing-up, in all the areas of Amritsar, it could be seen that people are depending on private modes, with all its attendant disadvantages. The public transport did not get its due importance hence the present situation. There is need to allow the full benefits of public transport to the citizens of Amritsar through appropriate policy interventions.
4.3.5 Importance of Public Transport

Public Transport comprises of all transport systems in which the passengers do not travel in their own vehicles.

While it is generally taken to include rail and bus services, wider definitions include scheduled Taxi Cab Services, Intermediate Public Transport (IPT) and Ferries etc, in other words, any system that transports members of the general public.

Public Transport is usually regulated as a common carrier and is usually configured to provide scheduled services on fixed route on a non-reservation basis. The majority of transit passengers are traveling within a local area or region between their homes and places of employment, shopping or school.

Public Transport offers many advantages over individual transport modes. It:

- Costs less to the community
- Needs less urban space
- Is less energy-intensive
- Pollutes less
- Is the safest mode
- Improves accessibility to jobs
- Offers mobility to all

4.3.6 The Role of public Mass Transport in Urban Areas

Public transport is an essential part of infrastructure, and its role is:

- To carry many people efficiently, comfortably and dependably, in order that the designated activities are accomplished.
- To provide access to work places, improve job, residential and social mobility and give employers access to a larger labour market.
- To guide city development and ensure that utilization of resources spent take place to optimum levels
- To help create a more balanced city since transport and land use go together
- To provide equity to all in the form of affordable and available transport.
- To allow the free and least cost movement of people and goods and reduce the total transport cost, including the economic costs of energy, time, pollution and accidents
- To draw together the metropolitan region including satellite towns.

These factors have not been given their due. It is an unfortunate fact that only bad transport arouses concern while the benefits of good transport have been overlooked.
4.3.7 Modal Share & Average Trip Lengths

The modal share of different modes operating in Amritsar and their trip lengths are detailed at Table 4.4.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Share of Trips (%)</th>
<th>Average Trip Length (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walk</td>
<td>26.75</td>
<td>1.65</td>
</tr>
<tr>
<td>Private Modes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Two Wheeler</td>
<td>25.90</td>
<td>5.39</td>
</tr>
<tr>
<td>• Cars</td>
<td>6.63</td>
<td>8.84</td>
</tr>
<tr>
<td>Public Transport Modes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Standards Bus</td>
<td>1.90</td>
<td>37.12</td>
</tr>
<tr>
<td>• Mini Bus</td>
<td>2.74</td>
<td>8.24</td>
</tr>
<tr>
<td>• Auto Rickshaw</td>
<td>22.03</td>
<td>4.75</td>
</tr>
<tr>
<td>• Taxi</td>
<td>Negligible (0.09)</td>
<td>6.55</td>
</tr>
<tr>
<td>Non-Motorised Modes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Cycle</td>
<td>11.15</td>
<td>2.97</td>
</tr>
<tr>
<td>• Cycle Rickshaw</td>
<td>2.53</td>
<td>2.40</td>
</tr>
<tr>
<td>Rail</td>
<td>Negligible (0.28)</td>
<td>281.56</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
<td><strong>5.64 (All Modes)</strong></td>
</tr>
</tbody>
</table>

The major findings of the mode-split analysis are:

- Auto Rickshaw is the main mode of Public Transport in Amritsar while bus system has only a token presence
- The non-motorized vehicles ie. Cycles and cycle rickshaws have a significant role in transport system of Amritsar (Especially in Walled city)
- Two wheelers are the most popular mode of personalized modes probably because of its affordability and versatility

4.3.8 The Rail Based System

Amritsar has an important railway station and is well connected to major cities in India through daily trains form Delhi, Mumbai, Kolkata, Chennai, Hyderabad, Indore, Bhopal, Thiruvananthapuram, Agra, Gwalior, Jabalpur, Ujjain, Ahmedabad, Pune and other major Indian cities. Amritsar Railway Station is the main station. There is a special train that runs west to Wagah (Attari Border), which is the last station on the border in India before continuing to Pakistan. It has five platforms and platform no 1 is exclusively for shatabdi trains. Total 29 trains are originating and 28 trains are destinating at Amritsar railway station and 8 numbers of trains are passing through Amritsar railway station.
There are no local train services for serving city traffic. As the rail system primarily caters to long distance, inter-city and inter-state traffic, the contribution of rail system for urban transport in Amritsar is very insignificant. It is as good as, no share of rail system, in the present scenario.

4.3.9 The Road based System

The Road based Public Transport System, could be further categorized into two sub-systems viz:

- Bus System (including Mini Bus)
- Intermediate Public Transport (IPT) System-Auto Rickshaws

4.3.10 Bus System

Punjab Roadways (PR) - a department of Punjab Government and Pepsu Road Transport Corporation (PRTC) - a corporate body constituted under the Road Transport Act 1950, operate buses between Amritsar and various cities in Punjab and the other neighbouring states of J&K and Himachal Pradesh from the Intercity Bus Terminal at Amritsar. A number of private operators and a few other State RTCs also operate intercity/interstate buses from this terminal.

The Amritsar Intercity Bus Terminal is located in G T Road spread on an area of 8.5 acres. This bus terminal complex included all administrative areas, passenger waiting areas as well as amenities. The bus terminal presently services, on an average, 1,100 normal buses and 600 mini buses a day and about 80-100 buses are parked within the Terminal complex overnight.

In Amritsar, neither mini buses nor standard buses are operated exclusively for urban traffic. About 1700 buses (including 600 mini buses) operate from the bus stand to various cities of Punjab and other states. The buses pertaining to shorter routes such as to Majitha, Ajnala, Verka, Batala, Taran Taran, Jallandhar, Beas etc. pickup local traffic, where ever there is opportunity as that practice will help both the passengers and operators.

The Shiromani Gurdwara Prabhandhak Committee (SGPC) operates free buses for Pilgrims of Golden Temple, from Railway Station. The frequency of this bus is one in an hour. Thus, practically, the bus system contribution to urban transport in Amritsar is very insignificant. It is only a skeleton service, wherever, the bus operates.

Operating Characteristics of Buses

- Hours of operation - 10 to 15 hours per day
- Average vehicle utilization - 195 kms per day
• Average number of trips operated - 6 trips per day
• Share of owners vs Employees Operating the Buses
  ➢ Owner drivers - Nil
  ➢ Employee drivers - 100 percent

The bus operators, usually (like in any other city) complained about the harassment by regulating agencies like Police and Motor Vehicle Department. The other problems faced by bus operators are low fare structure, lack of parking facilities, high competition and difficulty of getting licences. The bus operators request for softer loans, simplification of procedures and better infrastructure facilities for parking at bus stops and terminals.

4.3.11 Intermediate Public Transport (IPT) System - Auto Rickshaws

A number of IPT modes provide transport services in the city. They include both motorized (Auto Rickshaws, Taxi, etc) and Non-motorized (Cycle, Cycle Rickshaw) vehicles, though Auto Rickshaw is the predominant mode. These IPT modes, not only fulfill their designated roles, but also provide complimentary and supplementary services to the main modes i.e. Buses and Mini Buses. Infact, the Auto Rickshaws have substituted the bus system with their services, may be due to its superior demand responsive characteristics beside its flexibility and willingness of passengers to Patronize.

The growth of Auto Rickshaws is Phenomenal, as could be seen from Table 4.5.

Table 4.5: Growth of Auto Rickshaws in Amritsar

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of Auto Rickshaws</th>
</tr>
</thead>
<tbody>
<tr>
<td>2003-2004</td>
<td>12,149</td>
</tr>
<tr>
<td>2007-2008</td>
<td>15,176</td>
</tr>
<tr>
<td>2009-2010</td>
<td>18,874</td>
</tr>
</tbody>
</table>

The average growth rate of Auto Rickshaws from 2003-2004 to 2009-2010 works out to 7.62 percent. The operations of Auto Rickshaws are not restricted or regulated to serve either as Contract Carriages or Stage Carriages. Thus the Auto Rickshaws operate in large number, as shared autos substituting the conventional public transport bus services.

Operating Characteristics of Auto Rickshaws

• Hours of operation - 10 to 15 hours per day
• Average vehicle utilization - 215 kms per day
• Average number of trips operated - 12 trips per day
• Vehicle ownership distribution
  ➢ Owner - 64 percent
Hired

• Rent Payable by hired drivers

- 36 percent
- Rs. 350 per day

All these IPT modes are in private sector, there is no effective monitoring or regulation by authorities. The IPT modes provide a very useful service to the society besides generating employment and contributing to the local economy. Presently these modes are suffering with many inadequacies.

The Auto Rickshaw drivers, usually (like in any other city) complained about the harassment by regulating agencies like Police and Motor Vehicle Department. The other problems faced by Auto Rickshaws are low fare structure, lack of parking facilities, high competition and difficulty of getting licences. The Auto drivers request for softer loans, simplification of procedures and better infrastructure facilities.

The role of IPT modes as an important component of integrated multimodal PMTS needs to be appreciated and their entry and operation facilitated through appropriate policies, plans and interventions.

4.3.12 Issues in Public Transport

Presently public transport is not able to rise to its full potential and play its useful role as it is constrained with many issues. Some of the major issues are listed below.

**Share of Trip between Public Transport; IPT and Private Modes**

The present share of person trips between Public Transport, IPT and Private modes is in the ratio of 8:37:55 respectively.

The proportion is arrived at considering only motorized modes, and assuming that

• Buses and Mini Buses as Public Transport
• Taxi and Auto Rickshaws as Intermediate Public Transport (IPT) modes
• Car and Two Wheelers as Private modes

Now the basic question is what should be the ideal proportion between Public Transport, IPT and private modes for Amritsar City?

The Master Plan (2010-2031) and other policy documents clearly state that, the Public Transport should be assigned a dominant role, to provide mobility, accessibility, safety, security and health to the citizens at optimal cost to the society as a whole.
It is the observation of every person, that in Amritsar, Public Transport role is under played while IPT and private modes overplay their roles. Infact, the transport authorities should ensure that in a given urban setting, all the transport modes play their assigned roles and bring harmony to the system, through better services. The major issue before the authorities is how to increase the share of Public Transport, by attracting customers from the IPT and private modes.

National Urban Transport Policy (NUTP) and Share of Public Transport

The NUTP has laid great emphasis on promotion of public Mass Transport System in urban areas. The present programme of JnNURM in extending financial grants for augmentation of public transport system is an endeavor in this direction. The study group on Alternative Urban Transport System set up by Government of India (1987) had recommended norms for public transport share based on city population size (Table 4.6).

<table>
<thead>
<tr>
<th>City Size (population in millions)</th>
<th>Public Transport Modal Share (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>&lt; 1.0</td>
<td>30</td>
</tr>
<tr>
<td>1.0</td>
<td>35</td>
</tr>
<tr>
<td>1.5</td>
<td>40</td>
</tr>
<tr>
<td>3.0</td>
<td>50</td>
</tr>
<tr>
<td>6.0</td>
<td>70</td>
</tr>
<tr>
<td>7.0</td>
<td>75</td>
</tr>
</tbody>
</table>

Source: GoI, Ministry of Railway, Study Group on alternate Urban Transport Systems

Infact, the Government of India, Ministry of Urban Development from time to time constituted various committees and organized detailed studies on the role and extent of Public Transport System in different size of cities. All committees/ studies without any exception recommended that Public Transport share should increase with the increasing size of the city population. The major recommendations from the Commission on urbanization; and studies on Traffic and Transportation policies in urban areas (1997 & 2008), and various working groups emphasized the need to promote Public transport in every city. However, Amritsar is yet to take the call and initiate policy measures in the direction of NUTP recommendations.

Priority is for Roads but, not for Public Transport

The road projects get priority for investments from various agencies, either for new roads or widening the existing roads, or providing by-passes, while Public Transport, in the name of “free enterprise” is left to the private sector for providing services. Thus essential infrastructure for Public Transport or Traffic Management is not available in terms of Bus stops, Bus stations, Bus terminals, or for Traffic Management (Area Traffic Control schemes). The quality of operations of the
private sector which provides Public Transport services are not even monitored not to speak of centralized planning of routes or modal integration between different modes.

The present policy for widening roads or constructing new roads is based "Demand Orientation". In this policy, the demand of traffic is forecasted and the road space is constructed/built to meet the demand of traffic i.e. supply created to match the demand. Infact, this policy has proved to be unsustainable, as additional supply of road has invited additional demand, and the traffic congestion was never eased with additional road supply.

The prudent policy to adopt is "Supply Orientation". In this policy, the existing road space is taken as a constraint, and to meet the traffic demands, high occupancy Public Transport Vehicles are chosen to move the traffic. In this option, the objective is to “move people and not vehicles”. This would be a sustainable policy to our cities.

**Non-incentives to Private Sector**

Presently the Policy of the Central Government is that, the Private sector should invest in Public Transport business and manage the affairs as a part of market economy. In the light of the above policy, no State Government is investing in Public Transport and private sector is expected to meet the financial needs of this sector, either for augmentation, expansion or replacement of fleet.

Private sector manages Public Transport services from business perspective, thus operate only on high demand transport routes and tend to sacrifice the values of Public (Transport) service, safety and security.

In a progressive State like Punjab, the Public Transport cannot be seen only as a business activity. It has a social role, developmental role, besides promoting equity amongst citizens. The present policy is a non-incentive to private sector, to realize full potential of Public Transport.

The urban transport operations in Amritsar cannot be left to the market forces exclusively as there are many externalities. There is need for enlightened approach about investments in Public Transport as the present policy is a non-incentive to private sector for significant investments.

**Role Clarity between Buses and Auto Rickshaws**

No policy or regulation exists to clearly distinguish the role of Bus and Auto Rickshaws which are presently operating only on the high demand corridors with severe competition and poor infrastructure. There is need to clarify the role of each mode. Bus Public Mass Transport System (PMTS) should be the basic public
transport system for Amritsar. The IPTS should play supplementary and complimentary role to the main system i.e. bus system. However, for some trips like hospital trips, trips with luggage to Railway Station or Bus Station etc. Auto Rickshaws shall play their role as a basic mode for those purposes. The objective is to ensure, operation of higher carrying capacity vehicles on high density traffic corridors, while small occupancy vehicles provide services where there is relatively less traffic.

**Expenditure on Transport**

The household survey, give the following information on income and expenditure. The survey also gives the household expenditure pattern.

Average Household income : Rs. 17,392
Average Household expenditure : Rs. 14,734

The pattern of Household expenditure is detailed at Table 4.7.

<table>
<thead>
<tr>
<th>Item of Expenditure</th>
<th>% of Expenditure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>25.4</td>
</tr>
<tr>
<td>Housing</td>
<td>10.2</td>
</tr>
<tr>
<td>Education</td>
<td>9.6</td>
</tr>
<tr>
<td>Transport</td>
<td>14.2</td>
</tr>
<tr>
<td>Health</td>
<td>6.6</td>
</tr>
<tr>
<td>Others</td>
<td>34.0</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>100.00</strong></td>
</tr>
</tbody>
</table>

*Source: Household Survey – CES (2011)*

It may be observed that the expenditure on transport is higher than the expenditure either on housing or education or on health. It is next only to expenditure on food, which is a cause for concern. The probable reason for this high expenditure on transport (about Rs. 2090 per household), is absence of adequate Public Transport service in Amritsar City. The travel by private modes, or even by IPT involves higher expenditure, when compared to mass public transport system.

Presently, nearly 30% of city populations are the urban poor and they live in slums. There are about 64 slum areas, with a population of 3.04 lakhs, which are worst affected due to the absence of Public Transport. Most of these slums are on the southern part of Amritsar, and these people will become the captive customers of Public Transport, as most of them do not own any vehicles. The slum population in Amritsar is growing from decade to decade, as could be seen from the Table 4.8.
Table 4.8: Slum Population in Amritsar

<table>
<thead>
<tr>
<th>Year</th>
<th>City Population</th>
<th>Slum Population</th>
<th>% to City Population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1981</td>
<td>5,89,299</td>
<td>32,632</td>
<td>5.53</td>
</tr>
<tr>
<td>1991</td>
<td>7,08,835</td>
<td>1,23,000</td>
<td>17.35</td>
</tr>
<tr>
<td>2001</td>
<td>10,16,079</td>
<td>3,04,824</td>
<td>30.00</td>
</tr>
</tbody>
</table>

Source: Master Plan (2010-2031), Amritsar City

Promotion of Public Transport

It is well known that Public Transport occupies less road space and causes less pollution per passenger-km than personal vehicles. As such Public Transport is more sustainable form of Transport. Hence the transport policy would be to promote investments in Public Transport as well as measures that makes it use more attractive than the personalized modes.

The major issues in Amritsar are that no specific authority (Institution) is responsible for Public Transport. In fact, improvement of Public Transport is a joint effort between four important stakeholder organizations viz:

- Infrastructure providers - the local authorities such as Municipal Corporation, Municipal Council, Urban Area Improvement Trust, Local Planning Authorities etc
- Traffic Management Authorities - i.e. Police Department (Traffic Police)
- Public Transport Operators - Either Bus Operators or Auto Rickshaw operators
- Transport Service Regulators - Motor Vehicle Department Officers i.e. RTO or Motor Vehicle Inspectors etc.

The city authorities have to bring all of them onto one platform and provide co-ordination for integrated efforts. This is a major issue, for want of which Public Transport is not able to play its due role, consequently the people are suffering.

Improving Public Transport does not mean improving Buses or Auto Rickshaws, which offer comfort during passenger journey. The passenger, not only values the comfort during the journey, but also the pre-journey, and post-journey comforts. Hence the need for Bus stops and terminals. Public Transport facilities should be seen as urban assets. Thus, there is need for capacity building efforts for professionals involved in Planning Public Transport functions at city level.

Bus stops, stations, Terminals and associated facilities form the interface between passenger and Public Transport System. They should be permanent, weather protected facilities that are convenient, comfortable, safe and accessible to passengers. These facilities should support a strong and consistent identity of
urban context. Presently, public transport is not taken as a priority hence this pathetic situation.

**Summing UP**

The quality of life depends on transport. Most of the people travel every day, even if only locally, and people need an efficient transport system to support a strong. Prosperous and emerging economy of Amritsar. But, in turn, the way the people are traveling is damaging quality of life of citizens, and harming their health. As demand for transport grows, if the present ill effects of transport system continue, they may change even, the very climate of our planet.

The personalized vehicles have revolutionised the way people live, bringing great flexibility and widening horizons. In principle, the Government does not want to restrict ownership of private vehicles. But the way people are using their personal vehicles has a price - for the health of people, for the economy and for the environment. The need is for a change, so that majority of work and education trips are catered by Public Transport System.

There is need to promote integrated public transport to fight congestion and pollution; even if people can afford to own personalized modes. Amritsar city is yet to take the call to improve quality and quantum of Public Transport. Infact, there is no exaggeration in saying, the lives of citizens are shaped by Public Transport System of the city/region.

### 4.4 Urban Goods Movements

The truck traffic inflow is observed mainly on G.T. road and Tarn Taran road. The truck movements to and from the major trade / commerce and industrial activity centers are to be regularized.

### 4.5 Traffic Safety and Enforcement

The Amritsar City is facing acute traffic problems resulting in large number of road accidents. The enforcement is inadequate.

The details of road accidents are shown in **Table 4.9**

The number of persons killed per year varied from 67 to 119. The maximum number of persons killed was in the year 2007. The persons killed per year varied from 83 to 161, the highest number occurred in the year 2008. The fatal accidents constitute minimum 42 percentages to maximum 72 of total accidents. This is really a serious issue and stresses the need for implementation of accident prevention methods. The causes of accidents, recorded by police, includes; roads deficiencies
such as blind curves, lack of signals / traffic lights / road markings, encroachments reducing the effective carriageway width, poor road conditions and road geometry.

**Table 4.9 Road Accident Statistics - Amritsar**

<table>
<thead>
<tr>
<th></th>
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</tr>
</thead>
<tbody>
<tr>
<td>Accident Cases</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Registered</td>
<td>125</td>
<td>118</td>
<td>146</td>
<td>105</td>
<td>149</td>
<td>143</td>
<td>128</td>
<td>114</td>
<td>126</td>
<td>131</td>
<td>166</td>
<td>190</td>
</tr>
<tr>
<td>Fatal accidents</td>
<td>72</td>
<td>61</td>
<td>89</td>
<td>71</td>
<td>80</td>
<td>75</td>
<td>69</td>
<td>76</td>
<td>79</td>
<td>101</td>
<td>103</td>
<td>99</td>
</tr>
<tr>
<td>Severity accidents</td>
<td>53</td>
<td>57</td>
<td>57</td>
<td>34</td>
<td>69</td>
<td>68</td>
<td>59</td>
<td>38</td>
<td>47</td>
<td>30</td>
<td>63</td>
<td>91</td>
</tr>
<tr>
<td>Persons killed</td>
<td>78</td>
<td>67</td>
<td>98</td>
<td>74</td>
<td>81</td>
<td>84</td>
<td>77</td>
<td>89</td>
<td>84</td>
<td>115</td>
<td>119</td>
<td>115</td>
</tr>
<tr>
<td>Persons injured</td>
<td>91</td>
<td>123</td>
<td>140</td>
<td>83</td>
<td>116</td>
<td>122</td>
<td>91</td>
<td>98</td>
<td>80</td>
<td>123</td>
<td>161</td>
<td></td>
</tr>
</tbody>
</table>

*Source: Amritsar Police Department*

### 4.6 Institutional and Financial Situations

The Municipal Corporation Amritsar (MCA) along with the Amritsar Improvement Trust (AIT), Amritsar Heritage Society, Shrimoni Gurdwara Parbandhak Committee (SGPC), Cantonment board and Punjab Urban Development Authority (PUDA), Water Supply and Sewerage Board (PWSSB) are involved in the civic administration management. The recent management reforms includes; continuous monitoring system, complaint monitoring system and computerization.

Monitoring within MCA is done at four levels mainly corporation level, zonal level, sub division level, and on the field. In the regular meetings, the problems and issues and mitigation measures, if possible, are discussed.

At the sub division level all complaints are lodged in a register either in person or through E-Mail ([admincorporation@sancharrnet.in](mailto:admincorporation@sancharrnet.in)) or on phone. Complaints and its mitigation are carried out within a specific time period i.e. in a minimum of 24 hours with upper limit as a week.

MCA has introduced computerization in its most of the departments. The town maps are digested and detail of each department are laid over. The corporation has its own web ([www.amritsarcorp.com](http://www.amritsarcorp.com)).

**Finance Situation**

The MCA has shown operating surplus in the order of Rs.7 to 23 crores during the years 2001-02 to 2005-06). The Corporation had a healthy opening balance of more than Rs. 54 crores in last financial year and the positive fiscal result demonstrates official will to maintain fiscal control.
4.7 Environment and Social Conditions

One of the major areas of environmental concern in the Amritsar city is that of rising air pollution levels which are results of increasing personalized modes of transport and intermediate modes of transport such as auto rickshaws in the absence of efficient public transport system in the city. The other major source of air pollution in the city is industrial emission of gases. Neither any sufficient buffer zone nor any landscape elements are provided near industrial area to reduce the impact of air pollutants.

4.8 Other Relevant Issues

Heavy congestion in major areas of Amritsar city especially on Bhandan Bridge Road, Hall Bazar, Lawrence Road, Crystal Chowk, have resulted in intolerable air pollutants (So2 and Nox, SPM and RPM).

4.9 Tourism in Amritsar

4.9.1 Introduction

Amritsar is one of the most important pilgrimage centers in the county especially for the Sikhs. The city is characterized by some of the must visit religious, historical as well as contemporary sites of importance. The Golden Temple, where Sikhs from all over the world come to pay their reverence to Guru Granth Sahib and take a dip in the Amrit Saras Kund (Pool of Immortality) for spiritual purification is the major landmark of the place. The hard working and warm-hearted character of the people of Amritsar is conducive to the idea of hospitality which is very important for tourism promotion.

Like several other medieval settlements, Amritsar is a fortified city. The city wall is punctuated by 12 gates connecting one another and also the core of the city where the Golden Temple sits in a commanding position surrounded by the sacred tank and the circumambulation path. Between the city wall and the Golden Temple is the densely built urban fabric characterized by narrow lanes, houses with courtyards and bustling bazaars. This form of urbanity is typical of the period with several other cities displaying similar characteristics. The challenge today, for most of the medieval Indian cities, is to address the paradoxical situation of development and conservation of the unique urban heritage. The planning and development strategy has to be structured in a sensitive mode.
4.9.2 Places of Tourist Interest

4.9.2.1 Within Amritsar City

Golden Temple

The Golden Temple is the genesis of Amritsar with the city growing around it nurtured by its divine sanctity, and is the most sacred Sikh religious sites in India. The temple is built below the level of the surrounding area and is confronted by the sanctum glimmering in the water of the holy tank that is flanked on all four sides by clean marble walkways and pavements. Situated at the other end of the causeway connected to the Harmandir Sahib is the Akal Takht. Literally, it means the eternal throne. While the temple stands for the spiritual guidance, the Akal Takht symbolizes the dispensing of justice and temporal activities. During the day, the Guru Granth Sahib is kept in the temple and at night at the Akal Takht. Traditionally all Sikh warriors sought blessings here before going for war. There are several other Gurdwaras, around the Golden Temple, that trace their links with the Gurus. Gurdwara Baba Atal Sahib and the Gurudwara Shaida are important religious centers, each with its own history.

It is estimated that about 70,000 persons visit Golden temple daily. On occasions the number swell to about 2 lakh people per day.

Jallianwala Bagh

Amritsar played a pivotal role in India's quest for independence, and no national monument has more significance than Jallianwala Bagh, a solemn, grim reminder of one of the bloodiest chapters of India's freedom movement. The 2000 Indians killed and wounded here in the indiscriminate firing by the British General Dyer on Baisakhi in 1919 was carnage that had nationwide ramifications, shaking and enraging the whole country. Jallianwala Bagh commemorates the martyrs, keeping the tragic episode in its historical context. Today, one finds a small gallery with photos of key personalities involved, the well into which the crowds jumped to
escape the murderous hail of bullets and a simple memorial at the site that shaped India's destiny.

**Durgiana Mandir**

Built in 1924, Durgiana temple is an important religious center in Amritsar. It is in close vicinity of Amritsar Railway Station & about 1.5 Km from the Bus Stand. There is not enough parking spaces for the visitors. The encroachment on the katcha road constructed over the Nallah passing adjacent to the temple is restricting from having another access to the temple. The area around the temple, especially along Shivpuri, is encroached upon by the jhuggi-jhoparis, which is also affecting the aesthetics of the temple. A proper access and parking area is required for the temple having great religious significance. Under the Durgiana Temple beautification scheme, Improvement Trust is finding it difficult to locate the owners of 3.03 acres of the land, which is needed for the beautification of the area.

**Mata Mandir temple**

A grand old pious lady developed this Hindu temple situated at Rani kaBagh, on the lines of holy shrine of Mata Vaishno Devi at Katra (Jammu), the temple draws crowds of devotees from far and near.

**Other Heritage Places**

Other places of heritage interest in Amritsar include:

- **Gandhi Gate**

  Popularly known as Hall Gate, it is the entrance to the shopping hub of Amritsar - Hall Bazaar. A typical maharaja type gate with a clock and a Glow sign which reads "Amritsar - Sifti- Da - Ghar".

- **Ram Bagh Garden**

  The first heritage site is the Ram Bagh Garden in Amritsar with royal places and gates, gardens, watch towers and "Baran Dari" with a beautiful layout of fountains and lawns having rare trees planted by Maharaja Ranjit Singh. The Garden is spread over 84 acres of land. It is appreciable that the Punjab Government has declared the Ram Bagh Garden and its buildings as protected monuments.
**Gobindgarh Fort**

That second heritage site is the Gobindgarh Fort of Maharaja Ranjit Singh and named after Sri Guru Gobind Singh. The fort was occupied by the British Army in 1846 and it remains under the Army control since then without any regular maintenance and conservation. One could see the crumbling main gate and side-walls with lot of unwanted Peepal and Banyan trees on the main building. It has underground escape outlets and inlets with fortifications. This fort was mainly used as a treasury of the Sarkar-e-Khalsa and is the only Sikh fort with the longest history.

**Maharaja Ranjit Singh Museum**

An attempt to conservation and preservation of the cultural heritage of the city of Amritsar is the Maharaja Ranjit Singh museum. Maharaja Ranjit Singh museum in the Company Bagh is a treasure house of the history, art and architecture of the Sikhs of the 18th and the 19th century. Formerly the summer residence of Maharaja Ranjit Singh, a famous Sikh king of the 19th century the palace now has been converted into the museum. Maharaja Ranjit Singh as his summer residence built it in 1818 and he stayed here till 1837. The building was in Arabic style. The main collection includes Paintings, Arms and Armours, Manuscripts, and Coins.

A few of the other heritage sites include:

- Khalsa College
- 12 Gates of the walled city
- J allianwalla Bagh
- A few Havelies within the walled city
- Akharas
- J ama Masjid, Hall Bazaar
- Gurudwaras like Saragarhi, Darshini Deori, Kaulsar, Shahid Baba Deep Singh

In the city, many old areas around Guru Ka Mahal, Katras may be conserved and declared as heritage zone. Such actions will facilitate to retain the original architectural style and character of the city. It is observed that many buildings in the walled city are either crumbling within passage of time or due to poor maintenance. The expansion of commercial activities with walled city has also caused to large-scale structural change. Haveillis, forts and other palaces are almost at verge of extinction, which are a serious threat to tourism and cultural resources of the city and need immediate action for their conservation.
4.9.2.2 Tourism in Amritsar City and Surroundings

- **Other Religious and Historical Gurudwaras**

Within an hour's drive from Amritsar are several Sikh religious sites to visit. Several historical Gurudwaras at Baba Bakala, Goindwal Sahib, Khandoo Sahib, Tarn Taran, and Dera Baba Nanak, attract the devout. The drive takes one through the heart of rural Punjab with lush green paddy fields, tiny villages, and robust farmers.

- **Wagah Border**

This is the famous international border between India and Pakistan. The pomp and pageantry of the Beating Retreat and the Change of Guard within handshaking distance of the Indian and Pakistani border security forces makes for a most charming spectacle. Soldiers from both countries march in perfect drill, going through the steps of bringing down their respective national flags.

- **Ram Tirath temple**

On the outskirts of Amritsar is this significant historic birthplace of Lav and Kush. It is the spot where sage Valmiki's ashram stood and this is a sacred place for the Hindus where we get a glimpse of statues illustrating scenes from the Ramayana. Maharishi Valmiki conducted them to highest levels in education in the realms of religious and social life besides intricacies of warfare. A fair is organized for four days on every KartikaPuranmashi event annually.

- **Harike Wetland**

The lake formed at the point of confluence of rivers Beas and Sutlej at Harike ford, situated midway between Amritsar and Ferozpur was declared a national wildlife sanctuary in 1982.
**Baba Bakala**

Situated about 35 km East of Amritsar. It has a magnificent Gurudwara where people gather in thousands on every amavasa and an annual fair is held on Rakshabandhan day.

**Dera Baba Jaimal Singh**

About 44 km east of Amritsar is Dera Baba Jaimal Singh the Radhaswami, self-sufficient colony near Beas.

### 4.9.3 Tourist Circuits

The tourist circuits include:

**Amritsar - Ram Tirath - Sarai Amanat Khan -Wagha Border - Amritsar**

Ram Tirath takes visitors back to the times of Ramayana, at Sarai Amanat Khan tourists come down to a highway inn of the Mughul times, at Wagha Border tourists suddenly land into the present. The pageant of the beating of the retreat and the change of guard within handshaking distance of the Indian and Pakistani forces here makes the most charming of the spectacles as a daily evening drill.

**Amritsar - Dera Baba Nanak -Qadian-Kalanaur-Gurdaspur-Pathankot**

At Dera Baba Nanak the first Prophet of Sikhism, Sri Guru Nanak Dev spent the last days of his life. At the historic Gurudwara built in his memory holy robes that were presented to him at Mecca are still preserved. Qadian is the home of the founder of the Ahmedyia Sect of the Muslims. At Kalanaur, Akbar-the-great was coroneted. Pathankot is India's link city to the State of Jammu and Kashmir and the best tourist destinations of Himachal Pradesh.

**Amritsar-Tarn Taran-Hari-Ke-Pattan - Goindwal Sahib - SultanpurLodhi - Kapurthala (Kanjililake) - Jalandhar**

A majestic gurudwara with a golden dome and a large holy pool having healing powers is built at Tarn Taran in the memory of 5th Guru, Sri Guru Arjan Devji. Hari-Ke-Pattan is a wild life sanctuary of international fame. Goindwal Sahib was the seat of Sikhism during the lifetime of the 3rd Guru Sri Guru Amar Dass ji. It has a deep well with 84 steps. The faithful say that if visitors recite Jap Ji Sahib, a composition of the first Guru at each step after a bath they cross the cycle of 84,000 lives and attain moksh. At Sultanpur Lodhi Sri Guru Nanak Dev spent 12 years in the service of Nawab Daulat Khan Lodhi. It was from here in 1500 A.D. that he had begun his first holy travel towards the east and the south to preach the Word of God. Kapurthala is renowned for beautiful palaces and buildings. Kanjli Lake receives several species of migratory birds and is a fulfilling picnic spot.
Amritsar - BabaBakala - Kartarpur - Jalandhar

At Baba Bakala the 9th Guru Sri Guru Teg Bahadur Ji had revealed himself to Makhan Shah Lobana. The 5th Prophet of Sikhism founded Kartarpur. The authenticated, handwritten copy of Sri Guru Granth Sahib compiled and edited by him and having his seal is located here. It is also famous for the manufacture of quality world-furniture. Jalandhar is the oldest city of Punjab. Today it is internationally famous for the manufacture of sports goods and landmarks connected with the Hindu religion.

4.9.4 Tourist Accommodation in Amritsar

Existing hotel accommodations in Amritsar are given in Table 4.10.

**Table 4.10: Tourist Accommodations in Amritsar**

<table>
<thead>
<tr>
<th>Category of Accommodation</th>
<th>Total Numbers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hotels</td>
<td>Number 117</td>
</tr>
<tr>
<td></td>
<td>Rooms 2094</td>
</tr>
<tr>
<td>Dharamshalas</td>
<td>Number 6</td>
</tr>
<tr>
<td></td>
<td>Rooms 750</td>
</tr>
</tbody>
</table>

*Source: Punjab Tourism Development Master Plan 2008 - 2023*
There is a huge NRI population belonging to Punjab. There is requirement for more number of star category hotels in popular tourist destinations. This will not only help in boosting the tourism industry but also improve the position of Punjab as tourism destination at par with neighboring Delhi and Rajasthan.

### 4.9.5 Tourism Policy

The State’s tourism policy has a coherent feature, viz., the policy is rooted on one hand in convergence of socio-economic benefits, eco-friendliness and employment generation, while on the other hand, the policy has to fulfill the growing demand for tourism products in the state brought about by the rapid industrial development. The main objective of the tourism policy 2003 in Punjab includes:

- To identify and develop tourist destinations giving special focus to pilgrimage and religious tourism.
- To improve, diversify and expand marketing of the tourism products of the state.
- Strengthen tourism infrastructure in the state and create new infrastructure wherever necessary.
- Promotion of rural tourism eco, adventure, sports, youth, heritage and pilgrimage tourism
- To provide quality service to all domestic and international consumers and stake holders.
- To promote private sector participation with the help of government to develop necessary infrastructure in the state that will help the state to promote tourism.
- To encourage people’s participation in tourism promotion and to provide economic benefits to people through such participation.

### 4.9.6 CMP and Tourism

CMP programs play an important role on promoting tourism in Amritsar. For a tourist, accessibility to places of interest and connectivity are important. As tourists are of different income levels, the city transport services must meet the needs of all groups and interests.

The Transport Network Plan proposed in the CMP connects all places of tourist interest within the city. The Public Mass Transport System provides affordable service. The IPT system with upgraded and modernized taxi and auto rickshaws provide a wide option of services. The pedestrianization of Walled City area and redesign of the street network provides a pleasant environment for the tourists. Operation of tourist circuits will connect places of tourist interest outside the city. The technology and quality of service by the proposed BRTS and LRTS will enhance the brand image of the city.
Figure 5.1 Traffic Volume Count (TVC) survey locations and OD survey Locations
4.10 Service Level Benchmarks (SLB) for Urban Transport

Service level benchmarks (Ten performance indicators) have been identified for the following areas of intervention:

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

The parameters highlight the performance as would be monitored by the Urban Local Bodies / Development Authority/ Parastatal Agency. These performance measurements will need to be carried out by the service delivery agencies themselves, reported to higher levels of management and also disseminated widely. Clear definitions and methodologies are expected to eliminate bias in measurement and reporting.

Typically, four levels of service (LoS) have been specified, viz. ‘1’, ‘2’, ‘3’ and ‘4’ with ‘1’ being highest LoS and ‘4’ being lowest to measure each identified performance benchmark. Therefore, the goal is to attain the service level 1.

4.10.1 Public transport facilities

It indicates the city-wide level of services provided by public transport systems during peak hours (8 to 12 noon & 4 to 8 pm). Public Transport systems will only include rail, or organized bus based systems. Public Transport systems are characterized by - Fixed origins and destinations; Fixed routes and schedules; Fixed stoppage points; and Fixed fares. Public Transport therefore does not include Intermediate Public Transport (IPTs) such as shared RTVs, auto-rickshaws, three-wheelers, tempos, shared taxi or other such vehicles providing point-to-point services.

Overall level of service of public transport facilities city wide is given in Table 4.11
Table 4.11: Overall Level of Service of Public Transport Facilities City Wide

<table>
<thead>
<tr>
<th>S.No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Presence of Organized Public Transport System in Urban Area (%)</td>
<td>&lt; 20</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Availability of Public Transport (Ratio)</td>
<td>&lt; 0.2</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Service Coverage of Public Transport in the city (road kms/sq. km)</td>
<td>&lt; 0.3</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Average waiting time for Public Transport users (Min)</td>
<td>&gt;10 min</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Level of Comfort in Public Transport (passengers per seat)</td>
<td>&gt; 2.5</td>
<td>4</td>
</tr>
<tr>
<td>6</td>
<td>% of Fleet as per Urban Bus Specifications</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>24</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Total score 24 refers to overall LOS 4 (As per Guidelines). The city has no organised public transport system

4.10.2 Pedestrian Infrastructure Facilities

It indicates the percentage of road length along the arterial and major road network or Public Transport corridors and at intersection that has adequate barrier free pedestrian facilities. Overall Level of Service of Pedestrian Infrastructure facilities City wide is given in **Table 4.12.**

Table 4.12: Overall Level of Service of Pedestrian Infrastructure facilities City wide

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Signalized intersection delay (%)</td>
<td>&lt; 25 %</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Street Lighting (Lux)</td>
<td>4to 6</td>
<td>3</td>
</tr>
<tr>
<td>3</td>
<td>% of City Covered</td>
<td>&lt;25</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td><strong>Total</strong></td>
<td><strong>8</strong></td>
<td></td>
</tr>
</tbody>
</table>

**Comments:** Total score 8 refers to overall LOS 2. The city has pedestrian facilities which may need some improvements in terms of improvements in intersections, footpaths, and street lighting as some parts of the city are not served by it. The footpath available needs improvements. The system provided is otherwise comfortable and sustainable
4.10.3 Non-Motorized Transport (NMT) facilities

Indicates the percentage of dedicated cycle track / lane along the arterial & sub arterial road network or public transport corridors with a minimum of 2.5 m width. It is characterized by continuous length, encroachment on NMT lanes, and parking facilities. All JnNURM cities to have NMT tracks on all major roads within a year. The indicators to calculate the adequate NMT facilities are given in Table 4.13.

Table 4.13: Overall Level of Service (LoS) of Non-Motorized facilities (NMV) City-wide

<table>
<thead>
<tr>
<th>S.No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>% of network covered</td>
<td>&lt; 15</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Encroachment on NMV roads by Vehicle Parking (%)</td>
<td>&gt; 30</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>NMT Parking facilities at Interchanges (%)</td>
<td>&lt; 25%</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

Comments: Total score 12 refers to overall LOS 4. The city lacks adequate NMT facilities

4.10.4 Level of usage of Intelligent Transport System (ITS) facilities

ITS refers to efforts to add information and communications technology to transport infrastructure and vehicles in an effort to manage factors that typically are at odds with each other, such as vehicles, loads, and routes to improve safety and reduce vehicle wear, transportation times and fuel consumption. GPS/GPRS systems are required so as to cover all the public transport and intermediate public transport vehicles on the National public transport helpline. besides the use for operational efficiencies. The indicators to calculate the usage of ITS facilities in the city are given in Table 4.14.

Table 4.14: Overall Level of Service (LoS) of usage of Intelligent Transport System (ITS) City-wide

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Availability of Traffic Surveillance (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Passenger Information System (PIS) (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Global positioning system (GPS) / General Packet Radio Service (GPRS) (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>4</td>
<td>Signal synchronization (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>5</td>
<td>Integrated Ticketing System (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>
Comments: Total score 20 refers to overall LOS 4. The city lacks adequate ITS facilities

4.10.5 Travel speed (Motorized and Mass Transit) along major corridors

This level of service provides an indication of effective travel time or speed of Public or private Vehicles by taking into account indications of congestion or traffic density. This level of service is along corridors, and not indicative of overall level of service from origin to destination. Level of service (LoS) measured along key corridors and then aggregated for the city. The indicators to calculate the Travel speed (Motorized and Mass Transit) along major corridors are given in Table 4.15.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Average Travel speed of Personal vehicles (Kmph)</td>
<td>15-25</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>Average Travel speed of Public Transport (Kmph)</td>
<td>10-15</td>
<td>3</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Comments: Total score 6 refers to overall LOS 3. Significant approach delays and average travel speed of 1/3 of free flow speed or lower. Such operations are caused by some combination or adverse progression, high signal density, extensive queuing at critical intersections and inappropriate signal timing.

4.10.6 Availability of parking spaces

It indicates the restriction on free parking spaces for all vehicles in a city. The indicators to calculate the parking facilities are given in Table 4.16.

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Availability of on street paid public parking spaces (%)</td>
<td>&lt; 25</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Ratio of Maximum and Minimum Parking Fee in the City</td>
<td>&gt;4</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>5</td>
</tr>
</tbody>
</table>

Comments: Total score 5 refers to overall LOS 3. Paid parking spaces provided in the city need to be improved upon and to cater to the demand some differential parking rates for the CBD have been adopted. The city authorities need to initiate considerable improvements measures.
4.10.7 Road safety

With increasing road traffic, many cities are witnessing rising levels of accidents, leading to rising levels of injuries and fatalities. Level of fatality is an indication of road safety. Road design and available road infrastructure, traffic management and other such reasons significantly contribute to road safety. Therefore fatality rate should be monitored. The benchmark for the same is zero, as ideally fatalities and injuries out of accidents should be brought down to nil. Within the number of accidents, the vulnerable road users are pedestrians and persons with non-motorised vehicles. It is therefore, critical to monitor the extent to which such road users are impacted within the overall set of road users. The benchmark value for the same is also zero. The indicators to calculate the LoS of road safety is given in Table 4.17.

Table 4.17: Overall Level of Service (LoS) for Parking Space City-wide

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Fatality rate per lakh population</td>
<td>6</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Fatality rate for pedestrian and NMT (%)</td>
<td>20-40</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>6</td>
</tr>
</tbody>
</table>

Comments: Total score 6 refers to overall LOS 3. Need considerable improvements in road design and available road infrastructure, traffic management and in other such reasons which significantly contribute to road safety.

4.10.8 Pollution levels

This indicator indicates the Level of air Pollutants in the city i.e. average level of pollution in urban areas. The indicator to calculate the pollution levels is Annual Mean Concentration Range (µg/m3). Overall Level of Service (LoS) for Pollution levels is given in Table 4.18.

Table 4.18: Overall Level of Service (LoS) for Pollution levels

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SO2 (µg/m3)</td>
<td>0-40</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Oxides of Nitrogen (µg/m3)</td>
<td>0-40</td>
<td>1</td>
</tr>
<tr>
<td>3</td>
<td>SPM (µg/m3)</td>
<td>180-360</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>RSPM (Size less than 10 microns) (µg/m3)</td>
<td>40-80</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

Comments: Total score 8 refers to overall LOS 2. Need some improvements in emission standards, checking pollution etc.
4.10.9 Integrated land use transport system

It indicates the effectiveness of land use-transport arrangements and identify the level of integrated land use transport system expected to result in overall trip reduction and mode shift in favor of public transit. The indicators to calculate the land use transport integration are as given in Table 4.19.

Table 4.19: Overall Level of Service (LoS) for Land Use Transport Integration City-wide

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Population Density - Gross (persons / Developed area in hectare)</td>
<td>&lt; 125</td>
<td>1</td>
</tr>
<tr>
<td>2</td>
<td>Mixed Land use on major transit corridors / network (% area under non-residential use)</td>
<td>15-30</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>Intensity of development - City wide (FSI)</td>
<td>1-1.5</td>
<td>3</td>
</tr>
<tr>
<td>4</td>
<td>Intensity of development along transit corridor (FSI)</td>
<td>1.5-2</td>
<td>3</td>
</tr>
<tr>
<td>5</td>
<td>Clear Pattern and completeness of the network</td>
<td>Somewhat unclear pattern</td>
<td>3</td>
</tr>
<tr>
<td>6</td>
<td>% of area under roads</td>
<td>10-12</td>
<td>3</td>
</tr>
<tr>
<td>7</td>
<td>% age network having exclusive ROW for transit network</td>
<td>&lt; 10 %</td>
<td>4</td>
</tr>
</tbody>
</table>

Comments: Total score 19 refers to overall LOS 3. Faint coherence between city structure and public transport system

4.10.10 Financial sustainability of public transport

The indicators to calculate the financial sustainability of public transport by bus is as follows:

- **Extent of Non-fare Revenue (%):** All city transit system operators to achieve a minimum of 20% and above share.
- **Staff / bus ratio:** To keep at a level as defined in LoS 2 or above.
- **Operating Ratio:** To take the operating ratio to at least 1.

The overall LoS for financial sustainability of public transport city wide is given in Table 4.20.
### Table 4.20: The Overall LoS for Financial Sustainability of Public Transport City Wide

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Indicator</th>
<th>Value</th>
<th>Level of Service</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Extent of Non fare Revenue (%)</td>
<td>&lt; 10</td>
<td>4</td>
</tr>
<tr>
<td>2</td>
<td>Staff /bus ratio</td>
<td>&lt; 5.5</td>
<td>4</td>
</tr>
<tr>
<td>3</td>
<td>Operating Ratio</td>
<td>1-1.5</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

**Comments:** Total score 8 refers to overall LOS 4. There is no public transport bus system serving the city. Financial sustainability does not arise.

### 4.10.11 SLBs for Urban Transport in Amritsar City

A quick assessment of LOS of ten performance indicators (parameters) for Amritsar Urban Transport was made, using the available data in reports and secondary data collected during this study.

The significance of the various scores, as described in the MoUD Guidelines, is shown in **Table 4.21**. The significance of each LOS score, as shown in the right-hand column, is consistent with the findings of the CMP.

### Table 4.21: Significance of Amritsar Levels of Service

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Performance Indicator</th>
<th>LOS Actually Achieved</th>
<th>LOS Targeted for Next Year</th>
<th>Significance as per SLBs Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Public Transport Facilities</td>
<td>4</td>
<td>3</td>
<td>The city has no organised public transport system</td>
</tr>
<tr>
<td>2</td>
<td>Pedestrian Infrastructure Facilities</td>
<td>2</td>
<td>1</td>
<td>The City has pedestrian facilities which may need some improvements in terms of improvements in intersections, footpaths, and street lighting as some parts of the city are not served by it. The footpath available needs improvements.</td>
</tr>
<tr>
<td>3</td>
<td>NMT Facilities</td>
<td>4</td>
<td>3</td>
<td>The city lacks adequate NMT facilities.</td>
</tr>
<tr>
<td>4</td>
<td>Level of Usage of ITS</td>
<td>4</td>
<td>3</td>
<td>The lacks adequate ITS facilities</td>
</tr>
<tr>
<td>5</td>
<td>Travel Speed (Motorised and Mass Transit) along major corridors</td>
<td>3</td>
<td>2</td>
<td>Significant approach delays and average travel speed of 1/3 the free flow speed or lower. Such condition of one or more reasons such as high signal density, extensive queuing at critical</td>
</tr>
<tr>
<td>Sl. No</td>
<td>Performance Indicator</td>
<td>LOS Actually Achieved</td>
<td>LOS Targeted for Next Year</td>
<td>Significance as per SLBs Guidelines</td>
</tr>
<tr>
<td>-------</td>
<td>--------------------------------</td>
<td>-----------------------</td>
<td>-----------------------------</td>
<td>------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>6</td>
<td>Availability of Parking spaces</td>
<td>3</td>
<td>2</td>
<td>Paid parking spaces provided in the city need to be improved upon and to cater to the demand some differential parking rates for the CBD have been adopted.</td>
</tr>
<tr>
<td>7</td>
<td>Road Safety</td>
<td>3</td>
<td>2</td>
<td>Need considerable improvements in road design and available road infrastructure, traffic management and in other such reasons which significantly contribute to road safety</td>
</tr>
<tr>
<td>8</td>
<td>Pollution Levels</td>
<td>2</td>
<td>1</td>
<td>Need some improvements in emission standards, checking pollution etc.</td>
</tr>
<tr>
<td>9</td>
<td>Integrated Land Use Transport System</td>
<td>3</td>
<td>2</td>
<td>Faint coherence between city structure and PT.</td>
</tr>
<tr>
<td>10</td>
<td>Financial Sustainability of PT</td>
<td>4</td>
<td>3</td>
<td>There is no public transport bus system serving the city. The financial sustainability does not arise.</td>
</tr>
</tbody>
</table>
Chapter 5.0 : Analysis of Existing Traffic / Transport Situation
CHAPTER 5.0

ANALYSIS OF EXISTING TRAFFIC/TRANSPORT SITUATION

5.1 Traffic Surveys

Appreciation of a city’s transport system and traffic characteristics is the first essential step to plan for its future development and operation. As part of CMP, extensive surveys and studies were carried out in Amritsar. Table 5.1 lists the surveys and their scope

Figure 5.1 shows the Traffic Volume Count (TVC) survey locations and OD survey Locations

Table 5.1: Traffic Surveys

<table>
<thead>
<tr>
<th>Sl. No.</th>
<th>Survey</th>
<th>Scope</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Road Network Inventory</td>
<td>112 km</td>
<td></td>
</tr>
<tr>
<td>2.</td>
<td>Speed and Delay</td>
<td>112 km</td>
<td></td>
</tr>
<tr>
<td>3.</td>
<td>TVC-Outer cordon</td>
<td>10 CS</td>
<td>3 days x 24 hrs.</td>
</tr>
<tr>
<td>4.</td>
<td>TVC - Inner Cordon</td>
<td>8 CS</td>
<td>3 days x 24 hrs.</td>
</tr>
<tr>
<td>5.</td>
<td>TVC - Screen Line</td>
<td>9 CS</td>
<td>3 days x 24 hrs.</td>
</tr>
<tr>
<td>6.</td>
<td>Mid-Block Volume Count</td>
<td>15</td>
<td>1 x 24 Hrs</td>
</tr>
<tr>
<td>7.</td>
<td>Origin and Destination Survey</td>
<td>25</td>
<td>1 x 24 Hrs</td>
</tr>
<tr>
<td>8.</td>
<td>Intersection Turning Movement Count</td>
<td>12</td>
<td>12 Hrs.</td>
</tr>
<tr>
<td>9.</td>
<td>Household Interview Survey</td>
<td>2944 HHs</td>
<td></td>
</tr>
<tr>
<td>10.</td>
<td>Secondary Data Collection</td>
<td></td>
<td>Passenger Terminal Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>IPT &amp; Bus Operator Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Pedestrian Survey</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Parking Survey</td>
</tr>
</tbody>
</table>

5.2 Road Network System

Amritsar Road Network System is radial in pattern with 9 radial roads emerging cut from the Central Area. NH - 1 and NH - 15 run through the city. The general characteristics of the road network are:

- Network is poor in pattern, mainly radial. Orbital roads missing
- Hierarchy of road network is not well defined and maintained. Radial roads, and partial ring road, function as arterial roads. Lower classes of hierarchy not well defined. The functional characteristics of arterial roads are adversely affected due to parking, encroachment and poor management.
- The Right-of-way ranges between 10 m to 60 m. 71% of the road length has less than 30m ROW.
• The capacity of the road network is poor. 60% of the road length has less than 15m carriageway (average) width.
• 40% of the roads have undivided CW
• 93% of roads have no service roads
• On-street parking is predominant (over 63% of road length) resulting in capacity reduction.
• Pavement condition ranges from good to very good (50%)
• Surface drainage is poor
• Pedestrian facilities are either poor or absent. 87% of road length has no footpaths.
• Road markings not adequate. 37% of roads have no markings
• Road signages are poor. 59% have no signages

5.3 Speed and Delay Characteristics

Speeds on the road network define the level of service prevailing. It is an important input at many stages of transport system planning and management. The general characteristics observed are:

• The average speed ranges between 11 and 40 kmph on arterial roads and between 8 and 30 kmph on sub arterial roads. Only 12% of arterial roads have speeds of 40 kmph and above. 50% of sub arterial roads have speeds less than 20 kmph
• Divided CW roads have higher speeds compared to undivided CW roads

5.4 Traffic Characteristics

Appreciation of traffic characteristics in terms of size, composition, variation, etc. and travel pattern in terms of desire, etc. are important to plan the transport system of the city. The important characteristics revealed by the extensive traffic surveys are:

5.4.1 At Outer Cordon - Traffic Characteristics

• A total of 228,936 vehicles (219,839 PCUs) crossed the 12 stations on an average day.
• Motorized passenger vehicles accounted for 77%; and goods vehicles for 7.45%
• 2-wheelers had a high share of 35% followed by cars with 28%, Buses were only 3% and Slow Moving vehicles were 16%.
• Day (0600 to 2200 hrs) traffic accounted for 95%
• Peak hour flow ranged between 6.52 to 8.78%

5.4.2 Travel pattern of passenger modes at Outer Corridor

• 93% of passenger modes was External - External
  The pattern (%) was:
  Internal - External - 45
  External - Internal - 46
  External - External - 9
• The average trip length (km), by modes, was:
  2 Wheeler - 17
  Cars etc. - 38
  Taxi - 62
  Mini Bus - 68
  Bus - 137
• Average Occupancy, by modes, was:
  2 Wheeler - 1.50
  3 Wheeler - 4.48
  Cars, etc. - 2.52
  Taxi - 4.05
  Mini Bus - 24.00
  Bus - 42.80
• Amongst trip purpose, “work” was predominant (19.8%)

5.4.3 Travel Pattern of goods modes at OC

• About 9% was by passable. The pattern (%) was:
  Internal - External - 45.70
  External - Internal - 45.66
  External - External - 8.63
• The average trip length (km) were:
  LCV - 23.87
  2/3 Axle Truck - 62.75
  MAV - 293.61
  Tractor - 21.11
• The average loads (tonnes) were:
  MVA - 22
  2/3 Axle Truck - 9.93
  LCV - 5.53
  Tractor - 7.28
• Empty vehicles accounted for 54%
• Food grains, Construction Material, Fuel (Oil & gas) and Agriculture Products
  were major commodities moving

5.4.4 Traffic Characteristics at Inner Corridor

The Inner Corridor was around the walled city area of Amritsar. There were 8 count
stations. The observed traffic characteristics were:

• 231,698 vehicles (201,753 PCUs) crossed the Inner Corridor, on an average day
• Maximum traffic volume (48,716 vehicle) was at Sultan Wind Road (near Kaka
  Ram Halwai)
• The average composition (%) by modes, was:
  2 Wheeler - 43
  3 Wheeler - 14
Cars, etc. - 10
Taxi - 1
Mini Bus - 3
Bus - 28
- Day traffic share was 93.5%
- Peak hour flow ranged between 5.39 to 8.78%

5.4.5 Traffic characteristics at Railway Line (East-West) Screen Line

- A total of 167,531 vehicles (141,572 PCUs) crossed the 9 count stations along the screen line
- The share of 2 wheelers was high at each count station, ranging between 30% to 53%, slow moving modes share ranged between 30% to 44%. The share of buses was very low, ranging between nil to 2.23%.

5.4.6 Traffic characteristics at Mid Block Stations

- The ADT at 13 mid block count stations ranged between 15,572 to 48,622 vehicles
- 2 wheelers were major modes at all the stations (35 to 48%)
- Slow moving modes share ranged (11 to 32%)
- The share of buses was very low (0.13 to 2.8%)
- Peak hour flow ranged (7.16 to 9.23%)

5.4.7 Traffic characteristics along By-pass road (NH-1)

TVC survey at 5 count stations, along Bypass road (NH-1) was carried out. The general characteristics were:

- Traffic volume was maximum of 26,549 vehicles at Doburj (near 1BP petrol Pump)
- Cars, etc. had high share (41 to 48%)
- Bus share was very low. Only at Doburj its share was nearly 5%
- Slow moving vehicles share ranged between 6 to 9%
- The peak hour flow was between 7.2% to 9%

5.4.8 Traffic characteristics at Intersections

Intersection Turning Movement surveys at 12 major intersections, for 12 hours were carried out. The general features are:

- The total of all directional movements ranged between a high of 173,324 vehicles (143,068 PCUs) at Bhandari Chowk to a modest 39,684 vehicles (35,050 PCUs) at Ratan Singh Chowk
- Passenger modes were predominant
- Goods mode share was low (1 to 2%)
• Bus share was very low (1%)
• Slow moving mode share was reasonably high (9 to 41%)
• Peak hour flow ranged between 9.4 to 12.2%

5.4.9 Issues

Traffic surveys highlight the following issues and constraints:

• Hierarchy in the road network is not well defined
• The availability of major (city level roads) is low
• The road capacity is poor
• The potential for upgrading the road system, increase capacity, segregate modes by lanes, etc. is limited
• The average speeds on the roads is low indicating low level of service
• The traffic volumes are high with private modes dominating
• The share of buses is very low
• Intersection flows are high, geometrics poor and delays are manifest
• Peak hour flows at many locations are high and need measures to moderate
• The by-passable traffic share is moderate to high and need strengthening of the bypass system
• Para-transit modes play a major role in providing mobility. They need to be facilitated.

5.5 Travel (Trip) Characteristics

Analysis of socio-economic trip characteristics and their correlation provide base for policy formulation, model construction, travel demand forecast and socio-economic evaluation. The Household Interview Survey (HIS) has brought out interesting information on household, demographic and trip characteristics. Some of the important ones are reiterated here:

5.5.1 Household Characteristics

• The average household size was 5.47 amongst TAZs. If ranged between 4.5 and 6.4
• The sex ratio was 897. The range was 734 to 1055
• Amritsar is a city of young people 40% were below 25 years. The share of aged (above 60 years) is also high (11.5%)
• The literacy rate is moderate (81.9%). The high share of illiterates calls for a major thrust in education program including provision of physical infrastructure.
• “Student” and “Homemakers” (housewife) accounted for 25% and 26% of population. “Business” and “Service” occupation accounted for 12% each
• Weighted average monthly household income was moderate at Rs. 17,392. It ranged between Rs. 8,533 to Rs. 55,504 amongst the 65 wards in AMC
“Food” (25.3%) and “Transport” (14.2%) account for a major share of household. If 10% of household income is taken as affordable expenditure on “transport”, then the actual expenditure is very high.

5.5.2 Travel Characteristics

- A total of 14,20,158 person trips were generated in AMC on an average day
- The mobility rate (per capita trip rate [PCTR]) works out to 1.20 including “walk” trips and 0.88 excluding “walk” trips.
- “Walk” trips accounted for nearly 27% of all trips. Auto Rickshaws play a major role in modal share (22.03%). Share of Bus was very low (4.64%). “Cycle trips accounted for 12%:
- The average trip length of “walk” mode was 1.65 km. That of “standard buses” was 37.12 km indicating the inter-city characteristics of the bus service. The overall average trip length was 5.64 km.
- The predominant trip purpose was “Work” (45.77%), “Education” trip was also high (43.62%)

5.6 Base Year Travel Demand Model

Base Year Travel Demand Model for Amritsar City is given in Appendix 5.1.

5.7 Issues

The general findings of the surveys and studies in terms of major issues are summarized in the Table 5.2.

Table 5.2: Amritsar Municipal Corporation Transport System - Issues

<table>
<thead>
<tr>
<th>ISSUES</th>
<th>Severity (High/Medium/Low)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1. Traffic Congestion</strong></td>
<td></td>
</tr>
<tr>
<td>City-wide traffic congestion</td>
<td>Medium</td>
</tr>
<tr>
<td>Traffic congestion on major roads at peak hours</td>
<td>High</td>
</tr>
<tr>
<td>Narrow streets contributing to congestion</td>
<td>High</td>
</tr>
<tr>
<td>Waiting or parked vehicles contributing to congestion</td>
<td>High</td>
</tr>
<tr>
<td>Slow moving vehicles(Bicycle, Cycle Rickshaw, Auto Rickshaw)</td>
<td>High</td>
</tr>
<tr>
<td>contributing to congestion</td>
<td></td>
</tr>
<tr>
<td><strong>2. Existing Bus Systems</strong></td>
<td></td>
</tr>
<tr>
<td>Lack of (Public) Bus operator</td>
<td>High</td>
</tr>
<tr>
<td>Lack of Bus Routes</td>
<td>High</td>
</tr>
<tr>
<td>Lack of Bus vehicles</td>
<td>High</td>
</tr>
<tr>
<td>Poor maintenance of publicly operated buses</td>
<td>Not Applicable (NA)</td>
</tr>
<tr>
<td>Poor maintenance of privately operated buses</td>
<td>Medium</td>
</tr>
<tr>
<td>Proliferation of disorganized private bus services (including Mini Buses)</td>
<td>High</td>
</tr>
<tr>
<td>Low profitability of bus operators</td>
<td>NA</td>
</tr>
<tr>
<td>Lack of bus driver training</td>
<td>High</td>
</tr>
<tr>
<td><strong>ISSUES</strong></td>
<td><strong>Severity (High/Medium/Low)</strong></td>
</tr>
<tr>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>3. Parking</strong></td>
<td></td>
</tr>
<tr>
<td>Major streets are too narrow for parking</td>
<td>Medium</td>
</tr>
<tr>
<td>Problems caused by parking of private vehicles</td>
<td>High</td>
</tr>
<tr>
<td>Problems caused by parking / waiting of rickshaws and Auto Rickshaws</td>
<td>High</td>
</tr>
<tr>
<td>Lack of parking areas at stations / Bus terminals</td>
<td>High</td>
</tr>
<tr>
<td>Lack of land for off-street parking</td>
<td>Medium</td>
</tr>
<tr>
<td>Lack of regulations for parking measures</td>
<td>Medium</td>
</tr>
<tr>
<td>Parking policy and Guidelines</td>
<td>High</td>
</tr>
<tr>
<td><strong>4. Traffic Safety</strong></td>
<td></td>
</tr>
<tr>
<td>Vehicle-vehicle accidents</td>
<td>Low</td>
</tr>
<tr>
<td>Accidents involving pedestrians</td>
<td>Medium</td>
</tr>
<tr>
<td>Accidents involving cyclists</td>
<td>Low</td>
</tr>
<tr>
<td>Accidents involving Auto/Cycle rickshaws</td>
<td>Low</td>
</tr>
<tr>
<td>Level of Driver education / Training / Licensing</td>
<td>Low</td>
</tr>
<tr>
<td><strong>5. Enforcement</strong></td>
<td></td>
</tr>
<tr>
<td>Enforcement of illegal traffic movements or speeding</td>
<td>Low</td>
</tr>
<tr>
<td>Enforcement of illegal traffic parking</td>
<td>Low</td>
</tr>
<tr>
<td>Enforcement of unlicensed private vehicle motorist</td>
<td>Low</td>
</tr>
<tr>
<td>Enforcement of illegal bus / para - transit operators</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of enforcement resources (Traffic police and equipment)</td>
<td>Medium</td>
</tr>
<tr>
<td><strong>6. Environment</strong></td>
<td></td>
</tr>
<tr>
<td>Air pollution</td>
<td>Low</td>
</tr>
<tr>
<td>Traffic noise</td>
<td>Low</td>
</tr>
<tr>
<td>Planning and Implementation Capacity</td>
<td></td>
</tr>
<tr>
<td>Guidance for making city transport policy /plans</td>
<td>Medium</td>
</tr>
<tr>
<td>City Master plans do not reflect actual situation on the ground</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of sufficient urban transport planners within the city government</td>
<td>Low</td>
</tr>
<tr>
<td>City officials dealing with transport planning lack experience or training in transport planning</td>
<td>Low</td>
</tr>
<tr>
<td>Lack of data collection capability</td>
<td>High</td>
</tr>
<tr>
<td>Lack of finance resources to implement planned transportation projects</td>
<td>High</td>
</tr>
<tr>
<td>Lack of knowledge of Public-Private-partnership</td>
<td>High</td>
</tr>
<tr>
<td><strong>7. Coordination Capability</strong></td>
<td></td>
</tr>
<tr>
<td>Small private developers do not make strategic provision for transport infrastructure</td>
<td>High</td>
</tr>
<tr>
<td>Transport and urban planning agencies do not coordinate or integrate plans and processes</td>
<td>High</td>
</tr>
<tr>
<td>Land use plans are not coordinated with transport plans</td>
<td>Medium</td>
</tr>
<tr>
<td>Workers / transport operator's unions obstruct improvement</td>
<td>Low</td>
</tr>
<tr>
<td>Division of duties between State government and urban local bodies (ULB) is not clear</td>
<td>Low</td>
</tr>
<tr>
<td><strong>8. Transport / Traffic Regulation</strong></td>
<td></td>
</tr>
<tr>
<td>Bus / para transit operators are not adequately regulated</td>
<td>High</td>
</tr>
<tr>
<td>Para transit vehicles are not adequately regulated</td>
<td>High</td>
</tr>
</tbody>
</table>
Chapter 6.0 : Development of Visions & Goals
CHAPTER - 6.0

DEVELOPMENT OF VISIONS AND GOALS

6.1 Vision

The overall vision of the Comprehensive Mobility Plan for Amritsar is to “Plan, Develop, Operate and Manage an Integrated Multi-Modal Transport System (IMMTS) for the LPA of Amritsar which is efficient, inclusive, affordable, safe, sustainable and which enhances the brand image of Amritsar as a “World Class city”

6.2 Mission

The mission is to develop and operate a transport system that will include:

- Road Network system adequate in capacity, appropriate in pattern and hierarchical in structure
- Public Mass Transport System which is extensive in coverage, appropriate in technology mix, equitable and inclusive in access to service, affordable and which caters a large share of the travel demand
- Pedestrian and Non-Motorized Transport facilities which are extensive, adequate, attractive and safe
- Terminals, both of passenger and goods, to provide a place of convenient access to the services, a place of easy transfer amongst modes and services, a place of refuge, a complex of multi-uses, a landmark in urban escape, and overall, a facilitator of integration amongst transport modes, land use and people.
- Parking policy, parking areas and parking complexes which, provide for orderly parking of modes, enable convenient transfer to public transport and support traffic management objectives of local spot, area and corridor plans.
- Rational goods movement within, to, from and through the city
- Reform and restructure of the institutional framework in the city to plan, develop, operate and manage the proposed IMMTS

6.3 Strategies

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

- Upgrade the existing road network system
- Identify and develop the missing links

- Complete the Inner Ring Road and, over a period of time, transform it into a city development road

- Develop Orbital roads to reorganize traffic pattern and reduce concentrated flows into the Walled City area

- Upgrade and manage the Orbital road around the Walled City area to promote restrictive access policy into, and traffic management of, the Walled City area

- Develop, re-engineer and manage the Radial and Orbital corridors as multi-modal Integrated Transport Corridors (ITCs)

- Transform Walled City area into a predominantly pedestrian and NMT area with very restrictive and limited access to motorized modes

- Re-design the streets within Walled city to promote safe, leisurely and convenient movement of pedestrians

- Inter-connect all heritage, cultural and tourist interest places within the Walled city by a well designed pedestrian cum NMT street system with well designed and attractive street furniture and other facilities to enhance the “Walk-ability” within the Walled city.

- Invariably provide pedestrian footpaths and NMT lanes along all corridors and streets of the city

- Provide exclusive pedestrian phase at all signalized inter-sections

- Provide pedestrian grade separation facility, at mid-block, along major arterial corridors where the inter-section spacing is 1 km or more

- Provide pedestrian refuge islands, of adequate size, at all intersections

- Prepare and implement the Traffic Management Plans, for critical locations, corridors and areas with emphasis on priority of access and movement for public transport (PMTS and IPT), pedestrians and NMTs

- Prepare and adopt a comprehensive Parking Policy which:
  - discourages use of private modes for ‘Work’ and ‘Education’ trips
  - facilitates ‘Park and Ride’ system in integration with PMTS;
  - conserves space; and
  - prohibits encroachment on road space and capacity
• Adopt 'Zero Fatal Accident' policy. Promote high degree of safety in the planning, design and construction of transport facilities and operation of transport service

• Conduct safety audit at all stages – planning, design, construction, post construction and operation – of transport facilities and services

• Promote a balanced Nodal cum Corridor urban form and efficient multi-nuclei urban structure

• Promote integrated development of land use and transport. Adopt the policy of transport leading development

• Adopt ‘move people not vehicles’ policy. Introduce, operate and manage high capacity modernized bus system (BRTS) and rail based mass transport system (LRTS) to provide capacity, improve level of service, conserve resources and enhance image

• Develop Integrated Freight Complexes at appropriate locations, in adequate numbers and extent, and shift goods handling wholesale markets and go-downs from the Walled city area

• Rationalize goods vehicle movements. MAV's to terminate at IFC's. Small and medium size vehicles to distribute goods within city area. Confine heavy goods vehicles to identified roads/corridors.

• Enhance the environmental quality of the city through a comprehensive package of programs including restriction in movement of heavy goods vehicle;
  - restriction on age of commercial vehicle;
  - fuel policy;
  - formulating vehicle exhaust standards;
  - regular vehicle pollution checking;
  - replacing 2-stroke, diesel based auto rickshaws by 4-stroke, CNG based vehicles;
  - operating battery based small vehicles within Walled City as IPT modes;
  - restricting speeds of vehicles on urban corridors to be at the optimal level; and
  - other traffic management measures.

• Establish Environment Monitoring Cell in AUMTA/UMTA/AMC

6.4 Goals/ Objectives

The following goals/objectives are set:

• Restructure the city development pattern from a radial, mono-nuclear into a radial-cum-corridor, nodal, multi-nuclei one

• Increase the arterial/sub-arterial road multifold (from 499.4 Lane km to 1861 lane km)
• Double the share of Public Transport modes from 30% to 60%

• Of the Public Transport share, increase the share of Public Mass Transport System (PMTS) from 4% to 40%

• Plan and operate modernized, medium capacity, public mass transport technology systems of about 233 Km

• Develop 4 Integrated Freight Complexes of about 500 ha (total)

• Construct grade separated flyovers /interchanges at all inter-sections of radial and orbital (IRR and MRR) roads (about 25 nos.)

• Consult and Operate multi-storied parking complexes (about 17Nos)

• Double the average journey speed of traffic on arterial roads/corridors

• Improve the Level Of Service (LOS) of traffic on arterial and sub arterial roads to 0.7 or less

• Reduce fuel consumption by 30 to 50%

• Reduce travel time (by 50%)

• Reduce delay at intersections (30 to 50%)

• Reduce traffic related air pollution (to be within prescribed standards)

• Establish AUMTA, TEMU in AMC and a number of SPV's for BRTS, LRTS, IFCs, Terminals and Parking complexes
Chapter 7.0 : Future Urban Growth Scenarios
CHAPTER -7.0

FUTURE URBAN GROWTH SCENARIOS

7.1 Urban Growth Scenarios in the Master Plan

The Amritsar Master Plan (Draft) envisages the continued fast growth of the city and has estimated the population to increase from 1.27 m in 2011 to reach a size of 3.02 m by 2031. The Master Plan has envisaged the economic base of the city to be multi-functional comprising trade, industry, education, tourism and defence. The employment size (Main workers) in AMC is estimated to be 31.66%. The spatial distribution of the people and activities (land use) is envisaged as mono-nucleus, spread out pattern. The overall gross density is proposed to be of median density of 125 ppha. The transport system is of radial-cum-orbital network pattern. This includes 9 radial roads and 4 ring roads.

The proposed transport technology is road based. The public mass transport comprises road based bus system in combination with the Intermediate Public Transport (IPT) modes comprising taxis, auto-rickshaws and cycle rickshaws. No specific modal split amongst the modes is recommended/estimated. The area earmarked for the proposed Land Use Plan (2031) is of the order of 656.26 sq.km (47% of the total LPA area).

A detailed overview of the Master Plan is presented in Chapter 3.

The Master Plan Scenario is considered as one of the alternative development scenario for comparative evaluation.

7.2 Urban Growth Development Scenarios

7.2.1 Urban Form and Structure

The spatial distribution of people and activities of an urban area results in its form and structure. Urban form generally refers to the physical shape of the city. Important predominant forms are linear, radial and radial-cum-orbital. A number of possibilities are potential by a combination of the basic forms, with no one form being exclusive but generally predominant.

7.2.2 Urban Structure

Urban Structure refers to the spatial distribution and configuration of centers of activities, the two main possibilities being mono-nucleus and multi-nuclei. Historically cities tend to develop as mono-nucleus with the concentration of activities (employment centers) in the traditional Central Business District. However, as growth intensifies, certain dis-economic factors like high land values, non-availability of space, congestion,
delays, etc. tend to disperse the activities to other locations. This process is facilitated and accelerated by the city transport system and technology, increasing the accessibility and connectivity of once distant, in accessible and poorly connected locales. The resultant structure is identified as multi-nuclei.

### 7.2.3 Impact on Travel Pattern

Each of the combinations of form and structure have advantages and constraints. When the city is young and small in size a simple mono-nucleus structure with radial network system may be the most optimal. However, as the city grows, the change in form and structure take place, aided by a number of enabling factors. Market forces try to optimize over a long period of time. Planning process accelerates the desirable form and structure. The impact of city form and structure is profound on the urban traffic and travel pattern in terms of concentration or dispersal, modal share, trip length, trip desires, etc. The endeavors of planned and integrated development of land use and transport system are to promote and establish an optimal and sustainable system.

### 7.2.4 Amritsar Development Growth Scenarios

To enable to evaluate and select the optimal development growth pattern, 3 alternate development growth scenarios are conceptualized. They are briefly described in the following sections.

#### 7.2.4.1 D1: Master Plan Scenario

In this, the Master Plan concept, in terms of population and activities (land use) distribution, is adopted. The basic features of the scenario have already been described. At the first instance 4 major spatial units comprising Walled city, Rest of Amritsar Municipal Corporation, LPA Urban and LPA Rural are identified. The urban extension area proposed in the Master Plan outside the municipal corporation area is designated as LPA Urban. Rest of LPA is designated as LPA Rural.

The estimated population of 3.02 million is distributed amongst the above 4 spatial units based on estimated population in the base year, the density ranges as derived from the Master Plan report and Land Use Plan (Refer Plan 2, Drawing No. D.T.P. (A) 18/2010 of Master Plan report).

For employment size estimation, the Worker Participate Rate (WPR) in Amritsar Municipal Corporation is estimated to be 31.66% based on Master Plan estimate of main and marginal workers, by 2031. The WPR in LPA Rural is estimated to be 47.30% based on the WPR of rural areas in the district (2001). The LPA urban area, which is transitioning from rural to urban, will have a WPR in between the above two spatial units and is estimated to be 36.24%.

The total employment in each spatial division is further sub divided into primary, secondary and tertiary sectors based on the overall occupation structure proposed in
the Master Plan for 2031, the assumption of the formal to informal employment to be 1:1 and based on proposed land use plan. Figure 7.1 shows the density map of scenario-1.

![Density map of Scenario 1: Master Plan Scenario](image)

**Figure 7.1: Density map of Scenario 1: Master Plan Scenario**

The distributions of population and employment, amongst the 4 spatial divisions are presented in **Table 7.1** and distribution of employment in Primary, Secondary and Tertiary sub divisions are shown in **Table 7.2**.

**Table 7.1: Population and Average Density distribution - Amritsar LPA (Scenario 1)**

<table>
<thead>
<tr>
<th>Name</th>
<th>Area (ha)</th>
<th>Density (persons/ ha.)</th>
<th>Population</th>
</tr>
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<tbody>
<tr>
<td>Amritsar MCI</td>
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<tr>
<td>Walled City</td>
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<td>130.84</td>
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<tr>
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<td>13402.26</td>
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<td>LPA Urban</td>
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<tr>
<td>LPA Rural</td>
<td>70397.52</td>
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</tr>
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<td><strong>Total</strong></td>
<td><strong>144009.16</strong></td>
<td><strong>21</strong></td>
<td><strong>3017937</strong></td>
</tr>
</tbody>
</table>

**Table 7.2: Employment Distribution Amritsar LPA - Scenario 1**

<table>
<thead>
<tr>
<th>Name</th>
<th>Area (ha)</th>
<th>Ppln.</th>
<th>Primary</th>
<th>HHi</th>
<th>Constr.</th>
<th>Manuf.</th>
<th>Total Secondary</th>
<th>Tertiary</th>
<th>Total Empt.</th>
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7.2.4.2 **D2: Poly Nodal Scenario**

In this scenario, 6 urban Nodes in LPA (apart from AMC) with higher concentration of people and employment are considered resulting in a poly nodal pattern. The new urban nodes envisaged are:

- Rajasansi
- Majitha
- Jandiala
- Rayya
- Mandiala
- Lahorimal

The population in the LPA Urban Spatial division in D1 is redistributed amongst the new urban Nodes and rest of LPA urban. A higher density of 32 ppha in each of the new Urban Nodes is proposed. The population size in Walled City, Rest of AMC and LPA Rural will remain the same as in D1.

As regards employment distribution, the WPR in the new Urban Nodes has been derived with the weighted average of WPR’s of AMC and the six urban nodes in 2001. **Figure 7.2** shows the density map of scenario-2.

![Figure 7.2: Density map of Scenario 2: Poly Nodal Scenario](image)

The distribution of population and employment amongst the spatial divisions is presented in **Table 7.3** and distribution of employment in Primary, Secondary and Tertiary sub divisions are shown in **Table 7.4**.
Table 7.3: Population and Average Density distribution - Amritsar LPA (Scenario 2)

<table>
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<th>Name</th>
<th>Area (ha)</th>
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Table 7.4: Employment distribution Amritsar LPA - Scenario 2

<table>
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<th>Name</th>
<th>Area (ha)</th>
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<td>Constr.</td>
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7.2.4.3 D3: Nodal-cum-Corridor Scenario

Interlinking AMC with the new Urban Nodes are strong transport corridors. There is a potential of developing and operating high capacity, high technology public means transport system along these corridors. This offers an opportunity for achieving a close integration between land use and transport. The concept of Transit Oriented Development (ToD) along these corridors would be very relevant. In this scenario, the population distributed in LPA Urban in D2 is redistributed between the zones along the corridors and LPA Urban. The density along the corridor to a depth of 500 meters on either side is taken at a high of 35 ppha. The distribution of population amongst Walled City, AMC and LPA Rural spatial divisions will remain the same as in D2.

The employment size of 2.83 lakhs in LPA Urban (Urban Nodes and Rest Urban) is redistributed amongst the new 3 sub spatial units of Urban Nodes, Urban Corridors and Rest urban. A higher share of WPR in catchment areas of Urban Corridors is provided to reflect the concentrated activities distribution along the corridors. Figure 7.3 shows the density map of scenario-2.
The proposed distribution of population and employment in this development scenario is presented in Table 7.5 and distribution of employment in Primary, Secondary and Tertiary sub divisions are shown in Table 7.6.

Table 7.5: Population and Average Density distribution across six circles - Amritsar LPA (Scenario 3)

<table>
<thead>
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<th>Area (ha)</th>
<th>Density (persons/ ha.)</th>
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Table 7.6: Employment distribution Amritsar LPA - Scenario 3

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<th>Name</th>
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Urban growth development scenarios representation are shown in Figure 7.4.
AMRITSAR SCENARIO REPRESENTATIONS

*WC – Walled City
AMC – Amritsar Municipal Corporation
UN – Urban Nodes
UC – Urban Corridor
LPA U – LPA Urban
LPA R – LPA Rural

Figure 7.4: Amritsar Scenario Representations
Chapter 8.0: Transport Network Scenarios
CHAPTER - 8.0

TRANSPORT NETWORK SCENARIOS

To support and service the conceptual development growth scenarios, 5 alternative Transport Network and Systems have been conceptualized. They range from “Do Nothing” to development and Operation of high technology public mass transport systems on an extensive basis.

8.1 The conceptualized transport system alternative

T-1: Do Nothing

➢ Existing Road Network

➢ Existing Bus Routes

Figure 8.1 shows the Transport Network Alternative-1

![Figure 8.1: Transport Network Alternative-1]

T-2: Master Plan Transport System (MPT-1)

➢ Master Plan Road Network

➢ Master Plan Public Transport System - Routes & Technologies

Figure 8.2 shows the Transport Network Alternative-2
**Figure 8.2: Transport Network Alternative-2**

**T-3 Master Plan Transport System [Moderated] (MPT-2)**

- Master Plan Road Network comprising
  - Inner Ring Road
  - Middle Ring Road (Outer ring Road deleted)
- PT Technology
  - Bus System with revised roads
  - BRTS along
    - NH 1 from Rayya to west side (Lahorimal along NH – 2)
    - Queens Chowk to Airport (along Ajnala Road)
    - Along Inner Ring Road

**Figure 8.3** shows the Transport Network Alternative-3

**Figure 8.3: Transport Network Alternative-3**
**T-4 High capacity Bus System (BRTS)**

- Master Plan Road Network
- BRTS along all Arterial Roads (Except Outer Ring Road)
- BRTS along CBD Orbital (Circular)

*Figure 8.4* shows the Transport Network Alternative-4

![Figure 8.4: Transport Network Alternative-4](image)

**T-5 High Capacity Rail Road System (LRTS)**

- Master Plan Road Network

- LRTS along
  - From Transport Nagar (Lahorimal) to Jandiala via Bus Stand along NH-1 (34.1Km)
  - Verka to Mandiala Industrial via Bus Stand and Through Walled City along NH-15 (17.5 km)
    (Note: The Stretch through Walled City will be underground)
  - Bus Stand to Airport along Ajnala road (11.5km)

- BRTS along all other Arterials (Ex: Outer Ring Road)

- BRTS along CBD Orbital

*Figure 8.5* shows the Transport Network Alternative-5
8.2 The Matrix of Land Use Transport Contributions

The 3 development growth scenarios and 5 transport system alternatives combine to generate a matrix of 15 Land Use Transport (LUT) systems of them, on a pre-selection qualitative basis, the most important probable ones will be selected and will be subjected to rigorous quantitative evaluation. The constructed Transport Model will be applied to each of the selected combinations and system outputs generated.

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<tr>
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<td>D2T3</td>
<td>D3T3</td>
</tr>
<tr>
<td>D1T4</td>
<td>D2T4</td>
<td>D3T4</td>
</tr>
<tr>
<td>D1T5</td>
<td>D2T5</td>
<td>D3T5</td>
</tr>
</tbody>
</table>

8.3 Multi Criteria Evaluation

Multi criteria evaluation is adopted to rank the selected LUT combinations. The criteria are:

- PMTS Share
- Passenger - Kms
- Passenger - Hours
- Vehicle - Kms
- Vehicle – Hours
- Energy Consumption
- Environmental impact
8.4 **Ranking**

A unique weightage system based on comparison of outputs of the alternative under each criteria has been developed, with the scores ranging from 0 depicting worst case to 10 depicting best case in fulfilling the objective under each criteria. The combinations are ranked in order of priority, from best to poor, based on the total weightage. The system selection, for detailing, is made based on the ranking moderated by other feasibility considerations.
Chapter 9.0 : Travel Demand Model Projections
CHAPTER 9.0

TRAVEL DEMAND MODEL PROJECTIONS

9.1 Introduction

The base year model has been calibrated. The model is then forecasted for Horizon Year (2031). The model has been forecasted for three land use scenarios and five transport system alternative scenarios. In all, total 15 scenarios has been prepared for various combinations of Land use scenarios and Transport Network alternatives.

9.2 Input Data- Land Use and Transport System Alternatives

The zonal wise input data of population, employment and school places are attached in Appendix. Various transport system alternatives are also attached in Appendix. The basic details of transport network alternatives are:

- Alternative-1: Do Nothing
- Alternative-2: (Proposed Inner and Outer Ring Road)
- Alternative-3: (Proposed City and Inner Ring Road and BRT Corridor)
- Alternative-4: (Proposed City, Inner Ring Road, Outer Ring Road and BRT Corridor)
- Alternative-5: (Proposed BRT and LRT Corridor on City, Inner Ring Road and Outer Ring Road)

9.3 Forecasted Trips

Table 9.1 below gives the modewise horizon year forecasted person trips for Horizon Year for different scenarios and transport system alternatives.

Table 9.1: Horizon Year-2031 Forecasted Person Trips

<table>
<thead>
<tr>
<th>Mode</th>
<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LAND USE SCENARIO-1</td>
<td>CAR</td>
<td>228046</td>
<td>228222</td>
<td>228046</td>
<td>229201</td>
</tr>
<tr>
<td></td>
<td>MC</td>
<td>767110</td>
<td>770330</td>
<td>767110</td>
<td>767903</td>
</tr>
<tr>
<td></td>
<td>IPT</td>
<td>891460</td>
<td>1076838</td>
<td>891460</td>
<td>667574</td>
</tr>
<tr>
<td></td>
<td>BK</td>
<td>85468</td>
<td>88997</td>
<td>85468</td>
<td>79584</td>
</tr>
<tr>
<td></td>
<td>CR</td>
<td>29362</td>
<td>31285</td>
<td>29362</td>
<td>27308</td>
</tr>
<tr>
<td></td>
<td>PMTS</td>
<td>1933</td>
<td>213975</td>
<td>512131</td>
<td>894281</td>
</tr>
<tr>
<td>Total</td>
<td>2003379</td>
<td>2409647</td>
<td>2513577</td>
<td>2665851</td>
<td>2716329</td>
</tr>
</tbody>
</table>
9.4 Per Capita Trip Rate

Per capita trip rate obtained from the model for the horizon year are presented in the Table 9.2.

<table>
<thead>
<tr>
<th>Mode</th>
<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>Land Use Scenario-2</td>
<td>CAR</td>
<td>228797</td>
<td>228842</td>
<td>228651</td>
<td>229377</td>
</tr>
<tr>
<td></td>
<td>MC</td>
<td>767120</td>
<td>768692</td>
<td>766397</td>
<td>767453</td>
</tr>
<tr>
<td></td>
<td>IPT</td>
<td>1249907</td>
<td>1066206</td>
<td>872124</td>
<td>618994</td>
</tr>
<tr>
<td></td>
<td>BK</td>
<td>86610</td>
<td>82494</td>
<td>81830</td>
<td>78173</td>
</tr>
<tr>
<td></td>
<td>CR</td>
<td>31342</td>
<td>30352</td>
<td>28767</td>
<td>26811</td>
</tr>
<tr>
<td></td>
<td>PMTS</td>
<td>2310</td>
<td>239978</td>
<td>501395</td>
<td>958905</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2366085</td>
<td>2416565</td>
<td>2479164</td>
<td>2679714</td>
</tr>
<tr>
<td>Land Use Scenario-3</td>
<td>CAR</td>
<td>223732</td>
<td>223595</td>
<td>223376</td>
<td>224059</td>
</tr>
<tr>
<td></td>
<td>MC</td>
<td>747979</td>
<td>749312</td>
<td>746916</td>
<td>747534</td>
</tr>
<tr>
<td></td>
<td>IPT</td>
<td>1223554</td>
<td>1042056</td>
<td>849016</td>
<td>606788</td>
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<tr>
<td></td>
<td>BK</td>
<td>85367</td>
<td>82635</td>
<td>81552</td>
<td>77988</td>
</tr>
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<td></td>
<td>CR</td>
<td>31099</td>
<td>30158</td>
<td>28557</td>
<td>26661</td>
</tr>
<tr>
<td></td>
<td>PMTS</td>
<td>2386</td>
<td>236410</td>
<td>490813</td>
<td>925365</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>2314116</td>
<td>2364165</td>
<td>2420230</td>
<td>2608395</td>
</tr>
</tbody>
</table>

9.5 Mode Spilt

Mode split results obtained from the model for the base and the horizon year is presented in the Table 9.3 below.
### Table 9.3: Mode Split

<table>
<thead>
<tr>
<th>Mode</th>
<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAR</td>
<td>11.38%</td>
<td>9.47%</td>
<td>9.07%</td>
<td>8.60%</td>
<td>8.42%</td>
</tr>
<tr>
<td>MC</td>
<td>38.29%</td>
<td>31.97%</td>
<td>30.52%</td>
<td>28.81%</td>
<td>28.24%</td>
</tr>
<tr>
<td>IPT</td>
<td>44.50%</td>
<td>44.69%</td>
<td>35.47%</td>
<td>25.04%</td>
<td>22.64%</td>
</tr>
<tr>
<td>BK</td>
<td>4.27%</td>
<td>3.69%</td>
<td>3.40%</td>
<td>2.99%</td>
<td>2.94%</td>
</tr>
<tr>
<td>CR</td>
<td>1.47%</td>
<td>1.30%</td>
<td>1.17%</td>
<td>1.02%</td>
<td>0.99%</td>
</tr>
<tr>
<td>PMTS</td>
<td>0.10%</td>
<td>8.88%</td>
<td>20.37%</td>
<td>33.55%</td>
<td>36.76%</td>
</tr>
<tr>
<td>Total</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
<td>100%</td>
</tr>
</tbody>
</table>

#### Land Use Scenario-1

#### Land Use Scenario-2

#### Land Use Scenario-3

### 9.6 Sub-mode split for PMTS

Sub-mode split for PMTS in Local Bus, BRTS and LRT (if proposed) is shown in Table 9.4 below:

### Table 9.4: Sub-mode split for PMTS

<table>
<thead>
<tr>
<th>Mode</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td>LUS-1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>29.12%</td>
<td>12.42%</td>
<td>8.55%</td>
</tr>
<tr>
<td>BRTS</td>
<td>70.88%</td>
<td>87.58%</td>
<td>39.65%</td>
</tr>
<tr>
<td>LRT</td>
<td>0.00%</td>
<td>0.00%</td>
<td>51.80%</td>
</tr>
<tr>
<td>LUS-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>33.89%</td>
<td>11.18%</td>
<td>8.66%</td>
</tr>
<tr>
<td>BRTS</td>
<td>66.11%</td>
<td>88.82%</td>
<td>39.83%</td>
</tr>
<tr>
<td>LRT</td>
<td>0.00%</td>
<td>0.00%</td>
<td>51.51%</td>
</tr>
<tr>
<td>LUS-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>35.11%</td>
<td>13.13%</td>
<td>9.64%</td>
</tr>
<tr>
<td>BRTS</td>
<td>64.89%</td>
<td>86.87%</td>
<td>40.49%</td>
</tr>
<tr>
<td>LRT</td>
<td>0.00%</td>
<td>0.00%</td>
<td>49.87%</td>
</tr>
</tbody>
</table>
9.7 Future year critical sections (Year: 2031)

Assumptions:
- Capacity Increase: 10%
- Network Change: Outer ring roads
- Peak Factor: 9%
- Light Goods Vehicle Increase: 2 times
- Heavy Goods Vehicle Increase: 2 times
- Special Generator Increase: 3 times

Daily or peak hour assignment loadings for different alternative network scenarios are presented in Figure 9.1 to Figure 9.30.
Figure 9.1: Future Network Showing Link with VC ratio > 1.0 For Scenario 1 Transport System Alternative-1
Figure 9.2: Future Network Showing Link with VC ratio > 0.8 For Scenario 1 Transport System Alternative-1
Figure 9.3: Future Network Showing Link with VC ratio > 1.0 For Scenario 1 Transport System Alternative-2
Figure 9.4: Future Network Showing Link with VC ratio > 0.8 For Scenario 1 Transport System Alternative-2
Figure 9.5: Future Network Showing Link with VC ratio > 1.0 For Scenario 1 Transport System Alternative-3
Figure 9.6: Future Network Showing Link with VC ratio > 0.8 For Scenario 1 Transport System Alternative-3
Figure 9.7: Future Network Showing Link with VC ratio > 1.0 For Scenario 1 Transport System Alternative-4
Figure 9.8: Future Network Showing Link with VC ratio >0.8 For Scenario 1 Transport System Alternative-4
Figure 9.9: Future Network Showing Link with VC ratio > 1.0 For Scenario 1 Transport System Alternative-5
Figure 9.10: Future Network Showing Link with VC ratio > 0.8 For Scenario 1 Transport System Alternative-5
Figure 9.11: Future Network Showing Link with VC ratio > 1.0 For Scenario 2 Transport System Alternative-1
Figure 9.12: Future Network Showing Link with VC ratio >0.8 For Scenario 2 Transport System Alternative-1
Figure 9.13: Future Network Showing Link with VC ratio > 1.0 For Scenario 2 Transport System Alternative-2
Figure 9.14: Future Network Showing Link with VC ratio > 0.8 For Scenario 2 Transport System Alternative-2
Figure 9.15: Future Network Showing Link with VC ratio > 1.0 For Scenario 2 Transport System Alternative-3
Figure 9.16: Future Network Showing Link with VC ratio > 0.8 For Scenario 2 Transport System Alternative-3
Figure 9.17: Future Network Showing Link with VC ratio > 1.0 For Scenario 2 Transport System Alternative-4
Figure 9.18: Future Network Showing Link with VC ratio > 0.8 For Scenario 2 Transport System Alternative-4
Figure 9.19: Future Network Showing Link with VC ratio > 1.0 For Scenario 2 Transport System Alternative-5
Figure 9.20: Future Network Showing Link with VC ratio > 0.8 For Scenario 2 Transport System Alternative-5
Figure 9.21: Future Network Showing Link with VC ratio > 1.0 For Scenario 3 Transport System Alternative-1
Figure 9.22: Future Network Showing Link with VC ratio > 0.8 For Scenario 3 Transport System Alternative-1
Figure 9.23: Future Network Showing Link with VC ratio > 1.0 For Scenario 3 Transport System Alternative-2
Figure 9.24: Future Network Showing Link with VC ratio > 0.8 For Scenario 3 Transport System Alternative-2
Figure 9.25: Future Network Showing Link with VC ratio > 1.0 For Scenario 3 Transport System Alternative-3
Figure 9.26: Future Network Showing Link with VC ratio >0.8 For Scenario 3 Transport System Alternative-3
Figure 9.27: Future Network Showing Link with VC ratio > 1.0 For Scenario 3 Transport System Alternative-4
Figure 9.28: Future Network Showing Link with VC ratio > 0.8 For Scenario 3 Transport System Alternative-4
Figure 9.29: Future Network Showing Link with VC ratio > 1.0 For Scenario 3 Transport System Alternative-5
Figure 9.30: Future Network Showing Link with VC ratio > 0.8 For Scenario 3 Transport System Alternative-5
9.8 Number of link type with VC ratio greater than 1.0

Table 9.5 gives the number of link type with volume by capacity ratio greater than 1.0 for various land use scenarios and transport system alternatives.

<table>
<thead>
<tr>
<th>Land Use Scenario-1</th>
<th>LT</th>
<th>Name</th>
<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>NH</td>
<td>17</td>
<td>10</td>
<td>10</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Major Road</td>
<td>12</td>
<td>7</td>
<td>5</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Minor Road</td>
<td>17</td>
<td>12</td>
<td>11</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Other M R</td>
<td>10</td>
<td>5</td>
<td>6</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Kachha Road</td>
<td>1</td>
<td>0</td>
<td>2</td>
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<td>2</td>
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<td></td>
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<td>Total</td>
<td>57</td>
<td>34</td>
<td>34</td>
<td>9</td>
<td>13</td>
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</table>

<table>
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<th>Land Use Scenario-2</th>
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<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>NH</td>
<td>22</td>
<td>9</td>
<td>6</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Major Road</td>
<td>23</td>
<td>9</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Minor Road</td>
<td>14</td>
<td>16</td>
<td>10</td>
<td>9</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Other M R</td>
<td>9</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Kachha Road</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>75</td>
<td>39</td>
<td>22</td>
<td>17</td>
<td>12</td>
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</table>

<table>
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<tr>
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<th>LT</th>
<th>Name</th>
<th>Alternative-1</th>
<th>Alternative-2</th>
<th>Alternative-3</th>
<th>Alternative-4</th>
<th>Alternative-5</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2</td>
<td>NH</td>
<td>22</td>
<td>7</td>
<td>3</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>Major Road</td>
<td>15</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>Minor Road</td>
<td>14</td>
<td>13</td>
<td>9</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>Other M R</td>
<td>5</td>
<td>4</td>
<td>2</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>7</td>
<td>Kachha Road</td>
<td>7</td>
<td>2</td>
<td>2</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Total</td>
<td>63</td>
<td>26</td>
<td>16</td>
<td>13</td>
<td>12</td>
</tr>
</tbody>
</table>

9.9 Prioritization and Indexation

The various scenarios have been analysed for various transport network alternatives. Based on the various output received from the model, the scenarios have been prioritised based on indexation. The values used for indexation is shown in Table 9.6. Indexation of various alternatives and scenarios are given in Table 9.7.
### Table 9.6: Amritsar - Alternative Network System - Evaluation & Selection

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Criteria</th>
<th>Objective</th>
<th>Output</th>
<th>Alternative - 1</th>
<th>Alternative - 2 (Proposed Inner and Outer Ring Road)</th>
<th>Alternative - 3 (Proposed City and Inner Ring Road and BRT Corridor)</th>
<th>Alternative - 4 (Proposed City, Inner Ring Road, Outer Ring Road and BRT Corridor)</th>
<th>Alternative - 5 (Proposed BRT and LRT Corridor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Modal Share(MRTS) in %</td>
<td>Maximization</td>
<td>MRTS MS in %</td>
<td>0.10%</td>
<td>8.88%</td>
<td>20.37%</td>
<td>33.55%</td>
<td>36.76%</td>
</tr>
<tr>
<td>2</td>
<td>Passenger trips(MRTS) (Per day in HY)</td>
<td>Maximization</td>
<td>Value</td>
<td>1933.35</td>
<td>213975.00</td>
<td>512131.00</td>
<td>894281.00</td>
<td>998524.00</td>
</tr>
<tr>
<td>3</td>
<td>Passenger-hours(MRTS) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>238.38</td>
<td>39787.30</td>
<td>86061.00</td>
<td>82559.00</td>
<td>66855.00</td>
</tr>
<tr>
<td>4</td>
<td>Vehicle-km(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>3205360.44</td>
<td>3432578</td>
<td>3088381.57</td>
<td>2575541.73</td>
<td>2462187.02</td>
</tr>
<tr>
<td>5</td>
<td>Vehicle-hour(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>808220.90</td>
<td>832274</td>
<td>784226.13</td>
<td>699148.53</td>
<td>674922.79</td>
</tr>
</tbody>
</table>

### Amritsar - Alternative Network System - Evaluation & Selection (Scenario-2)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Criteria</th>
<th>Objective</th>
<th>Output</th>
<th>Alternative - 1</th>
<th>Alternative - 2 (Proposed Inner and Outer Ring Road)</th>
<th>Alternative - 3 (Proposed City and Inner Ring Road and BRT Corridor)</th>
<th>Alternative - 4 (Proposed City, Inner Ring Road, Outer Ring Road and BRT Corridor)</th>
<th>Alternative - 5 (Proposed BRT and LRT Corridor)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Modal Share(MRTS) in %</td>
<td>Maximization</td>
<td>MRTS MS in %</td>
<td>0.10%</td>
<td>9.93%</td>
<td>20.22%</td>
<td>35.78%</td>
<td>40.49%</td>
</tr>
<tr>
<td>2</td>
<td>Passenger trips(MRTS) (Per day in HY)</td>
<td>Maximization</td>
<td>Value</td>
<td>2310.00</td>
<td>239978.00</td>
<td>501395.00</td>
<td>958905.00</td>
<td>1118712.00</td>
</tr>
<tr>
<td>3</td>
<td>Passenger-hours(MRTS) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>249.72</td>
<td>41570.00</td>
<td>88139.00</td>
<td>86392.00</td>
<td>74254.00</td>
</tr>
<tr>
<td>4</td>
<td>Vehicle-km(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>2812988.25</td>
<td>2711661.75</td>
<td>2352512.67</td>
<td>1915770.18</td>
<td>1830976.09</td>
</tr>
<tr>
<td>Sl. No</td>
<td>Criteria</td>
<td>Objective</td>
<td>Output</td>
<td>Alternative - 1</td>
<td>Alternative - 2 (Proposed Inner and Outer Ring Road)</td>
<td>Alternative - 3 (Proposed City and Inner Ring Road and BRT Corridor)</td>
<td>Alternative - 4 (Proposed City, Inner Ring Road, Outer Ring Road and BRT Corridor)</td>
<td>Alternative - 5 (Proposed BRT and LRT Corridor)</td>
</tr>
<tr>
<td>-------</td>
<td>-----------------------------------------------</td>
<td>-------------</td>
<td>----------</td>
<td>-----------------</td>
<td>-----------------------------------------------------</td>
<td>---------------------------------------------------------------------</td>
<td>--------------------------------------------------------------------------------</td>
<td>--------------------------------------------------</td>
</tr>
<tr>
<td>5</td>
<td>Vehicle-hour(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>757454.70</td>
<td>711135.21</td>
<td>645091.81</td>
<td>545781.77</td>
<td>525776.80</td>
</tr>
</tbody>
</table>

**Amritsar - Alternative Network System - Evaluation & Selection (Scenario-3)**

<table>
<thead>
<tr>
<th>Sl No</th>
<th>Criteria</th>
<th>Objective</th>
<th>Output</th>
<th>Alternative - 1</th>
<th>Alternative - 2 (Proposed Inner and Outer Ring Road)</th>
<th>Alternative - 3 (Proposed City and Inner Ring Road and BRT Corridor)</th>
<th>Alternative - 4 (Proposed City, Inner Ring Road, Outer Ring Road and BRT Corridor)</th>
<th>Alternative - 5 (Proposed BRT and LRT Corridor)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Modal Share(MRTS) in %</td>
<td>Maximization</td>
<td>MRTS MS in %</td>
<td>0.10%</td>
<td>10.00%</td>
<td>20.28%</td>
<td>35.48%</td>
<td>40.52%</td>
</tr>
<tr>
<td>2</td>
<td>Passenger trips(MRTS) (Per day in HY)</td>
<td>Maximization</td>
<td>Value</td>
<td>2386.00</td>
<td>236410.00</td>
<td>490813.00</td>
<td>925365.00</td>
<td>1087601.00</td>
</tr>
<tr>
<td>3</td>
<td>Passenger-hours(MRTS) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>227.68</td>
<td>39332.00</td>
<td>85691.00</td>
<td>83571.00</td>
<td>133142.00</td>
</tr>
<tr>
<td>4</td>
<td>Vehicle-km(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>2646127.00</td>
<td>2548582.00</td>
<td>2196151.00</td>
<td>1817449.00</td>
<td>1730110.00</td>
</tr>
<tr>
<td>5</td>
<td>Vehicle-hour(All) (Per day in HY)</td>
<td>Minimization</td>
<td>Value</td>
<td>725990.00</td>
<td>675966.00</td>
<td>613603.00</td>
<td>521881.00</td>
<td>505626.00</td>
</tr>
</tbody>
</table>
9.9.1 Selection

Based on the above evaluation, S3T5 combination is selected for detailing.

This System includes:

- Road Network comprising 9 Radial, 4 Orbital and Other missing links
- An Exclusive Public Mass Transport System Comprising:
  - **Light Rail Transit System**
    
    Line 1: Green Line: From Transport Nagar (Lahorimal) to Jandiala via Bus Stand along NH-1 (34.1Km)
    
    Line 2: Red Line: Verka to Mandiala Industrial via Bus Stand and Through Walled City along NH-15 (17.5 km)  
    (Note: The Stretch through Walled City will be underground)
    
    Line 3: Yellow Line: Bus Stand to Airport along Ajnala road (11.5km)
  - **BRTS Corridors**
    
    - Corridor 1: Walled City Orbital Road (7.3km)
    - Corridor 2: Inner Ring Road (42.5km)
    - Corridor 3: Middle Ring Road (74km)
    - Corridor 4: Bus Stand to Majitha along Majitha Road (15.2km)
    - Corridor 5: Bus Stand to MRR along FathegarhChurian Road (7.2km)
    - Corridor 6: Lahori Gate to Middle Ring Road along Khemkaran Road (7.6km)
    - Bus System in Mixed Traffic along rest of Arterial and Sub arterial roads

IPT System Primarily in Walled City and Residential areas and along the major roads.
The proposed BRT and LRT corridors are shown in Figures 9.31 & 9.32 below.

- **Central Hub Terminal**

  The Present Bus Stand on NH-1, Catering inter-city bus services shall be redeveloped into an intra-city Central Hub Terminal of the Integrated Multi Modal Transport System it needs to be redesigned as a multi-level, multi-use complex providing for integration of all modes of public transport amongst themselves and with the private modes by provision of extensive parking areas.

  It is suggested that Techno-Economic Feasibility Study of the proposed PMTS be carried out immediately.
Figure 9.31: BRTS Corridors
Figure 9.32: LRTS Corridors
9.9.2 Section Analysis of PMTS Corridors

The traffic assignment was carried out with proposed PMTS corridors. The loadings on proposed corridors are shown in Table 9.8:

Table 9.8: Section Loading on Proposed PMTS Corridors

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Daily Ridership (in thousands)</th>
<th>Daily Passenger Km (in thousand)</th>
<th>Average Lead (Km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>LRT 1</td>
<td>268.3</td>
<td>2773.9</td>
<td>10.34</td>
</tr>
<tr>
<td>LRT 2</td>
<td>178.9</td>
<td>815.0</td>
<td>4.55</td>
</tr>
<tr>
<td>LRT 3</td>
<td>95.1</td>
<td>505.3</td>
<td>5.31</td>
</tr>
<tr>
<td>BRT 1</td>
<td>27.5</td>
<td>60.0</td>
<td>2.18</td>
</tr>
<tr>
<td>BRT 2</td>
<td>111.5</td>
<td>544.1</td>
<td>4.88</td>
</tr>
<tr>
<td>BRT 3</td>
<td>169.6</td>
<td>145.7</td>
<td>8.59</td>
</tr>
<tr>
<td>BRT 4</td>
<td>57.71</td>
<td>304.8</td>
<td>5.28</td>
</tr>
<tr>
<td>BRT 5</td>
<td>34.1</td>
<td>178.7</td>
<td>5.25</td>
</tr>
<tr>
<td>BRT 6</td>
<td>22.2</td>
<td>59.5</td>
<td>2.68</td>
</tr>
<tr>
<td>BUS</td>
<td>104.8</td>
<td>290.5</td>
<td>2.77</td>
</tr>
</tbody>
</table>

9.9.3 Trip Length Distribution for PMTS corridors

The trip length frequency distribution of the PMTS Corridors is shown in Figures 9.33 to 9.41 below. The average trip length for buses in mixed traffic comes to be 2.71km while for IPT the average trip length is 5.18km.

Figures 9.33: Trip Length Frequency Distribution of LRT 1 Corridor
Figures 9.34: Trip Length Frequency Distribution of LRT 2 Corridor

Figures 9.35: Trip Length Frequency Distribution of LRT 3 Corridor
Figures 9.36: Trip Length Frequency Distribution of BRT 1 Corridor

Figures 9.37: Trip Length Frequency Distribution of BRT 2 Corridor
Figures 9.38: Trip Length Frequency Distribution of BRT 3 Corridor

Figures 9.39: Trip Length Frequency Distribution of BRT 4 Corridor
Figures 9.40: Trip Length Frequency Distribution of BRT 5 Corridor

Figures 9.41: Trip Length Frequency Distribution of BRT 6 Corridor
9.9.4 Trip Length Distribution for Private Modes

Table 9.9 shows the average trip length for various modes for horizon year. The trip length frequency distribution of the IPT is shown in Figure 9.42.

Table 9.9: Average Trip Length for Various Modes for Horizon Year

<table>
<thead>
<tr>
<th>Mode</th>
<th>Average Trip Length(km)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Car</td>
<td>7.53</td>
</tr>
<tr>
<td>Motor cycle</td>
<td>7.47</td>
</tr>
<tr>
<td>IPT</td>
<td>5.26</td>
</tr>
<tr>
<td>Cycle Rickshaw</td>
<td>2.45</td>
</tr>
<tr>
<td>Bicycle</td>
<td>2.17</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7.48</strong></td>
</tr>
</tbody>
</table>

![Trip Length Distribution for IPT](image)

Figures 9.42: Trip Length Frequency Distribution for IPT