Chapter-6
Urban Transport and Traffic Management
6.1 INTRODUCTION

Cities are the most dramatic manifestations of human activities as they epitomise creativity, imagination and mighty power of the human populace. Over the last few years the debilitating edifice of our societies has incapacitated the metropolitan systems to bring an imperative engagement through humungous measures intended at emancipating the urban infrastructure, with an outlook of generating improved economic, social and environmental milieu; thus, propelling the liveable quotient of the cities. In the international fabric where the states guard their sovereignty and political autonomy, is it impossible for the diverging political leaders to converge on an issue, especially, global development. The unthinkable happened in the United Nations Resolution, “Transforming our World: The 2030: Agenda for Sustainable Development”, which led us to believe that this remarkable feat is indeed possible. The Indian scenario has the possible agglomeration of resources to cater the sustainable development goals with the tool of urban governance with the dynamic dynamics of the socio-economic scenario, in the progress. Nevertheless, the prevailing model of urban sustainability is too narrow, challenging the intent of the United Nations’ Sustainable Development Goals for cities. This impending task has been undertaken in the Master Plans focussing on the integrated urban planning approach. Today there are potentially five common aspects, namely, road infrastructure, support for non-motorized travel modes, technological solutions, vehicle access restrictions and control of land-uses; therefore, drawing on international research and examples of policies to quantify the impact of changing urban form on commuting and efficiency. As only by expanding spatial and social dimensions of urban policy making the holistic task of urban sustainability can be made truly tenable and equitable.

The expansion of cities has witnessed expeditious growth which has impacted the growth parameters of the urban milieu. Therefore, in the present day world, without the prevailing transportation systems, the existence of the cities would be jeopardised; henceforth, an effective transportation system in the cities provide social and economic backbone to urban development.
6.2 GLOBAL IMPLICATIONS OF TRANSPORT MOBILITY

“In the space of just a few decades, urban areas across the world, in both developed and developing countries have become increasingly automobile-dominated and less sustainable. In developing countries in particular, cities have experienced a rapid growth in transport-related challenges, including pollution, congestion, accidents, public transport decline, environmental degradation, climate change, energy depletion, visual intrusion, and lack of accessibility for the urban poor. In more developed countries, particularly in Northern Europe, some cities have witnessed a trend of reclaiming urban space from the automobile and prohibiting cars from major parts of downtown areas and/or confining them in other ways. Today, these places are often considered as leading examples of sustainable urban development, as cities across the world strive to meet urban sustainability standards by improving public transport, encouraging non-motorized modes, creating pedestrian zones, limiting the use of private cars, and otherwise trying to undo the transformation of cities caused by automobile dominance. Concepts of automobile restraint that were unthinkable just a few decades ago are now being considered or even adopted in many urban areas around the globe, both north and south, with the encouragement and support of major international organizations.”

The urban transport is facing global challenges in terms of mobility occurring within the sector and external factions, too. The growing urbanization trends have led the cities world over face increased demands of swift mobility with the increasing urge to match the needs with available resources. Thereby, the urban administrations have developed multiple urban transport models which are possess as a combination of technology and sustainability at the disposition of its populace. Though, the cities have had long established transportation system, yet its subsequent withering has set the authorities on an alarm to analyse and mechanise its facets to amplify its operational and functional domains with diligence.

In a nutshell, apart from the posing challenges, the urban transport also works on updating itself to acquaint the dynamics of the ever changing socio-economic growth;

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which has both qualitative and quantitative manifestations to appeal to its citizenry. However, despite of all the efforts made by the local government, yet there are some common alarming issues faced by the urban transportation. The computation of effective and efficient transport system is an endeavour in which the size of the city grows, with the evolution of its economic base, thus, magnifying the housing requirements with the increase in the mode of traffic mobility on the road network each day. Amidst this urban sprawl there surmounts huge pressure on the existing road network, wherein, the latter does not enlarge rather remains the same. Thereby, the pivotal aim of an urban set up is to maintain a robust transportation system. Some of the most daunting challenges faced in an urban transportation system are listed, hereunder:

In the humdrum of the challenging scenario prevailing in most urban set ups, there are significant changes taking place in this avenue, namely, globalisation of economy which has had a direct impact on the growth of urban transport, the development of business sector due to the exclusion of trade barriers; along with the changes driven by technological innovation which are sustained by policy initiatives due to collaboration of various organizations. At present nearly 92 nations with more than
1,300 affiliating organisations, with a representation of 15000 proficient and skilled personnel are dynamically implicated in the Association, UITP (International Association of Public Transport). Therefore, the only global network to amalgamate all public transport stakeholders and sustainable transport forms.  

6.3 INTERNATIONAL BEST PRACTICES IN TRANSPORT MANAGEMENT

Cities exist because of urban agglomerations which are associative with various trade and economic activities. The advanced sectoral growth in the cities has brought about significant labour influx, thus, demanding highly developed traffic and transportation mobility. No two cities can have similar characteristics and approach towards certain key issues. On the basis of growth and innovation patterns applicable across the globe for an efficient transport system, the following five parameters are the most suitable and adaptive in various milieus:

- **AVAILABILITY**
  - RAIL AND ROAD INFRASTRUCTURE
  - SHARED TRANSPORT
  - EXTERNAL CONNECTIVITY

- **AFFORDABILITY**
  - PUBLIC TRANSPORT
  - COST OF AND BARRIERS TO PRIVATE TRANSPORT

- **EFFICIENCY**
  - PUBLIC TRANSPORT
  - PRIVATE TRANSPORT

- **CONVENIENCE**
  - TRAVEL COMFORT
  - TICKETING COMFORT
  - ELECTRONIC SERVICES & TRANSFERS

- **SUSTAINABILITY**
  - SAFETY
  - ENVIRONMENTAL IMPACT

- **PUBLIC PERCEPTION**
  - SATISFACTION
  - PERCEPTION OF CHANGES

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2 The International Association of Public Transport (UITP, from the French: L'Union internationale des transports publics)

3 McKinsey International 2018
Some of the best practices incorporated in the world cities based on the above mentioned parameters are listed below:

1. **Singapore**: Apart from being a global city, it has managed to develop a highly efficient, safest, accessible, affordable and sustainable public transport system with a population expanding to over six million by 2030. The major pillars of this system are the Mass rapid Transit system which provides predictive maintenance; from 2013 onwards the administration initiated low fares, especially with 15 percent discount to women, low wage workers and free fare to children, etc; the EZ-link card which inculcates a technological dimension to the ticketing system; and a car limiting policy which provides a government sanction for the same.

2. **Paris**: A city famous for its architectural grandeur, also hosts to have a highly developed transport system which is committed to provide a pedestrian-bicycle enriched city. Through various measures, such as, to control the influx of traffic there is a shift in non-pedestrian zones, especially alongside the River Seine; the eco-friendly green buses; a transport system with the largest metro rail projects; and a wide variety of technological involvement are just a few to name.

3. **Hong kong**: A densely populated city along with Asia’s financial capital, Honk Kong has strived to carve a niche for itself. The most daunting task that this city faces is to provide efficient transport services to its 7.4 million residents and 58 million tourists, yearly. However, one of the strongest yardstick of the city is its transportation network with the following features, namely, a wide array of rail network, wherein, each workplace is within the dimension of 1km from the metro station; the city is a pioneer in technology such as the advanced ticketing system, the Octopus chip card and the EV popularization, these have not only made the lives of the citizens easy but has also reduced the number of fatal accidents, every year.

4. **London**: Though being one of the oldest cities of the world, London has experienced unprecedented urban growth in the last few decades and in the next two decades it is expected to witness an influx of million people. However, due to strong infrastructure the city has managed to invest in various
transport advancements to provide its people a quality life. Some of the highlighting features are efficient public and private transport equilibrium maintained the administration through advanced ITS technique; Legible London, a unique way of installing 1700 signs across the city which has made the streets more convenient for travelers and residents; Vision Zero, a pilot project to initiate safety measures in the transportation system to eliminate accidents by 2041.

5. **Madrid:** The outstanding way of the city to resolve its congestion problem created due to the influx of 1.25 million people entering 0.5 percent of the surface area of the city, they have managed to develop a radial network of road connectivity. The tools in action are the underground railway network which provides connectivity to nearly 97 percent jobs palace with 394 railway stations. The other initiatives taken by the local administration are enhancing the bus fleet, accessibility by the differently abled, the city aims to promote eco-friendly atmosphere through sidewalk ways, cycle tracks, sharing services and the adoption of Zero Emission areas.

6. **Chicago:** The city of Chicago forms the most unusual pattern of transport management as here nearly 77 percent of commute depends upon the private transportation, thus, it has an affordable private transport system with paid parking and toll charges, also for the public transport there are mass transit prices both with free and relaxed schemes, the administration aims 100 percent affordability and accessibility of transport facilities through steps like the Divvy Bike sharing, eco-friendly transport and extensive cycle tracks.

7. **Seoul:** The main focus of the administration here lies to develop public transport and non-motorized transport with enhanced and well-developed technological solutions. Thereby, both the underground rail and ground transport networks are highly automated and optimized. The integrated TOPIS system (an internationally recognized data centre) has further improved mobility and control of traffic. Furthermore, the schemes of bike sharing, special pedestrian zones and availability of Wi-Fi in the buses has added to its glory.
8. **Moscow:** The geographic, social and economic prospects of the city poses a threat for its effective management of transportation, as there is profound influx of people and scarce options to make the means and the ends match. However, inspite of these issues the city has managed to develop one of a kind public transport system which matches the growing urban upsurge. The various initiatives undertaken are the enhancement of the metro rail network, optimization of the ground transport through renewal of the bus fleet, a strong ticketing system, wherein, a unified chip card has digitized the approach and the Velo Bike sharing set up by the municipal administration.

9. **Milan:** As the most motorized city of Europe, Milan welcomes 850,000 commuters on a daily basis. Henceforth, it has established through the tool of affordability the efficient management of private transport, vide steps like ‘Area C’, wherein, a congestion charge was applied in the city. Thus, it lowered down the entry of cars on a daily basis. The other aspect utilized by the local administration is shared transport through the means of cars, bikes and fully electric vehicles.

10. **Schwebebahn:** An innovative addition to this list is the ‘Street-Level’ street car technology system that has been incorporated in Schwebebahn, in lieu of space conservation. These cars can be parked in narrow rows, across the rivers or along the roadside; thereby, contributing least to traffic congestion. This innovation has had an excellent safety record with only five (5) fatalities over a century long period.

The planning and organization of cities are two critical aspects to achieve global sustainability. It is an amalgamation of the processes of policy making and accountability to ensure as to what indicators can help the policy makers and public to acquire the correct indication and tabulate endeavours to accomplish sustainable and resilient city. Thereby, the designing of tools and appurtenances to accomplish the aforesaid is an imperative task.

### 6.4 INDIAN IMPLICATIONS OF URBAN TRANSPORT

The larger share of the Indian population still houses the villages (Census 2011) with only 31 percent of the total populace inhabiting the cities, with a GDP contribution of
60 percent, thus, making urbanization the steering wheel of growth, in both economic and social connotations. Also, it has been approximated that around 535 million people will be housing the metropolitan areas by 2026 and 590 million by 2031, respectively.

With an increase in the urban populace there is an increment in the income with a directly proportionate relationship to various urban services such as transportation, sewage, solid waste and squat housing is just a few mentions. Although, the policy makers have tried to check the rapid growth of migration and urbanization by introducing a few initiatives at the rural level; however, despite various bottlenecks the process of urban growth is an opportunity of economic growth and social emancipation.

Amongst various urban services, urban transport forms an integral of them due to its contribution to overall development; as transportation provides mobility to the people and the movement of various goods and services. It also affects the income levels of the citizens, land values and environment, thus, having a holistic impact in the overall development of the people.

Many cities are unable to meet the challenges due to the increasing demands of existing disparity in the modal divide, inadequate transport infrastructure, and lack of an integrated approach between land utilization and transport planning with sparse improvement in the city transport services; all these are leading to budge in personalised transportation modes. Thereby, due to some of the common bottlenecks observed in the transport management system the Ministry of Urban Development has initiated the following measures:

- Formulation of the National Urban Transport Policy, 2005
- Sectoral reforms linked to the development of urban transport infrastructure underneath the JNNURM initiative.
- Human resource development with capacity building.
- At the state level the following initiatives have been listed:
  - Establishment of a Unified Metropolitan Transport Authority for all cities having population more than one million
Setting up of an Urban Transport Fund

Incorporating modification in the bye-laws and Master Plan to initiate an integrated land employability and transport densification

Revision of fares of the public transport system by setting up a regulatory/institutional mechanism.

The State/Local Governments reimbursing their taxes on the city ground transport.

At the city level the following imperatives have been undertaken:

Every city is to have an Urban Transport Fund.

to generate awareness amongst the people the selection of an advertisement policy is encouraged through which a communication link can be created.

To create a parking policy with a fee which depicts the true value of land occupied, banning of arterial parking, creating multi-level parking, etc to smoothen the lives of the citizenry.

Setting up a well-developed and integrated bus system with effective PPP partnership.

Multi model integration with the local rail network with single ticketing to provide connectivity in the region.

Setting of a Traffic Information Management Control Centre for an effectual management of traffic and data generation/compilation for long term prospects.

The ULBs are suggested to come into MOU with the Mission Directorate to commence the above mentioned streamline with a time bound criteria.

From the above discussion, it is evident that the urban transport forms the backbone of city development and some positive initiatives have been taken the administration through various legislations with the achievement of desired targets. However, there might have been some challenges during the execution of these policies, thus, giving the policy makers and administrators an overview about the locus and focus of these
initiatives. Thereby, some of the good practices undertaken with an amalgamation of government initiative and citizen involvement are discussed, hereunder:

1. **Popularization of Public Transport in Karnataka:** The state created an independent body aka Karnataka State Road Transport Corporation in 1961 through the primary objective of enhancing the applicability of public transport and reducing personalized modes. However, their access was restricted to some large cities, thus, putting in lurch the centralized theme of the project. Witnessing a monopolistic attitude of the private sector in small or medium cities the bus routes were revised with maximum operational and identification efficiency of the state corridors. Thus, an accessible and affordable medium of public transport was introduced in the state.

2. **G Auto Service, Rajkot, Gujarat:** The project initiates the availability of auto rickshaws at the consumer’s door step. First initiated in 2009 it is now operational in nearly seven cities. It works through a mobile application, wherein, it notifies the booking, charges, messages, and tracking of the vehicle. Through this project the dual benefits of social security to these auto drivers by providing them job and its related benefits and the maintenance of law and order in the city has been achieved, as the whimsical attitude of the drivers was an alarming issue.

3. **Technological Innovation in Mumbai Traffic Control System:** The city being a metropolitan hub with an ever increasing population and its related demands and desires initiated a tool of technological innovation in 2002 funded by the World Bank. The project marked the introduction of Air Traffic Control (ATC) system, a first time initiative in the country it witnessed technology at its best with state of the art tools; along with the installation of a Fully Adaptive Traffic Control (FATC), leased fibre optic transmission network and Traffic Signal Control Equipment all connected through centralizing system with the Traffic Police Headquarters Control Centre and the Satellite Information Centre in the Municipal office.

4. **Alwar Vahini:** Although being a small town, Alwar had a strong network of informal traffic system viz. autos, tempos, etc. which were creating undue congestion and burden on the roads. The city administration took a step further
in 2011 by introducing Euro-IV vehicles as a replacement of all the informal sources of traffic. Thus, through this step a message has been sent across the nation that irrespective of its size an urban centre can motivate its people either take the public transport system or act as a feeder for other highly actives operatives.

5. **Fazilka Ecocabs**: As a city, Fazila did not have a public transport system, as there were more than 2000 registered motor vehicles, with 5000 rickshaws; thus, the dominance of the latter increased with being unorganized, unsafe, unfit and unviable for public use. Thereby, the city administration in 2008 introduced the system of EcoCabs with an attempt of ensure affordable, sustainable and accessible public transport with modern technology.

6. **Inclusion and Redevelopment of the Road Network in Nanded**: A small town in Maharashtra famous for its religious values, Nanded, has a population of over half a million with an area little less than 50 sq km. With major visits by the pilgrims the city has been included in the JNNURM program to upgrade the physical infrastructure of the city, especially the roads. A project encouraging the Non-Motorized Transport (NMT), especially the cycle tracks structure, with pedestrian facilities with the inclusion of Multi Utility Zone (MUZ) was introduced to provide equitable space allocation for all road users. It is one of a kind project as it focuses on people rather than automobiles with the provision of safe, sustainable, pleasant and people friendly streets.

7. **Prahladnagar Town Planning Scheme**: As a means of participatory and equitable land acquisition, amidst the ongoing fringe, the strategy adopted in Ahmedabad is not only an aspect of land readjustment but also an element of added enhancements. As the government occupied small patches of land known as land pockets to build roads, parks and other utilities with a value added return made to the owner. In lieu of this the owner pays half of the increased price to the government which is employed in urban infrastructural development.

Many cities have been unable to fulfil the demands of its urban populace, however, so of them have set a benchmark of development through their initiatives. Therefore, a number of innovative measures have been undertaken which aim to develop a sustainable, participatory and inclusive dialogue in the avenue of urban transportation to provide a standardised quality living.
6.5 URBAN TRAFFIC MANAGEMENT IN PUNJAB

The developing phase of our nation has had a direct proportionate relationship to various facets of the country, directly or indirectly boasting the process of urban growth, namely, industrialization, urbanization; urban service delivery, transportation, technological revolution, etc. are just few mentions. Thereafter, the ever increasing number of traffic on the Indian roads and their grave manifestations leading to their pandemic status has made it imperative that we develop a means of swift mobility.

“The cost of road crashes has been assessed at one to two per cent of GDP in developed countries. A study by the Planning Commission in 2002 estimated the social cost of road accidents in India at Rs.55000 crore annually (2000 prices), which constitutes about 3% of the GDP. It is distressing to note that on an average 10 persons are killed in road accidents every day in Punjab. Besides causing untold misery to the victims’ families, casualties in road accidents cause huge economic loss to the society. The present road fatality death rate per lakh population in Punjab is 12 compared to 12.8 of India and 24 of Haryana. Punjab has about 62,298 km of road network comprises 1739km of National Highways and 1503km of State Highways. The details classification kilometer wise of Punjab State Road Network is given in Table 1 below. 83% of the road fatalities in Punjab are happening on the 4.8% core road network of Punjab comprised 1739km of National Highways and 1503km of State Highways.”

Thereafter, presently there exists no policy which ensures an all inclusive sustainability of the transport sector in the state of Punjab. Other aspects of transportation, namely, railways are a subject of the Union List with the prerogative of the national government and facets of road transport are to be covenanted in a fragmented manner at various levels government. For the development of roads, especially, national highways, several projects have been undertaken by the national and state governments, respectively. An example of this initiative is the National Highways Development Programme (NHDP), Pradhan Mantri Gramin Sadak Yojana (PMGSY), road widening work undertaken by the World Bank collaboration, NABARD assisted construction of roads and bridges in the rural areas, Central Road

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As the road connectivity is a feature of inter-state collaboration, thereby, these measures cannot be supervised by a single tier of government but has to be accomplished on a sharing basis.

The following endeavours are undertaken by the state government:

- **Intercity Public Transport:** As state transport is the responsibility of the State government. Due to the absence of a comprehensive policy framework to guide the synchronization, organization and development transportation in Punjab, the outlook of the government machinery has been mostly on the provision of road connectivity, rural services and intercity transport.

- **Urban Transport:** “Urban (or intra city) transport has been a neglected area until the launch of the national level urban transport policy (or the NUTP) in 2006. The national level policy is, however, not a mandate and acts only as a broad guiding document for the states to help cities plan for more people centric urban transport solutions. The policy was further linked to a central assistance fund, Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to support state and local investment in urban development. The mission provided a timely platform for providing significant financial support for investments in urban transport infrastructure. As a mandatory requirement to avail funding under the mission, five cities in Punjab namely Amritsar, Ludhiana, Pathankot, Jullundur, Patiala and Bathinda have prepared Comprehensive Mobility Plans (CMP’s); out of which only three have been approved and sanctioned by the Ministry.”

- **Safety Policy:** To ensure road safety, the state has adopted the Punjab Road safety Policy which is based on the concept of informed, warned, controlled, guided, forgiving in all three instances, i.e. pre-crash, in-crash and post-crash scenarios.

- **Pollution:** In anticipation to the increased pollution levels and deteriorating air quality in the cities of Punjab, the government has made efforts to encourage the use of petroleum gas in last few years. In 2009, a ruling was passed by the Punjab and Haryana High court to ban the registration of diesel-run autos in
three major cities including Amritsar, Jalandhar and Ludhiana. The main idea of the ruling was to promote the use of gas and encourage LPG/CNG run auto rickshaws in the three cities to curb the rising pollution levels. But due to lack of adequate infrastructure in these cities, LPG/CNG run auto rickshaws have not picked up.

- **Safety/Accidents**: The recent state government initiative in the form of the Road Safety Policy, 2014; has been successful at establishing a dedicated multidisciplinary road safety authority for the state along with a Road Safety Officer appointed at the district level. The policy also looks at establishing a road safety database management system in coordination with the traffic police department in the state, treatment of identified blots and creation of a road safety fund.

- Apart from the above mentioned points there exists a strong network of national, state and local authorities managing the various aspects of traffic and transportation, as discussed in table below:
**TABLE 6.1**

<table>
<thead>
<tr>
<th>ROADS</th>
<th>VEHICLES</th>
<th>URBAN PASSENGER TRANSPORT</th>
<th>INTERCITY PASSENGER TRANSPORT</th>
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<td>Ministry of Road Transport &amp; Highways (MORTH)</td>
<td>Ministry of Urban Development (MoUD) - JNNURM cell</td>
<td>Ministry of Environment and Forests (MoEF) - Central Pollution Control Board (CPC)</td>
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<td>State Transport Department</td>
<td>Punjab Urban Development Authority (PUDA)</td>
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<td>Regional Transport offices (RTO’s)</td>
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<td>Private Operators</td>
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<td></td>
<td>Punjab Municipal Infrastructure Development Company (PMIDC)</td>
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<tr>
<td>LOCAL</td>
<td>Public Works Department (PWD) Municipal Corporations</td>
<td>Urban Development authority/ department Municipal Corporation</td>
<td>Special Purpose Vehicle (SPV) especially set up for provision of PT services</td>
<td>City monitoring solutions</td>
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</table>

In consensus, various efforts are being made in isolation and collaboration to counter alarming issues of the transport sector in Punjab; however, there is an absence/ lack of attention for an integrated approach to comprehend the multimodal transport system. An evaluation of the measures undertaken with reference to the current trends and the bottlenecks perceived, it is clearly evident that there is a dire need for a consolidated policy framework which can enhance the socio-economic manifestations of the State whilst ensuring urban planning and growth.

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6.6 STATUS OF URBAN TRAFFIC AND TRANSPORT IN LUDHIANA

As a city, Ludhiana is a hub of industrial material with a dense population. Due to brimming employment opportunities and swift migration, it is becoming easy for the people from across the state to shift. However, the small, unplanned streets, roads and highways points, incompetent traffic system, careless driving including incredible development in the transportation sector and unprecedented chaos in the city have led to unwanted and unexpected accident ratio in the city. Thereby, making traffic and transportation management an alarming issue.

Considering the centralised location of the city, it has strong road network connectivity by means of a radial network. This network gravitates strongly within and outside the city through three National Highways. The road network does not follow any hierarchy. As the city has witnessed unplanned and haphazard growth and only 8% land under transportation; the city has not been able to provide a smooth traffic system to its populace. The ever increasing demands of the residents are coupled with issues such as, absence of an adequate and efficient transportation system and growth of cycles/ rickshaws, thus, providing its commuters an unsmooth mobility.

Thereafter, a few bottlenecks identified are listed below:

- **INTERMEDIATE PUBLIC TRANSPORT**: Absence of a public transport has led to the emergence of an intermediate public transport
- **PARKING SPACE**: Creation of houses, parks, etc. have led to the encroachment of sideways of road. Poor norms of parking
- **MANAGEMENT OF TRANSPORT**: The multiplicity of authorities, GLADA, MC, NHAI, PWD, etc. while managing the traffic leads to chaos. These agencies consider transportation as a secondary task
- **SPEED & DELAY**: Too many pedestrians on the street. Large encroachment of road space
6.7 DATA ANALYSIS

In reference to the study undertaken in the area selected, the Officials from the aforesaid department i.e. Traffic and Transportation Authority/Traffic Police and Registration and Licensing Authority Ludhiana, assigned with duties and responsibilities of traffic management and incorporation of policies and programs in the city. Also, as the study draws a comparison between the official and citizen interaction, thereby, a group of citizen responses was recorded. The data was collected through formal and informal structured questionnaire through the application of 5-Point Rensis Likert Scale. Further, the analysis was done by the conduction of Mann Whitney Test.

6.8 MATRIX SUMMING UP THE TESTING OF HYPOTHESIS

HYPOTHESIS:

Lack of adequate and efficient public transport has led to high rates of personalized systems.

6.2 TABULAR REPRESENTATION OF THE DATA ANALYSED

<table>
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<th>Question</th>
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<th>Mean Rank</th>
<th>Sum of Ranks</th>
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</table>
FINDINGS:

The test so conducted had two independent variables i.e. the Officials and the Citizens, whereby, the results upon analysis depicted the following observations:

Through the test the mean rank of six (6) questions was carried out with the following observations:

- The mean rank of the responses is ordinal.
- As the p value (significance) is less than 0.05 then the data analyzed is significant.
- The two groups considered for analyses have different opinion for the given question.
- Null hypothesis
- In Questions 2, 6, 21 and 27 the mean values of the citizens are greater than that of the officials, thereby, signifying that the citizens are more dissatisfied than the officials.
- In Question 32 the mean value of the officials group is greater than that of the citizen group, signifying that the officials are more dissatisfied than the citizens.
- In Question 26 the mean value of both the citizen and the officials is same.
A bar chart is a graphical representation of data that symbolizes the data with rectangular bars with heights or lengths proportional to the values that they signify. Also, a grouped bar chart, popularly known as the clustered bar graph or a multi-set bar chart or grouped column chart which is used to embody and compare different categories of two or more groups. The arrangement of categories/groups side by side helps in easy interpretation and differentiation of data analysis between the same categories across the groups.

Furthermore, through this representation i.e. bar graph the percentage value of the responses given by the officials and citizens have been calculated, thence explained with the following observations:

A.

**FIGURE 6.1**

- In the graphical representation above, the Officials have responded with a 100 percent partial agreement to the given statement.

- The Citizens have had a mixed response with a bifurcation between partial disagreement of 45 percent, complete disagreement of 40 percent and a very less proportion with a partial agreement of 15 percent.

- The above statement was in reference to the grading of the road network, wherein, there is a complete disagreement between the Officials and the Citizens.
B.

FIGURE 6.2

- In the graph above, the responses of the Officials and the Citizens have been mixed, along with complete bifurcation in their responses.

- The Officials have responded with a complete agreement of 45 percent and partial agreement of 55 percent to the statement.

- The Citizens have responded with a variant approach from 30 percent partial agreement, 50 percent partial disagreement and 20 percent complete disagreement to the given statement.

- The statement was in anticipation to the creation and incorporation of public transport system, especially, with reference to the new townships growing in the vicinity of the area of study.

- Thereby, it has been analyzed that there is a strong disagreement between the administration and citizens.
C.

In the bar graph mentioned above, the Officials and the Citizens have responded with diversity from among their responses.

The Officials have given a mixed response with a section of the sample giving 45 percent complete and partial agreement; whereas, a section has responded with partial disagreement of 10 percent to the given statement.

The Citizens have had a similar approach, wherein, a stratum is bifurcated between complete agreement and disagreement with a 45 percent response; whereas, a stratum remain undecided by 10 percent response.

The statement interviewed was in reference to the incorporation of new/latest technological advancements into the public transport system.

Thereafter, a major proportion of both the variables have partially agreed and disagreed to the given statement.
D.

FIGURE 6.4

- In the graph presented above, the statement was interviewed to study the impact of urban agglomerations of the transport system of the City.

- Interestingly, both the Officials and Citizens have responded with a consensus of 100 percent to the statement.

- Thereby, it signifies that urbanization and its growth patterns have touched every facet of Ludhiana, both on negative and positive connotations.
E.

FIGURE 6.5

- In the graph above, the Officials and Citizens have provided a diverse response.

- The majority of Officials have responded with partial agreement i.e. 100 percent consensus to the statement interviewed.

- However, the citizenry have given a mixed response with a bifurcation of 15 percent of complete agreement, 30 percent of partial disagreement and majority of the stratum i.e. 60 percent response to partial disagreement.

- The statement was in lieu of the usage and development of the public transport system due to the migrating population; whereby, majority of the citizens and the officials are not in agreement with each other.
In the preceding bar graph, the groups have been interviewed in the context of the impact of urban growth and its directly proportionate relationship to with parking challenge. Moreover, the inadequacy of public transport system.

To the given statement, both the Officials and the Citizens have responded with agreement and partial agreement.

The responses of the Officials have been to complete agreement of 37 percent and partial agreement of 70 percent.

Similarly, the Citizens have responded with a dichotomy of 50 percent complete and partial agreement.

Thereby, highlighting the fact that the urban agglomerations have impacted the transport externalities which is catalyzed by the inadequacy of public transport in Ludhiana.
STATUS OF THE HYPOTHESIS: Accepted

6.9 CONCLUDING OBSERVATION

The following concluding observations have been inferred on the basis of testing and analysis of data to validate the hypothesis.

ANALYSIS

One of the most prominent growth related factors associated with the development of urbanization, since times immemorial, have been the mobility of the people; popularly known as the transport system. It is the yardstick of urban development and growth as the entire circle of urbanization revolves around the circumference of its efficient transport system; given the essentiality that the populace has associates with the expansive and ever accommodating corridors of the city. Due to the increasing pace of urbanization the demand for the availability and accessibility of a smooth, integrated and inclusive transport system has become imperative for the local administration, world over. With the nation experiencing a humungous growth of urban expansion the inculcation of an efficient transport system is the lynchpin of urban planning.

As discussed earlier, in the economic and social connotations of urban growth, the city of Ludhiana has shown a remarkable increase in the former with a staggered pace in the latter. As urban centre are engines of growth, the wheels of these engines is in the mobility of transport across the city, wherein, the picture in the area of study, Ludhiana has been grim. Based upon the data analyzed, it has been inferred that the road network has not increased with that pace as the traffic volume and its related congestion. Also, being an industrial hub, this negating aspect of urban growth has further added to its vagaries. Thereby, not only the roads have lost their functional capacity but the aggravating levels of traffic and transportation have choked them.

The efficient management of traffic and transportation in the City is guided and managed by the Traffic Police Department and the Municipal Corporation, Ludhiana, thereby, apart from institutional collaboration it is also dependent upon the corroboration created with the citizens. The city has a road connectivity to suit its expansive mode but the absence of qualitative public transport is an obstacle in the
effective transport system. As with the migration lead urbanization coupled by the absence of an enriched public transportation, this has added to the volume of the vehicles; thus, making traffic management a daunting task.

The ratio of volume & capacity (V/C) is one of the most important factors for evaluation of level of services of road network. The peak hour volume of different categories of major road network in Ludhiana has been assessed to calculate volume capacity ratio. While the capacity is measured in PCU’s per lane of road width; The V/C ratio is up to 1 is considered as the optimum condition. If ratio exceeds 1, it indicates condition of congestion whereas figure below 1 indicates underutilization of the road capacity. But the table given below reveals that almost all the roads / chowks in Ludhiana city are suffering from the problem of traffic congestion. The V/C ratio ranges from 1 to 2 on 26 roads in different chowks; also in some areas this has increased to 3 which is an indicator of the extent of vulnerability of roads. This has an adverse side, wherein, the people have succumbed to the mishap of road accidents.

Apart from the above mentioned challenges, the other bottlenecks are the parking problem which has increased both due the intra and inter vehicular movement in the city. Also, a section of the society, the economically weaker and jobless, roadside vendors and hawkers have occupied a major proportion of the road, thus, inhibiting the road swiftness.

Although, the organizations due for the supervision and management of traffic in Ludhiana are attempting to create an order but it seems a distant dream. Looking at the existing mechanism, it would be better to put in place an umbrella organization to look into the entire mechanism of planning, development, operation and management of urban transport in Ludhiana. The dedicated authority should also be made responsible for planning, urban transport for the city as a whole including providing an integrated multi-moved public transport. The authority should be vested with power and authority to coordinate the effort of all agencies in order to develop state of art, safe, economic and convenient transport system in the Ludhiana Metropolis.