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Sustainable Urban Mobility: Challenges, Planning and Initiatives in Jalandhar

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ABSTRACT: The growth of cities is not impetuous and fractious but guided and shaped by human interaction and by physical infrastructure. Indian cities are witnessing a massive urban growth the streets and urban lanes of India are crucial to future growth especially in the transportation sector. As the demand for urban transport increases in India, so too does the popularity of the individual vehicles. The present urban transport scene in India, in general is quite untenable, the use of two wheelers and cars is rising, and public transport (PT) is inadequate, while walking and cycling are becoming less popular. According to the survey of ministry of urban development it is recorded that there is 377 million urban population that is 32% of total population and increased by 473 million by 2021 and 600 million by 2031 and the total number of registered motor vehicles are 142 million and figure will rise around 500 million by 2021. Their is 10% of total growth every year and the vehicular traffic growing faster than population of India. Mobility is more than just the mode of transport available it is the need of hour. This paper gives a brief review of urban transport in Jalandhar city and initiatives taken by government of India towards a feasible urban mobility plans and outlines the urban planning challenges for the local urban bodies, policy maker and urban designers.

I. INTRODUCTION TO URBAN TRANSPORT

India's urban population is about around 30% of its total population. It is projected that India's urban population would grow to about 473 million in 2021 and 820 million by the year of 2051, as against only 285 million in the year of 2001. Hence, cities must not only meet the motility needs of the current residents but also provide for the needs of those yet to join the urban population.

Recent rapid urban development in India has resulted in the transport problems, such as traffic mass and an increase in traffic accidents. Existing local government capacity for urban transport planning is still insufficient. Although many outline have been submitted by local bodies for the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) fund to appliance numerous urban transport projects, including), Bus Rapid Transit (BRT), Mass Rail Transit (MRT) flyovers, and roads etc, one of the main planning issues is that most cities do not have a long-term complete urban transport strategy. Accordingly the outline for specific projects are often not integrated with other urban transport measures or with land use arrangement. Some cities have prepared urban transport master plans by conducting complete Transport and Traffic Studies. However, these studies mainly fixate on vehicle movements and did not pay enough attention to the motility of people and goods.

It is important to prepare long- term system plans focused on motility of people as a basis for developing cost-effective and equitable urban transport measures with an consistent approach, with the National Urban Transport Policy (NUTP). In accordance with the Ministry of Urban Development (MoUD) encourages cities to prepare "Comprehensive Motility Plans" (CMPs) as part of long-term urban transport strategy providing for a feasible improvement of people's motility in metropolitan regions.

What is a CMP?

A CMP presents a long-term vision of fascinating motility patterns (people and goods) for a city and provides strategy and policy measures to achieve this vision. It should follow the National Urban Transport Policy (NUTP), which signify the importance of pedestrian facilities, non-motorized transport measures, and public transport systems, including buses and feasible mass rapid transit systems.

Objectives of CMPs. The decisive objective of a CMP is to provide a long-term strategy for the fascinating motility pattern of a city's populace. The following are the main objectives:

To provide a long-term vision and goals for fascinating urban development in each city.

To illustrate a basic plan for urban development and include a list of planned urban land use and transport measures to be applied within a time span of 20 years or more.

To ensure that the most appropriate, feasible and cost-effective implementation program is undertaken in the urban transport sector.

Why is it called a Comprehensive Motility Plan (CMP)?

Existing CTTS documents typically focus on motility needs of car users, while CMPs are to address the motility needs of all people and the infrastructure requirement for all modes, as well as to integrate both the land use and transport systems. The "comprehensive" in CMP conveys this all- enveloping scope. Existing CTTS documents allocate the majority of resources to "solving" vehicle crowding, while CMPs will focus on providing "motility" for all people, the most important issue to be addressed for effective and feasible urban development.

Planning Area for urban transportation. The objective area should be clearly described at the starting of the CMP. The planning area of a CMP should cover the "Agglomerated Area," rather than the area within the municipal boundary. The planning area for CMP can be accepted from the Master Plan.

A CMP must be prepared not only pander for city transportation needs, but also to the need for connectivity with (SEZs) Satellite towns and Special Economic Zones. Since the future limits of the city will be altered by the development of transport corridors, CMPs must take into consideration the entire planning area in relation to major activity areas outside the planning area. It will be difficult to optimize motility patterns as addressed in the vision and goals statements.

Future Transport Network Scenarios

Modal Split Scenarios. The future modal spilt should be prescribed by the modeling specialist if an aggregated model is used for modal split. The modal split ratio is usually estimated by trip length and purpose. When it is difficult to measure future modal split based on available data, it is suggested that several case studies be conducted by using different modal split scenarios:

The following scenarios are generally useful for analyzing future transport demand: Do Nothing Scenario: In this synopsis it is assumed that private vehicle users will increase at the current growth rate and a certain capacity of current public transport users will shift to private vehicles in future. E.g., 10-20% of public transport users may be affected to use private vehicles in 10 years due to economic growth.

Moderate Public Transport Improvement Scenario: Through appliance of public transport improvement measures, in this scheme it is assumed that no more public transport users will shift to private vehicles, i.e., the current module split rate applies.

Significant Public Transport Improvement Scenario: Through implementation of public transport improvement measures, as well as private vehicle restriction estimates such as Traffic/Transportation Demand Management (TDM), in this scenic some private vehicle users' shift to public transport, for example 5-10%.

Transport Network Scenarios

In the target year road network should be prepared are in the following cases which are typically used are as follows:

Do Minimum Case: The future transport network includes the existing network and ongoing MRT and aerial development projects. No other transport systems (corridors) are assumed to be constructed.

Do Maximum Case: The future transport network consists of the existing network and future substitute network. If new MRT systems are to be proposed, locations of their corridors need to be specified in relation to the future growth scenarios.

II. PUBLIC TRANSPORT IMPROVEMENT PLAN

The public transport improvement plan should be evolved through the following procedures.

Preparation of a Service Improvement Plan for Buses, Tram, and Para transit Systems

In medium-sized cities, conventional bus services will play a primary motility role. They could also serve as a feeder mode to MRT systems. A Bus Service Improvement Plan includes the following components:

Overview of the existing situation

Issues and problems

Proposed strategy

Explanation of proposed strategy in terms of land use patterns

System Integration with other modes (Integrated fare policy)

Intermodal facilities

Recommendations for infrastructure (bus ways, terminals)

Improvement in operations (routes, service level, fare structure, regulatory changes)

Costs and benefits

Preparation of an MRT Development Plan. (MRT) Mass Rapid Transit refers to a public transport system carrying passengers within and between urban areas.

Mass rapid transit can achieve reduced travel times through the provision of widely available networks, higher speed vehicles, exclusive right-of-way infrastructure, special limited-stop or express services, valuable fare collection systems, and/or faster boarding and arriving. Each major city has, according to its structure, one or more major corridors with mass transit requirements or that can be developed that is suitable for mass transit. Selection of MRT systems should be undertaken by considering corridor specification and the technical parameters of available MRT systems.

Bus Rapid Transit (BRT): These are designated, for example, Bus way System, High Capacity Bus System, or Integrated Transport System. They are different in focus, as well as in characteristics and performance.

The term Bus Rapid Transit includes these variations, but with the following specifications:

Corridors are mainly separated (with a minimum mix with general traffic in non-segregated sections);

Rapid boarding and alighting at customer-oriented stations;

New bus technology (low floor, wider doors and articulated)

Routes are organized in a trunk-and-feeder system.

Light Rail Transit (LRT): LRT is a railway system specialized by its flexibility in operation and technology compared to heavy rail system. It can operate in short trains or single car along exclusive rights-of-way on an eminent structure, at grade (sometimes on-street), or underground. The system can be designed with a shorter distance between stations and with steeper and sharper curves vertically/horizontally, providing relative flexibility in route alignment. As such, designed line capacity and operating speed is lower than for metro systems.

Metro: Metro is a massive rail system, often referred to as a subway or underground; although part of the route may be at-grade or exalted. The term here refers to urban grade-separated heavy rail systems, with the highest capacity among MRTs.

Preparing Intermodal Facility Plan. To promote public transport network, provision of intermodal facilities is essential. Public transport is generally able to work more readily if there is a good connections and network with other modes are provided. This is because public transport usually requires access transport from users' origination and emanation transport to their last destination, via walk, NMV, and auto -rickshaw. Therefore intermodal facilities can provide significant benefits in time savings as well as comfort. The following facilities should be checked together with the public transport network plan.

Bus terminal (for transfer between urban and intercity buses) Bus stops (with seat, shelter, and information board)

Intermodal facilities at existing on scheduled MRT stations

Para-transit facilities

Pedestrian facilities around bus stops and terminals

Bus terminal (for transfer between urban and intercity buses)

Guidelines for Bus Service Improvement. These Guidelines are proposed for use in medium-sized Indian cities (1–4 million people) where typical bus services will play a primary motility role. The guidelines will be used by authorities with liability for improving urban bus and passenger transport services.

The following basic principles apply:

The urban public transport system operates in a very complex environment, which needs to be clearly understood.

The level and phase of advancement of public transport varies across Indian cities. There is not one dependable model of urban public transport arrangement.

The guidelines accommodate this assortment and are applicable both where there is a high degree of intimate service and where bus services are already well organized.

The guidelines perceive that improvements to bus systems cannot be carried out in desolation. The bus system is a sub-set within the transport system. Therefore, attempts have to be made to improve the total system.

The guidelines are practical and take into account barriers and challenges which may be faced in contraption.

The guidelines describe various policy options and their implications

The guidelines assist decision taking.

Practitioners need relevant references to domestic and international good practice.

Bus Operating Plan. Improving bus services can be accomplished through a set of linked actions. The basic actions will depend on the problems identified, the ability to act and their expected impact. The action plan flows from the scenario selected by stakeholders. It should include the following parts:

Route plan

Capacity augmentation

Operation management

Ticketing and revenue management

Customer orientation

Operator efficiency

III. INTRODUCTION TO JALANDHAR

Jalandhar contribute in financial health of state of Punjab and is the major centre of sports goods, leather units, surgical instruments, casting and forging units, rubber industry and small scale industry. The city growth has largely been haphazard and unplanned.

The road network appropriately does not follow any well defined hierarchy. With Jalandhar recording high growth in the industry, trade and commerce, higher education, Medicare, vehicular ownership and travel demand in the city are increasing at a rapid pace. Further due to absence / inefficiency of reliable / efficient public transportation system, there is a growth of Intermediate Public Transport (Cycle rickshaws and Auto rickshaws). The existing transportation network has not has not kept pace with ever rising travel demand within and outside the city, appropriately roads have lost their functional character and are carrying traffic beyond their work capacity. The traffic and transportation in Jalandhar remains chaotic for major portion of the day and road users suffer enormously in the process

The existing road network of the city is ring and radial, in other words, the roads are broadcasting outward from the core of the city. A series of major roads passes through Jalandhar city which all assemble at one point in the centre. It has four National Highways and number of important roads passing through the city. The Bypass road runs from Bidhipur Phatak to PAP Chowk facilitating the traffic not to enter the city. Thus reducing the journey time and increasing the speed.

Table 1: Road hierarchy in Jalandhar.

Name of road	Length(km)	Right of way(m)	Carriage way(m)
National highway			
Jalandhar-Amritsar road (NH-1)	24	39-82	**10+10**
Jalandhar-Ludhiana road (NH-1)	24	39-82	**10+10**
Jalandhar-Pathankot Road (NH-1A)	15.075	32-34	**8+8**
Jalandhar-Hoshiarpur Road (NH-70)	20.375	30-34	**8**
Jalandhar-Nakodar Road (NH-71)	17	27.34	**8**
Jalandhar-Kapurthala Road (NH-703A)	17	18-48	**8+8**
Byepass			
Jalandhar-Amritsar (PAP Chowk to MaqsudanChowk)	**9**	**61**	**10+10**

Scenario of public transport in jalandhar. The concept of public transport is quite old in the city but could not meet with any reasonable success so far. In Jalandhar, the services of the city transport started in operation of buses by Punjab Roadways in way back 1980's which shifted to Municipal Corporation and ultimately ends.

All the routes originate and terminate at Main Bus Terminal leading to the congestion in central areas of the city. Due to the inefficient services and un-organized system of public transport, predominant modes used for the intra city passenger travel are personalized vehicles, cycle rickshaws, auto rickshaws etc, which enhance the problems such as congestion, accidents, parking as well as pollution. In the city, there is an urgent need of the provision of efficient and decisive public transport system, which can adequately meet the existing as well as the future transport demand for the next 20-25 years.

Traffic Surveys conducted in city.

Table 2: Standard PCU values.

Sr.no.	Vehicle type	PCU value
1	Car/jeep/van	1.0
2	3-wheeler/auto-rickshaw	1.0
3	2-wheeler	0.5
4	Bus	3.0
5	Mini-bus	1.5
6	Truck	3.0
7	Lcv	1.5
8	Tractor	4.5
9	Cycle	0.5
10	Cycle rickshaw	2.0

The proposed study is aimed for a feasibility of grade separators along Mahavir Marg passing through all major intersections like BMC Chowk. Guru Nanak Mission Chowk, Ambedkar Chowk, Football Chowk, Kapurthala Chowk and HMV Chowk. Traffic surveys are integral part of the study as these will establish to forecast the demand for grade separators on the intersections. In order to fully understand the nature and pattern of traffic / travel movement along the Mahavir Marg, a wide variety of field surveys were carried out along the corridor.

Table 3: Registered vehicles in Jalandhar.

Year	No.of vehicles
1995	18532
2001	30647
2006	35267
2007	38020
2011	50135
2015	1,03,560

Following types of survey were carried out by RITES:

Road Network Inventory: This survey was carried out along the influence area of the road network covering approximately 10.00 km.

Speed and Delay Survey: This survey was also carried out along the influence area of the road network covering approximately 10.00 km in bi-directional covering both morning and evening peak hours.

Classified Traffic Volume Counts: Traffic Volume Count has been carried out at junctions and mid blocks with 15 minute interval for duration of 12 hours (8:00 am to 8:00 pm). 74

Origin Destination Survey: Here sampling technique was adopted covering only 10-15% of the whole traffic.

Parking Survey: On-street parking survey was carried out with 30 minute interval time for duration of 12 hours (9:00 am to 9:00 pm).

Table 4: Existing Over bridge.

Sr.No.	Location	Carriage way (in meters)
1.	Khalsa college flyover	300
2.	B.M.C CHOWNK	200
3.	Damoria bridge	350
4.	Reru Chowk	100
5.	Maqsoodan flyover	50
6.	D.A.V college	50
7.	Lamba Pind Chowk	100
8.	ROB near Guru Gobind Singh Avenue	50

Table 5: Registered vehicles category wise.

Year	4-wheeler	3-wheeler	2-wheeler	Others	Total
2001	6815	514	20316	15	27660
2002	5577	430	20558	12	26557
2003	6128	515	22708	15	29366
2004	6672	523	27496	33	34724
2005	7300	675	29042	26	37043
2006	8149	668	25951	10	34778
2007	9981	753	26758	13	37505
2011	25660	2020	21540	915	50,135
2015	55678	2986	40956	3940	1,03,560

City bus service untimely ending in 2011

City bus service routes in jalandhar (2008-2013)

"Red line bus" will run from Rama Mandi to Maqsoodan via bus stand and Mahavir Marg,

"Blue line bus" will start from Rama Mandi and cover the bus stand, Mahavir Marg, Basti Bawa Khel and Jalandhar Kunj,

"Grey line bus" will run from the bus stand to Sat Guru Kabir Chowk via Guru Amar Dass Chowk, Masand Chowk, Manbro Chowk, Guru Ravi Dass Chowk and Guru Kabir Chowk

"Green line bus" will run from the railway station to Rama Mandi via GPO and the bus stand and vice versa.

The main reason which was responsible for the failure of city bus service in jalandhar was the plying of 25,000 illegal and unauthorized auto rickshaws well within the city municipal limits.

IV. CONCLUSION

On the basis of the data collected and analyzed in terms of tables, frequency, percentage and diagrams, conclusions are drawn and summarized. Even the valuable suggestions given by the respondents and realized by the researcher on the basis of primary data and secondary data are stated.

Accessibility and urban mobility are critical for promoting sustainable urban economic development in Indian cities. However, urban mobility has not contributed to desired outcomes owing to car-centric policies adopted by successive plans and projects at the city level. Urban mobility is multi-dimensional in terms of policy and operational implications In conclusion; sustainable mobility is a key enabler of economic growth and towards eliminating poverty and shared prosperity in Indian cities. Comprehensive integration of urban transport and land use planning systems is needed so that synergies are harnessed,

Interconnections are promoted and functionality optimized through multimodal mobility solutions for Indian cities most importantly, mechanisms for transparency, oversight and accountability of such institutions towards its people need to be ensured. All this can only be possible by strong political will and sustained public pressure for change.

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