# THE NEED FOR IMPROVING URBAN MOBILITY FOR ALL IN SUSTAINABLE MANNER THROUGH INTREGRATED TRANSPORT SYSTEM

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## ABSTRACT
The author has attempted to bring out the significance of mobility in city life. It has discussed how pace of urbanisation and growth of income/affluence has tolled upon mobility because of exponential growth of vehicular population which created congestion, parking problems, inequitable use of road space, and relegated people especially poor, women, children, elderly, differently abled and NMT users to inconvenient situation as far as the present transport system is concerned. City is to provide transport services for mobility to all citizens. The author has also discussed various issues and efforts being made to improve mobility in the urban areas emphasizing the need for more use of NMT especially walking and cycling through integration of various land uses and enabling pedestrian and cyclist friendly environment and compact city/ Transit Oriented Development (TOD). The paper also highlighted how different size classes of cities require to improve the transport infrastructure to improve mobility. The author is of the opinion that a comprehensive Mobility Plan be prepared within the framework of Urban Plan with policy guidelines for implementation to ensure mobility through development of integrated transport system and innovative use of APPs based services and ITS. The author also discussed how mobility could be studied and plan for residential neighborhood in Delhi with community participation. By and large the future of sustainable mobility in the country is looking up with emphasis for better planning and avoiding urban sprawl.

## KEY WORDS
Urbanisation, AMRUT, Smart City, ITS, Mobility, urban sprawls, Sustainability, Autonomous driving, e-hailing, Mass transit, TOD, inclusive transport, Community Participation.

Mobility of people is a challenge. Always people whether urban and rural need to move to perform a host of activities for their livelihood. For that, they need to move from place to place, from one corner to the other. This dynamics of movement could be vehicular or non-vehicular i.e. one is sustainable and the other though efficient, brought many ills and challenges, Some of them are inevitable if mobility requires to be ensured and sustained. This has significance when viewed with urbanisation and economic growth trajectory the country is determined to achieve. India's urban population is going to be 600 million in 2031 from 377 in 2011(census of India). With economic prosperity of people especially in urban areas the vehicular population will increase exponentially. Already city like Delhi has registered more than 10 million vehicles on roads Pedestrians and people using cycles and walking have been relegated to precarious situation because of threat to safety. This situation is not unique only for India. World scenario also speaks of the same condition. Sixty percent of the world's population will live in cities by 2030. Mega cities of 10m people will be in a large number with all problems for mobility inspite of policy interventions and heavy capital investment. Also one estimate indicates that number of cars will double from present 1.2 billion global car fleet. It is estimated that more that 200

million people in India can be bracketed in the middle class, category mostly concentrated in urban areas, who would likely to own automobiles, thus, there will be huge demand for road space and other infrastructures to accommodate vehicular population. If the mobility requires to be improved, this calls for supply as well as demand management based on city specific transportation study.

**URBAN PLAN AND MOBILITY**

There is increasing need to address the issue of mobility for all in Urban Plan through comprehensive study on urban transport as it provides access to employment, education, health, shopping, recreation, etc; facilities. It is observed that cities are finding increasingly difficult to meet demand for mobility due to lack of integration of land use and transport planning, Urban sprawls, poor hierarchy of roads, over dependence on personalized vehicles, declining use of NMT, etc. are the consequence. While preparing Urban Plan all these issues are to be reflected and addressed in Urban plan, where in it should be emphasized that a comprehensive mobility plan be prepared for moving people and goods in a sustainable and affordable manner, The Plan is significant if various facilities /activities planned for a city are to deliver the intended results for sustainable living environment and quality of life with economic prosperity.

**NATIONAL URBAN TRANSPORT POLICY**

In view of mounting transportation problems in Indian cities and towns like congestion, crawling vehicular movement, accidents, GHG emission, mixed traffic, inadequate or no public transport, poor transport infrastructure, over dependence on personalized motor vehicles etc, Government in their wisdom felt the need to formulate and approve National Urban Transport Policy as early as 2006[1]. This primarily focuses on how to address the mobility issues of people rather than that of vehicles, equitable allocation of road space, universal accessibility of people. It emphasizes the need to reduce travel demand and length of trips, integrating land use and transport planning. It also highlighted the need to improve transport infrastructure, introduce, ITS, use NMT, and public transport, institutional capacity building, UMTA for better coordination, innovative funding mechanism, cleaner technology, public-private partnership, regulatory mechanism, awareness campaigns, etc.

After this, Government initiated a number of schemes viz. JNNURM, AMRUT, SMART CITY (100 numbers selected based on a number of criteria) which also address the issues of urban mobility apart from building other urban infrastructure. All these schemes have sizeable capital budgetary provision for improvement of urban living environment and generate economic benefits to the urban community.

**MOBILITY NEEDS IN URBAN CENTERS**

Mobility as such cannot improve unless transport infrastructure is geared up Creation or augmentation of infrastructure will likely to vary and depends on many factors. City Government or State Governments' readiness to take up various measures over a period of time as per a blue print is important. Different urban centers of varying size classes will, as under, require systematic actions or interventions for mobility Improvement in line with working Group suggestions[2.]

**URBAN CENTERS WITH 1 LAKH-5 LAKH POPULATION**

- Provision of foot path/cycle tracks
- Road improvements
- Busy inter sections improvements
- Decongistion Plan of major activity area like major hospital, bus terminals, major market areas, railway station, etc.
- Designating parking areas for cycle, cycle rickshaw /Scooter in addition to private vehicles including two wheelers.
- Connecting outlying areas with proper road linkage for better interactions and orderly growth of new settlements.

**URBAN CENTERS WITH 5 LAKH-1 MILLION POPULATION**

In addition to measures indicated for cities less than 5 lakh, the following measures will help improving mobility in this category.

- APP based transport services.
- Shifting of activities like Grain/Vegetable mandi, hazardous industries.
- Planned Bus/ freight terminals
- Separate bus lane, wherever possible
- Plan linkages with lower order settlement in the influence zone.

**URBAN CENTERS WITH 1 TO 4 MILLION POPULATION**

These centers should plan for low and medium capacity rail based mass transit and BRT, guided MRT and last mile connectivity with multi-modal transport facility.

In addition to above **4 million plus** cities should also plan for high capacity high speed mass transit based on rail as well as road both at grade and elevated, or underground.

**TECHNOLOGY AND MOBILITY**

Technology has opened up a vast array of choices/possibilities in providing services, mass transit mode, easing of vehicular movement etc. Cities require to make informed choices in order to suit their demand of mobility, Adherence of administrative policies and regulation, Government decisions based on political expediency, funding capacity, cultural acceptability etc are also to be considered.

Technological trends like in-vehicle connectivity, electrification; car sharing and autonomous driving have immense possibility for improving mobility in cities. In vehicle connectivity through mobile phone and mapping APP and innovative software could be used to reduce accidents, optimizing traffic flows, anticipate traffic bottle necks, alerting drivers to avoid congested sections of roads.

**ELECTRIFICATION**

Battery powered electric vehicles and hybrids, it is estimated, will increase from 2.3 m units in 2014 to 11.5 m by 2022[3]. Even in India electric vehicles/hybrids could be seen in Indian roads as these are indigenously produced or assembled with Government subsidy, incentives. Further falling of battery price is likely tilt in favour of electric vehicle (EV) in a longer term.

**CAR SHARING**

It is another possibility to decongest urban roads by reducing the number of cars on roads. This was attempted in Delhi with mixed results, though the cost of personal mobility might have been reduced by 30 to 60 %[4].

**AUTONOMOUS DRIVING**

Autonomous and semi-autonomous vehicles have appeared on Indian roads. However, drivers less vehicles on Indian roads especially given uncertainty of regulation may not be a possibility in near future. Autonomous driving could increase the carrying capacity of road and could free up time for passengers to do other tasks like reading, view emails, etc in future.

**MASS TRANSIT**

The choice of mass transit mode apart from host of factors mainly depends on demand of ridership, the capacity of the mode, availability of dedicated land, etc. These could be built at grade or elevated or underground depending on a number of issues. There is wide spectrum of MRT choices like high capacity, high speed, high cost MRT, medium capacity light rail transit (LRT) monorail, Bus rapid transit (BRT), electric trolley buses, guided buses, water transport (as in Kolkata). A number of MRT projects with the help Government of India have been completed and some are in the pipe line. Government of India is promoting MRT in State capitals and cities with more than 1 million population. Cities with less than a million should plan MRT, based on a mix of buses of various sizes. While rail based system may be opted for high density corridor, bus systems could be the option where the cities have spread over a large area with relatively lower density However, what a particular modal choice a city should make depends on land use and mobility (Transport) Plan and what suits the specific city most. Whatever be the choice of MRT, a specific city is opting for, there is need to look at first and last mile connectivity of feeder services to ensure ridership in metros.

**DRIVERLESS PODS AS PERSONAL RAPID TRANSIT (PRT)**

Another innovative alternative mode is ultra PRT which is the largest in the world as claimed by Fair wood India, is operating on Electric, Autonomous system and works on Demand. It has a turning radius of only 5 meters; virtually no road space is needed. It uses light guide ways. In India the company has a project pipeline of 45 projects. It is claimed that it is no longer viewed as Airport system or an amusement Park ride with low capacity. It compares very well in a comparative analysis with other present day system in terms of cost, capacity, sustainability, urban overlay, etc[5].

**INTELLIGENT TRANSPORT SYSTEM (ITS)**

There is large demand for mobility in cities and the citizens are demanding quality of services. As indicated earlier there is tremendous growth of urban population thereby increasing transportation needs, traffic congestion, pollution, accidents etc. Intelligent management of traffic flows and making commuters informed about traffic conditions and status will be helpful. ITS is a cost effective means of increasing mobility of people. Use of ITS has many positive facets. Government of India is financially encouraging use of ITS. Many cities have undertaken such projects. The Mumbai Area Traffic control is a system of centrally co-ordinated traffic signals using real time data collected through detectors which helps to maximize traffic flow, reduce congestion etc. Jan Marg (Ahmedabad BRTS) has effectively used ITS to provide high

quality reliability for bus based rapid transit system. Bangalore Traffic improvement project with the help of ITS could achieve reductions in travel time, reduction in accidents, better enforcement of action Plan etc.

**NEW MOBILITY SERVICES**

These services have opened up a large number of options to choose from by the commuters to reach a destination at a competitive cost efficiently with comfort. As these are mobile application based one can demand a service from anywhere-home, office, recreational places, stations, etc without irritation and hackling. These services include car sharing pear to pear, E-hailing, on demand private shuttles, shared and Wi-Fi enabled commuter buses available to the public or corporate sector Mckinsey estimated $ 5b into mobility services in 2014, from less than $10m in 2009. This figure has certainly increased more by now as many players world over are finding services quite profitable. Besides Uber, an international player in this business, China's DidiDache which has more than 100 million users in 300 cities, raised more than $800 million and Ola, a recent largest player built online cab services in India, has raised $ 680 million[6].

**EQUITABILITY AND EQUITY IN MOBILITY**

As in other spheres of city living inclusive transport is emerging as a sensitive issue. At present, the transport services, the backbone of unhindered mobility, is focused on the personal motorized vehicles resulting in less priority for people who are walking or using NMT and Public transport. There is lack of equitability in road space allocation. A bus carrying 50 to 60 people uses road space two and half times only that of car carrying one or two people. NMT users are always vulnerable on urban roads as their safety issues are not addressed or looked indifferently. This scenario has emerged as an important issue. It is universally accepted now that the transport services should be people friendly, irrespective of their economic status. Mobility cannot be restrictive. It must be universal mobility for people with different abilities, women, children, elderly people poor in urban areas and this should be ensured through policy changes, incentivizing and integrating certain measures like provisioning of adequate width of footpath, tactile tiled pavements, anti-skid paving at entry /exit of transit stations, signage, ramps, lifts, appropriate lighting etc. Already some initiatives by Government and Private sector initiated to improve mobility for all without fear of exclusion and discrimination. Metro services are priced almost at par with that of the buses, has provision of barrier free accessibility for differently abled, wheel chaired sick people, seats for elderly, a separate coach for women, close circuit camera monitoring etc. Refurbishing of bus shelter and introduction of low floor busses to make them more accessible for the differently abled is another example. The example of Alwar Vahani's Mini passenger public transport service (Euro iv compliance vehicles) with 6-7 passengers in the city of Alwar in India is a good example of public initiative to provide mobility to the weaker sections of the society in the town and effectively reduce road congestion and pollution.

**MOBILITY AND POLLUTION**

India is currently fourth largest emitter of GHG in the world and transport sector being guzzler of fossil fuel is the second largest contributor of Co2 emissions making Indian cities highly polluted. National transport policy spelt out the need for reducing pollution through a combination of policies and measures without compromising mobility. A sector wide re-orientation to low carbon sustainable transport is required to avoid/reduce the need for travel,

ensure shorter trip length by creating compact city, high density corridor, modal shift to public transport and discouraging of personal motorized vehicles, through high parking charges, heavy congestion cost, increasing use of NMT mode, improving engine functions, etc. Initiatives have already been undertaken following implementation of Kolkata and Delhi metro Bangalore, Mumbai, Chennai, Hyderabad, Jaipur etc, have undertaken metro works. Other than that, several other initiatives like Fazilka Eco-cab-dial-a rickshaw project; Green Bike Ambedkar Nagar to Moolchand Delhi; Nanded Waghala city Municipal Corporation's construction of 28 Km. cycle track along with improvement of road networks with equal road space allocation to all types of road users are good examples of steps to reduce pollution and green low carbon transport ensuring mobility[7].

**LANDUSE AND MOBILITY**

It is well accepted fact that various land uses and activities generate the need for transport services as the people need to move in the city for jobs in industries, offices, commercial establishments. People need to go to recreational places, utilities, services, health, education, etc facilities. Residential areas will grow up faster in area where all the facilities are available nearby or these are well connected with good network of roads and transport services. These will give rise to urban structure and forms which over the years will have complex structure with low to high density with different building typology, land uses and various urban forms like radial, concentric and linear city, will emerge. Integration of land use and transport will have many implications like shorter trip length, walking, cycling, defined travel patterns, less vehicle ownerships, increasing use of public transport for long distance travel needs. These will have impacts in reducing GHG emission and less consumption of fossil fuel thereby saving hard earned foreign exchange, reduction in visits to doctors, etc. A number of cities in line with national urban transport policy have initiated actions for integration of land use and transport to reap several benefits. Urban planners are in a position to make choices to promote compact, transit oriented and sustainable cities. Transit Oriented Development will bring certain benefits to the cities like fast transit, high density development, high land value, well connectivity, feeder network development, limiting urban sprawl, etc. Several projects in the country are in the pipeline. TOD along BRTS corridor in Pimpri-Chinchawad near Mumbai, TOD along Metro in East Delhi, Naya Raipur TOD as green field project for the capital of Chattisgarh and Town Planning (TP) schemes in several states integrating land use and transport for better mobility, are some of the good examples in India.

**COMMUNITY PARTICIPATION AND MOBILITY**

It is a well accepted fact that many projects whether transport or other often do no incite public response and Public take an indifferent attitude because these are not based on their needs. This leads to failure of a scheme. Participation of the community will bring easy acceptance because it will be need based on the basis of their perception of impediments. One good example of community involvement in Delhi is the innovative initiative called Aapki Sadaki: Alternative Mobility solution and Pedestrianisation of existing urban neighborhood[8]. This project engages the community through social media, art, theatre, street plays and raise awareness about mobility in the predominantly residential neighborhood. Project team along with involvement of 600 residents has observed a number of key elements which are impeding mobility in the neighborhood.

- Footpaths if existing are narrow, high and broken at places
- Not accessible to the differently abled person, Fire tender
- No cycle and pedestrian paths/access to nearby transit nodes
- Uncoordinated design of public utility and poor maintenance
- Absence of NMT modes due to threat perception by residents
- Traffic congestions, bottle necks
- On street parking of vehicles often on both side

Further the three processes of technical, engagement and sensitization of activities synergized to reinforce each other and the process, if necessary modified for further interaction and design.

**COMPREHENSIVE MOBILITY PLAN (CMP)**

As indicated earlier that urban plan should emphasize the preparation of CMP for improving mobility to different parts of city activity areas through various road, rail, water based transport modes within the frame work of urban Master (Development) Plan. This will help to notify CMP under state T&CP Acts. CMP will be prepared comprehensively taking into consideration all the factors that contribute to the improvement of mobility or affecting mobility in the city. It should contain status and conditions of roads and associated infrastructure, detailed analyses of urban transport services of various modes and their integration and will indicate policy guidelines and regulations needed. At present urban transport is nobody's baby. Line departments act on a piece meal manner. In addition, overall funding requirements for undertaking improvement measures on a long, medium and short term basis should be included in CMP.

**CONCLUSIONS**

There is mismatch between demand for mobility and the provision of transport services in India and this will remain so in foreseeable future though erstwhile ministry of urban development has taken several initiative like construction of BRTS in 16 cities, sanctioning of 22500 buses for 177 cities and construction of metro rail in cities in addition to operation of Kolkata, Delhi, Chennai Metros and Mumbai Monorail[9]. There is no chance of decline in near future to the demand for personal vehicles because of the country's pace of urbanization and absolute increase in number of urban population. Growth in income/affluence will create fresh demand for owning personal auto mobiles for mobility. At present options are limited and more service integration is necessary. Future is not that bleak. Future of urban transit will be more on demand with more sharing, renting and broader spectrum of service discussed in previous paragraphs. Of late, it is observed that there is decline in car ownership and increase in Public transport amongst the American millennial generation. So is the case with Germany. The example of Helsinki, the capital of Finland, is even more exciting. It is working on demand mobility programme to make personal car unnecessary by 2025 and also commuters will be able to use mobile APPs to book and pay in one click for any trip by bus taxi, train, bike, car sharing, etc. Regulation for mobility service providers through mobile based Apps is being put in place taking into consideration demand for mobility of consumers for safety and providers to remain in business. The availability and integration of various new mobility services and large volume of data will substantially increase the share of trips generated through multi modal transport system. Further collaboration amongst service providers, innovation in connectivity, EVs, AVs, Automation, use of new materials will

emerge and cost of urban mobility will further decline. This will make mobility more equitable as poor, old, women, and children will equally be benefitted. Things are changing. Technology will be the driver of mobility in the integrated transport system in future. With better planning and avoiding urban sprawls, urban mobility will be sustainable in the country in future.

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