

# Role of Decentralized Transportation System in Urban Mobility

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**ABSTRACT:** Mobility is the most dynamic part of the urban phenomenon. These movement, be it people, goods or vehicles, shape the city and in true terms, are a reflection of how the city functions. And the aspiration of the city could not be achieved without looking into this parameter in a holistic manner. In today's world, when transportation has become not just an infrastructural or environmental concern, but a matter of experience and personal choice. The Mass transit system alone, without the last mile connectivity, is not able to solve the problems of congestion as of yet. And the advent of cab services increased the already overburdened roads of metro cities in India. BRT, MRT and Light rail together has not yet served the population of the cities, in the absence of an integrated planning and management framework. Increased usage of private vehicles is the reflection of this scenario.

In this paper, the author would like to talk about how the future mobility requirement of the cities could be met using a more decentralized system and achieving last mile connectivity, incorporating IPT, Shared cabs, and existing Mass transit system. Also, a scenario comparison to be drawn for the new technologies in the urban mobility structure like EVs, AVs and how they can be integrated with the existing and at what level for a complete mobility oriented development. Hence, the research would be oriented towards analyzing what are the future mobility options and how decentralized system can be used to fill in the gaps of present mobility network. And also, how this decentralized system needs to be integrated spatially in a city structure in order to be not just a retrofitted solution but an inherent characteristic.

**KEY WORDS**– Shared Mobility, Intermediate Para Transit, last mile connectivity, Technological Advancements

## I. INTRODUCTION

Today, half of the population of the world is living in urban areas. Going by the figures provided by Ford in their report Future of Mobility, it is 54% and is likely to reach 75% by 2050. And amongst this 75%; the maximum accounting to 90% increase in the population will be in Asia and Africa. It states that, In India Delhi is also moving upwards with a population of 2.5cr. And by every passing minute, the number of rural to urban migration is increasing and hence with this expansion in population of the cities will decide the fate of the coming world. However this increase in the population can not only be dealt with the planning approach but new technologies, existing infrastructure and services needs to be incorporated. And for the same reason the future of mobility or the future cities have the most science fiction movie poster-type image in people's mind.

People and government think that the solution to all the problem of the mobility in current world is providing technological solution and it will resolve the existing issue. But often it is not considered that every city has different sets of travel pattern which leads to different type of complicatedness. The problems at hand might be the same for these cities like dependence of people on private vehicle, pollution, congestion, accidents. Cities in India suffer from some of the worst congestion in the world. For example, on an average we have 1.2 people in one car at any given point [2].

However, the image that is inferred while talking about future mobility is that it will be designed for all the socio-economic strata, will provide safety and efficiency. Technology affects the modes of transport and also how one perceives and relate with the transportation. Conceptually, transport as a service has the power to revolutionise our relationship with mobility [3]. However, this interactive and on demand, service oriented transport system is another step. The first is to understand: what are the long term solutions that can be applied to reduce or remove the existing conditions and what are the changes that have to be made to incorporate these future solutions. The most important amongst these is to plan for and ensure the adaptive infrastructure in both the manners, digitally and physically. Urban municipalities need to think about not just introducing new technologies, but ensuring that infrastructure is introduced in tandem with availability; otherwise, inequality will be further pronounced than it already is.

**II. FUTURE MOBILITY: OPPORTUNITIES**

There are a number of new technologies that are being talked about and tested to bring the dramatic change in the existing scenario. However, some of them are more preferred over the others. Technological innovations in the form of electrification, connectivity, and autonomy are on the horizon. Increasing urbanization and the growth of “megacities” with more than ten million people provide the conditions for change [6].

Means of transportation is envisioned to have a drastic change with the advent of technology: Hyperloop, Driverless buses, Electric Vehicles, cable cars etc. are being used in few of the countries. EVs are the ones that is in the list as it is said to reduce energy consumption, pollution emission, and similarly there is autonomous vehicles that runs on its own. The Autonomous vehicle on the other hand will run on its own. These self-driving vehicles are expected to lower the accident rates, be smart enough to reroute to avoid congestion and connected to a network to shows the parking space. New Personal rapid transit system has also been adopted by some cities like Madras. It is also considered to decongest the cities by letting the cities off the cars.

There is a lot of vision in the urban mobility space, but our moderator questions the feasibility of it all. “Lots and lots of testing and R&D has to happen to make the technology work as stated in the report of Future of Urban Mobility: Reality vs. Fantasy, 2015

All the developed countries are rushing to adopt these new technologies and are making laws to support these mobility solutions however, without foresight. [4] Governments are rushing to legislation to introduce new mobility laws, but often this is too fast and with little foresight.

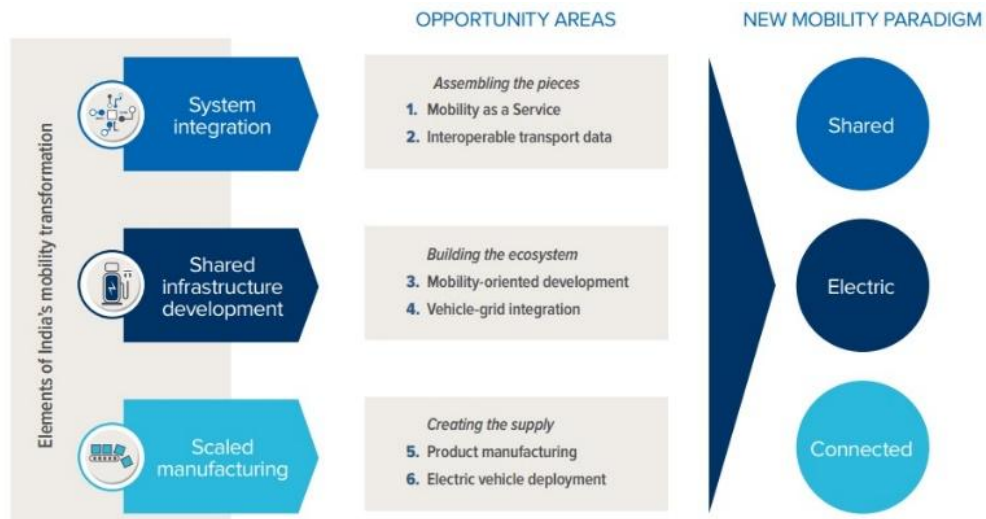


Fig.1. System Approach to mobility transformation, NITI Aayog Report, 2017

**III. INDIA’S VISION OF FUTURE MOBILITY**

India’s statistics represent that 66% of the trips made by its people are from NMT and Public transport [4]. It implies that India has a relatively lower private vehicle ownership .And with the advent of information technology reformation; there is a scope for having a connected system which will run on shared basis. Shared, Electric and connected is something that is aimed at by the government to reimage Maas i.e. mobility as service

There are plans that talks about the integrating various modes and system. Data sharing with the help of central data transport sharing institution. Easy availability and up gradation of routes according to traffic and real time check and transit pass membership, multiple payment mechanism.. Subsidizing the EVs and also fiscal and non-fiscal incentives given to promote the zero emission. New policies for these new modes of transport have started to come like E-rickshaw policy where the rules and registration of the drivers are talked about. But there are various other modes of transport and services that yet needs to be looked at.

At management level, there are various authorities that will now look into the mobility as a closer concept to city development, Unified Metropolitan Transport authority has been proposed in National Urban Transport Policy 2006;

however its establishment at city level is yet to be achieved by cities. The emergence of these newer and advanced forms of IPTs can be partly attributed to stringent regulations in the IPT sector. This disparity in 1“Assessing the benefits of Public Transport”, UITP, 2009 regulations has left the traditional sector at a disadvantage, but the new surge of competition has resulted in the various stakeholders waking up and taking action. [5]

At physical level, integrated transport hubs to enhance the service delivery and boost economic activity is seen as an opportunity in the NITIAayog report. These hubs are now aimed in all the mass transit areas like major metro stations, the new proposal for redevelopment of railway station and many ISBTs.

However, this integration does not clearly talk about the major mode of transport in Indian cities, i.e., the Para transit. Only data sharing and electrifying the system will not help. But a regularized network is needed because it serves major portion of the Indian cities as primary mode of transport. This also leads to problem of congestion and conflict.

Private stakeholders also have a part to play in this vision of new mobility vision of the country. Much participation is involved in the above programmed and some private parties are already working towards this. For example Uber, Ola, etc. have signed some principle at international level for ‘Shared Mobility Principle for Livable Cities’. And also some stakeholders like Ford that have come up with car rental schemes like Zoom Car to use the existing asset and provide services. Carpooling is definitely one of the most useful ideas as studies have found out that it reduces traffic upto 75%. [1]

#### IV. KEY ISSUES

Having all the infrastructure in place like bus stand , railway station, bus stops, and integrating them with the new technology so that shared mobility other ambitious objective can be achieved is the main aim of the city. This integration can not only be achieved with the help of technology, the assets that are not used like railway land, IPT and some of the assets that are not integrated functionally like rail with feeder buses, or last mile connectivity, these should be the first priority. Bringing in driverless car may/may not change these, but a localised plan with schemes to support at central and state level and participatory approach will improve on the existing situation.

The city infrastructure also needs to be developed in order to achieve the futuristic vision. But before that, what an Indian dense city has in hand should be used. The decentralized system of transport will eventually help in improving the mobility. When there are pattern of usage of place with different socio-economic context, one solution fits all approach cannot be used. At regional and City level there is no coherent transit mode. Bus, *vikram*, rail, car, bike each of them travel at each level. There is no hierarchy even at the district level in most medium size urban areas. The organized structure is something that will bring change.

#### V. DECENTRALIZED TRANSPORTATION SYSTEM

The road to futuristic city may sound as a fancy but it needs to be more grounded in dense Indian cities. Where one solution fits all cities cannot be adopted. The change has to be brought by improving the already existing infrastructure. To start with the multi modal integration and shared network, one has to start with the already available mode of transportation. Connected means all these modes can be accessed from the same place and same digital platform. The term ‘Asymmetric trips’ given by Martin Cooper in 2017, denotes a trip which is comprised of multiple modes of transport. The fragmented journey may sound opposite of seamless mobility , but, in dense developing cities this model of shared mobility and decentralized system will help to solve the problem of congestion and pollution and also the first and last mile connectivity



Fig.2. Mobility Paradigm, NITI Aayog Report, 2017

The technological advancements and new planning measures have talked about new vehicles, technology. However, these

advancements will lead to paradigm shift in Indian mobility and develop the cities in a cohesive manner. But other than metro cities in India, the dependence is largely on Public transport for intercity but intra city movement and rural urban movement is dependent on I.P.T. These are majorly auto rickshaws and tempo that are major part of the city movement. NMT and light vehicle like E-rickshaws have also started coming into use in these cities. These Para transit also act as first mile and last mile connection in major cities. They can act as a feeder serviced to the mass transit if regulated and framed in an organized manner.

However, there no fixed network of these IPT providers and absence of fixed route, fare, schedule are the reasons that in spite of having fair percentage of Para transit in the city, people are dependent on two wheelers and taxis. In relatively smaller cities, the main cause of congestion is the number of two wheelers randomly parked vehicles and auto rickshaws. These auto rickshaws are also dependent on gas and can be used to implement the idea of electrifying the mode of transport in India. And for that, these IPT needs to be identified and organized so that any changes and all the incentives, subsidies, and since all these futuristic mobility solutions talks about having shared and connected network, IPT may provide the platform to use the concept because it is already working majorly on the shared concept.

The urban mobility space doesn't stop or start at cars. "The new shared autonomous vehicle out there is the tricycle, It is a peddle-bike of electric design and only autonomous for bike lanes; it can be converted into a package delivery system. When the bike lanes are empty, this becomes a great time to deliver packages," Dr. Ryan Chin, MIT Media Lab

## VI. CASE STUDY: ORGANISED STRUCTURE OF IPT, KOLKATA

Kolkata was designed as a city based on pedestrian movement and mass transit system in the form of tram. Cycle rickshaws and hand pulled rickshaws supported the need of the city considering the narrow streets and the required maneuverability."

I.P.T has always been a major part of the city structure. The role that I.P.T plays in the city is evident by the increase in the share of passenger volume catered by the auto rickshaws. The 2008 Comprehensive Mobility Plan of Kolkata Metropolitan Area states that about 46.5% is the share of Para-transit trips of which a majority was intra-zonal (short distance). The increase as stated by the city's CMP report confirms the increase in the passenger volume form The CMP projected an increase lakh in 1998 to 23 lakh in 2011 to 27 lakh in 2017. This increase in the Para transit using passenger can be supported by the fact that the private ownership of vehicles in Kolkata is lower.

One of the important aspects of use of Para transit in Kolkata is the system of having permits for predetermined routes. This permit is granted by the Regional Transport Authority. The report on IPT of Kolkata by Centre of Policy Research states that Kolkata has a closed system of permits, there is a cap on the total number of permits provided overall and per route. There are various Public Vehicle Department that provide route permits. Some of the autos have more than one route permit. There is also demand driven regularization of the routes with the consultation of the union of the auto drivers.

Affiliation with Stand: There is also this systematic procedure guided by the union. All the auto drivers are affiliated with a particular stand. They have to pay the fee for the stand. This either on daily or monthly basis. This is a transaction that has a procedure lead by the unions.

There are also policies that were made specifically in West Bengal to cater the Para transit like: SESRU (Self Employment Scheme for Registered Unemployed) which later changed into *Udiyaman Swanirbhar Karmsansthan Prakaalpa* (USKP) 2008. The beneficiaries if this policy initially were only those who are registered with employment exchange under directorate of employment government There was this multi-level process of getting a rickshaw i.e. apply for loan under the scheme, then for permit from the RTA office. After only getting the permit, the loan can be used for buying the auto rickshaw.

The organized structure of this city for Para transit is one of its kinds because it dates back to two decade. However, such structure needs more modification, more participatory approach towards route planning and majorly lacks the physical integration with the other modes. However, being a metro city, the carbon emission is reduced by using the Para transit. And also, the Paratransit has become the image of this city.

Parameters	Within KMC	Periphery of the City
Vehicle Type / Fuel Type	Only two types – Auto-rickshaw & Taxi Auto-rickshaw (mostly on CNG/LPG) and Taxi (Diesel).	Various types of Vehicles. Only few Autos function on CNG/LPG. They mostly operate on diesel and petrol, and battery (in case of Toto).
Permit	Necessary	Auto-rickshaw permits taken by some, other autos ply without permits. Other IPT modes are mostly illegal and unorganised
Defined Routes	Defined and organised routes.	Most of the auto-rickshaw routes are defined and recognised. For other modes, no routes/locally defined routes are present.
Union Involvement	Either registered unions / operator committees/ sometimes both are present.	Union involvement is very much there for all modes. Operator Committees are also present for all modes.

Fig.3. Types of permit given, Kolkata Case Study, Centre of Policy Research, 2017

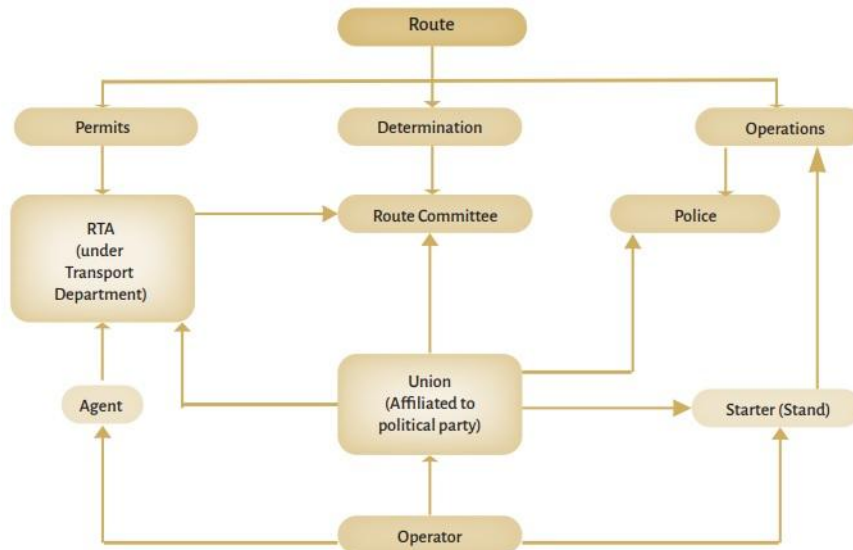


Fig.4. Route Identification Process, Kolkata Case Study, Centre of Policy Research, 2017

## VII. CONCLUSION

The future mobility plans and the case of Kolkata’s Para transit states that there is no one directional solution to the problem of mobility. Technological advancement, organized structure supported by schemes and policies at all scale and identifying the stakeholders is also an important point. And having dedicated space and design for integration of each is also required for this knitting of different modes of transport together.

The decentralized system hence gives us the space to improve on the existing scenario and lay the foundation for the future interventions. The journeys are to be fragmented with the help of different modes. Using the technology and data base to access all these modes and transfer points at the click of one button. And at the same time, the shared connectivity is to be achieved because splitting the journeys won’t help if the numbers are increasing at the same rate.

The focus area of every city is different; hence, the decentralization level also needs to be achieved at different combination. Like in metro cities, it is about adding last mile connectivity, changeovers, Multimodal but at relatively smaller scale, the focus should be to lessen the dependency on bikes/cars and to strengthen the Local buses or Para transit or both with effective technology, dedicated space and design



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