Inclusivity, Gender, and Safety in Mobility

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1. Introduction

An accessible and connected transport infrastructure for mobility is a precursor for socio-economic development of a country, as barriers impeding mobility, restricts market growth, inflates production cost and decreases accessibility (Filip Nistor, 2014). While the mobility sector in India is diverse to cater the needs of over 1.25 billion citizens, the importance of the sector can be further established by understanding its contribution to the total gross domestic product (GDP) of the country, which is about 4.1%; out of which road transport alone accounts for over 3% (MoSPI, 2017). The road transport sector in India has experienced an overall growth of over 13% Compound Annual Growth Rate (CAGR) in the last 15 years (TEDDY, 2017). The increase in road transport can be attributed to the rapid pace of urbanization coupled with population and economic growth, which is expected to continue in the future. In this context, it is also estimated that there will be a further rise in ownership of private vehicles, and the number of cars per 1,000 population would increase from 13 cars in 2013 to 35 cars per 1,000 population by 2025 (Ghate and Sundar, 2013). The increase in private motorised vehicles has led to an array of challenges such as congestion, environmental pollution, traffic fatalities and inequity in the use of road space. Increased dependence on private vehicles leads to restricted mobility of pedestrians and users of non-motorized transport (NMT). To address these emerging challenges of mobility, it is imperative that the three pillars of sustainability- environment, social and economic, be integrated to achieve sustainable mobility.

The United Nations High-Level Advisory Group on Sustainable Transport, 2014 defines sustainable mobility as *"The provision of services and infrastructure for the mobility of people and goods advancing economic and social development to benefit today's and future generations in a manner that is safe, affordable, accessible, efficient and resilient, while minimizing carbon and other emissions and environmental impacts"*. The definition clearly indicates that mobility should cater to the growing social, economic and environmental needs of the society. It is also evident from the definition that, sustainable mobility not only recognizes the importance of low carbon and efficient movement of goods and services, but also provides impetus on social aspects that is equity, accessibility, safety, and affordability.

Globally, the need for promoting sustainable mobility is well-recognized. Although, sustainable mobility has not been addressed as a separate Sustainable Development

Goal (SDG), targets surrounding promoting sustainable mobility have been introduced under SDG 3 (promoting good health and well-being) and SDG 11(sustainable cities and communities). Target 3.6 under SDG 3 **aims to reduce the number of deaths and injuries from road traffic accidents by 50% by 2020** and Target 11.2 under SDG 11 **aims to provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety, notably by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, person with disabilities and older persons**. While there are direct targets to promoting inclusive and sustainable mobility in SDGs 3 and 11, the realization of SDG 1-**End poverty in all its forms everywhere**, SDG 4- **Ensure inclusive and equitable quality education for all**, SDG 5- **Achieve gender equality and empower all women and girls**, SDG 8- **Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all,** SDG 9- **Build resilient infrastructure, promote inclusive and sustainable industrialization, and foster innovation**, SDG 10- **Reduce income inequality within and among countries** and SDG 13- **Take urgent action to combat climate change and its impacts by regulating emissions and promoting developments in renewable energy,** are not possible without adequate access and mobility. The presence of accessible and adequate mobility services would ensure alleviation of poverty, empowerment of women and increased access to economic opportunities for all, which is in alignment with the objectives of the SDGs.

The Government of India has introduced several measures, such as National Urban Transport Policy (NUTP), Service Level Benchmarks (SLBs) for urban transport, and development of Comprehensive Mobility Plans (CMPs) under the Urban Transport Planning scheme, etc. with the objective of promoting sustainable mobility. The NUTP was formulated with the objective to ensure 'safe, affordable, quick, comfortable, reliable and sustainable accesses to all residents', and the CMPs were developed by cities to guide sustainable growth of the transport sector. However, the CMPs that were developed by different cites, primarily promoted energy efficiency and environment benefits, with the social aspects such as improving accessibility of all economic sections of society and safety and security of women and elderly passengers not being considered (TERI, 2011). Furthermore, despite the growing concern for promoting sustainable mobility, emphasis has mostly been on achieving environmental sustainability. The transportation and land use plans traditionally do not address any kind of social equity issues (Cytron, 2010). To design efficient transport and urban systems in Indian cities, it is essential that socio-

economic and socio-cultural variables be considered from the inception of transport planning (Sohail Ahmad et al., 2016).

In the Indian context, in order to promote holistic sustainable mobility, it is essential that social aspects of equity and safety be incorporated. To this end, the paper aims to examine the social parameters of sustainable mobility and suggest policy interventions to integrate the social parameters with an impetus on mainstreaming inclusivity, gender sensitivity, and safety in mobility. For this purpose, the social parameters to achieve sustainable mobility have been broadly divided into the following:

- Inclusivity
    - Mobility for marginalized sections
    - Mobility for rural population
    - Mobility for the disabled, elderly, and children
- Mobility for women
- Safety

To ensure that mobility in India is truly sustainable, it is critical to develop an inclusive transport system, which not only promotes energy efficient technologies, but also enhances social inclusion and safety through appropriate policy interventions and provision of adequate infrastructure. In order to cater to the mobility needs of all sections of society and ensure inclusivity and safety, it is imperative to understand the existing scenario and the various challenges impeding it. The section that follows examines the social parameters essential for promoting sustainable mobility.

2. Inclusivity

One of the key objectives of sustainable mobility is to bridge the gap of service demand and supply availability. For majority of the urban residents, transit is the conduit to access economic opportunities (Blumenberg, E., Ong, P, 2001). Therefore, accessibility to adequate means of mobility is imperative for inclusive growth. Long-term serviceability, safety, reliability, affordability, and equitable access are essential attributes of a sustainable and inclusive transportation system. Access to mobility services refers to availability of transit service for all citizen groups such that the transit services are well-distributed among vulnerable groups. Apart from this,

equity is also an essential element because it ensures that the marginalized sections of population are provided with the same opportunities as the other population.

Inclusivity in transport can be defined as mobility for all; irrespective of socio-economic status of the commuter, the principle of inclusivity can be further defined from the concept of Right to City (ITF, 2015). Under the concept of Right to City, both the spatial aspect of transport in terms of connectivity and the right to equal mobility service is acknowledged. Transport planning should focus on aforementioned aspects of geographical spread, access, and equity to all sections of the society (Thomas Coggins et al., 2015).

2.1 Mobility for marginalized sections

The urban poor in developing countries face an enormous challenge in terms of daily commuting. They usually live in crowded slums, in remote peri-urban or sub urban areas, where adequate transport facilities are limited and their average per capita trip distance is high, due to the geographical expanse of urban centres. The modal choice of a commuter is primarily governed by their economic status and in most cities in developing nations,the majority of trips by the urban poor are on foot (Judy Baker et al., 2005).

According to a study titled 'Mobility in Urban India', in Delhi 77% of the urban poor (i.e. with a monthly income of less than Rs. 5,000) commute on foot , 6% use public transport, and 4% commute using cycles (iTrans, 2011). While in Mumbai, 61% of urban poor commute on foot, 14% use public transport, and 6% use cycles and in Ahmedabad, 41% of the urban poor commute on foot, 13% use cycles, and 11% use the public transport for their daily commuting needs. (iTrans, 2011), (Joshi, R. , 2014).In both Delhi and Mumbai, more than 80% of the urban poor depend on NMT or use the public transport to meet their daily commuting needs. Around 16% of the working population in India commutes an average of 8 km on foot (TERI Analysis, 2018). Long walking trips are one of the key indicators of lack of accessibility to mobility services for the urban poor. Since on-foot trips have been traditionally given limited emphasis in transport planning, the mobility requirements of the urban poor are usually neglected or partly ignored (UNCHS , 2008). Indian cities usually have limited sidewalks and are often blocked by parked vehicles, vendors, and building materials. Further, the rising ownership of private motor vehicles leads to inequitable distribution of road space, leading to reduced space for public transport, and restricted mobility of pedestrians and users of NMT. Mostly, the pedestrians are left with no choice, but to walk on crowded roads compromising

their safety. Apart from this, in parts of the city where the urban poor dwell, access roads to their settlements are often unpaved and poorly drained and maintained.

2.2 Mobility for rural population

About 70% of the total population of the country, that is approximately 720 million people reside in rural areas, therefore for overall growth and development, it is imperative to recognize the need for development of adequate transport facilities in villages (Rohit Gurjar, 2018). The lack of adequate rural mobility services adversely affects the livelihood and income of the rural population. So much so that inadequate transportation has been identified as a significant contributor to poverty in many regions (Olinto et al., 2013). Majority of the rural population lack access to education, nutrition, and health care which further deepens the ridge of rural-urban disparity (Das D. et al., 2012).

With an objective of providing connectivity to the unconnected habitations in rural areas in the country, the Government of India launched the Pradhan Mantri Gram Sadak Yojana (PMGSY) in 2000, and has been successful in providing connectivity to 1,52,124 habitations till date (PIB, 2018). This translated to 85.37% of the total 1,78,184 eligible habitations. The third phase of the Scheme was initiated in April 2018 with a fund allocation of Rs. 19,000 crore for FY 2018-19.

Although the Government of India has recognised the need for improving rural road infrastructure, the accessibility and connectivity to mobility services continues to be a challenge in rural India (UITP, 2016). Presently the mobility solutions catering to the rural population include shared mini-vans, tractor trailers, cycles, and bullock carts, among other primitive mobility options. The lack of adequate mobility services restricts the rural population from accessing the agricultural market or *mandis and other markets in the urban centres for their business needs*. Apart from this, the current rural mobility (motorised) options do not cover trip lengths more than 4- 5 km. Due to limited options available for mobility, the livelihood opportunities for the rural population are restricted to a certain geographical limit and approximately 18.5 million individuals in rural areas face this limitation (Shilpa Aggarwal, 2018) (UITP, 2016). Around 48% of the total rural workers need to commute 2-10 km on foot to reach their work places. And due to the long walking trips to their work places, most often people choose to remain at their homes. For works trips ranging over 10 km, bicycles are the most preferred mode of transport, which accounts for about 13% of the total work trips (UITP, 2016). The challenge of inadequate mobility impinges on the access to necessary health care facilities and in case of younger population, access

to educational opportunities, especially for girls. Since the asset ownership remains male dominant in rural India, lack of inclusive mobility results in lack of facilities, most of the students end up not pursuing higher studies and learning necessary skills.

2.3 Mobility for the disabled, elderly and children

Disability is usually defined as a physical condition that restricts a person's movement or senses or activities; it may be permanent or temporary. There are over 70 million people in India with disabilities (FICCI, 2017) constituting about 6% of the total population. Unrestricted access to mobility services is pivotal in facilitating participation of people with disabilities in economic, social and political processes (Soltani, S.H.K et al., 2012). However in India, people with disabilities are generally deprived of their basic mobility demand, in turn creating an inaccessible environment around them. In 2015, the Government of India launched the "Accessible India Campaign" to provide equal opportunity to persons with disabilities. The key focus of the Campaign was to develop an accessible physical environment, and transportation system and information & communication ecosystem.

With respect to developing accessible transportation systems, the Campaign, emphasised on enhancing accessibility of airports, railway stations, and public transport for the disabled. The Campaign targeted to convert 25% of government-owned public transport carriers into fully accessible and disabled-friendly by March 2018. The Campaign, also aimed at making all international and domestic airports fully accessible for the disabled. To this end, 25 international airports, out of the 32, have been made disabled-friendly with the installation of ramps, accessible toilets, lifts with braille symbols, and auditory signals (PIB, 2017). The fund allocation for the Campaign witnessed an increment of 16.7% in FY 2018-19. In Delhi, for improving accessibility for the disabled in public transport, apart from the Campaign, a High Court order was passed in 2018 for the same. However, very limited progress was seen, in spite of sufficient funds and provisions being in place (Scroll, 2018).

A disabled-friendly environment, while particularly relevant for people with disabilities, also benefits a broader range of people from different age and gender groups. For instance, curb cuts (ramps) leads to ease among parents for pushing baby strollers, information in plain language helps those with hearing impairment or non-native speakers of a language and announcements of each stop on public transit

may aid travellers unfamiliar with the route as well as those with visual impairments (Julie Babinard et al., 2012). To ensure inclusivity in mobility, it becomes important to consider the mobility requirements of people with disabilities during the inception of transport planning and design. Improving accessibility to mobility services for people with disabilities will not only benefit them, but also the elderly and children.

In addition to addressing the mobility needs of people with disabilities and elderly, it is also important to understand the challenges surrounding children and their mobility requirements, in order to ensure inclusivity. In India, apart from the buses, other vehicles such as mini-vans and auto-rickshaws, are often used for ferrying school children. These vehicles are generally over-loaded in terms of seating capacity (FirstPost, 2018). Furthermore, the deployed school buses compromise the fitness parameters as mandated under the Central Motor Vehicle Rules (CMVR); which poses great risk to children's safety and security.

While it is necessary to provide accessibility of mobility services to people with disabilities, elderly and children, ensuring their safety is of utmost importance. In order to ensure inclusive mobility, it is imperative to ensure safety and security of commuters. Generally, the provisions of road safety focus on ensuring the safety of younger people, as they are more likely to take risks and be less cautious while driving, cycling or crossing a road than their elderly counterparts (Walter B. Root et al., 2014). While the road safety aspects for the elderly, children, and people with disability are overlooked, it is necessary to provide considerable attention to this section of society as they are at a considerably higher risk of severe injury due to their physical vulnerability (United Nations, 2016).

Elderly, children, and people with disabilities are more susceptible to be affected by fatal accident as a pedestrian, so much so that, out of total fatalities in road accidents in the country, 5.8% of the fatalities were of the elderly above the age of 60, which accounted for 8,814 deaths in the year 2016. Furthermore, the number of fatalities affecting children (less than 18 years of age) was about 7% of the total road fatalities in 2016 (MoRTH, 2016). Therefore, due importance should be given to slow moving pedestrians while designing traffic signal timings, pedestrian crossings, and speed calming measures at intersections. Road safety for children can be considerably improved through promoting awareness programmes at the school level and by incorporating road safety curriculum in the syllabus of primary, secondary, and higher secondary levels. Also, restriction on speed limits where children regularly cross roads for example in front of schools and colleges, can be imposed by installing

proper warning signs. Similarly safety of elderly can be ensured by installing speed limit signs and other warning signs along with provisions such as table top crossings, speed restriction zones in residential areas etc. should be provided.

In order to ensure mobility is fully inclusive, it is integral to mainstream gender sensitivity when planning for access and mobility services. Promoting accessible and equitable transport for women is a key requisite for ensuring sustainable mobility. Adequate mobility services allow women to participate in the workforce, along with ensuring their due participation in societal growth. One of the most essential keys to economic and social opportunities for women, especially poor women, is safe, accessible, and affordable transportation options (Sonal Shah, 2017). Inclusive mobility in the lens of gender equality has been discussed in the next section.

3. Mobility for Women

Generally, the mobility needs and pattern of men and women are different. Women make a number of short trips for a variety of chores and economic opportunities (SUTP, 2018). Table 1 represents the variable transport needs of men and women. For instance, women may turn down better employment opportunities further away from home in favour of lower-paid local opportunities when the public transport system is unreliable or unaffordable (ADB, 2013).

Table 1: Transport needs of women vs. men

Women	Men
Personal security (theft, harassment)	Speed (get to destination fast)
Road safety (accidents)	Road safety (accidents)
Expenses	Order (schedules, routes, stops)
Comfort	Single fare
Courteous treatment	Personal security (thefts)
Hygiene	Courteous treatment
Order (schedules, routes, stops)	Hygiene

Source: (World Bank, 2011)

Men and women have different priorities in their valuation of transport attributes. While men value speed, sometimes at the expense of treatment or personal security, women's worries are centred on personal security and aspects related to their well-being while on the vehicle, such as comfort, courteousness and hygiene.

According to a study conducted by PwC in 2012, around 865 million women are estimated to be part of the labour force by 2020; out of which 812 million live in

developing nations (Strategy and PwC, 2012). Despite the increasing trend of women labour force, in urban India, women contribute to a miniscule 15.5% of the total labour force, in fact the female labour force in India declined by 19.2 million individuals from 2004 to 2012 (Luis A. Andre et al., 2017). The declining female labour force can be attributed to the inadequate availability of mobility services to women, as implications of poor public transport affects women more adversely, in comparison to men (ITDP & Safetipin, 2017). Therefore provision of public transportation is a key enabler to provide economic opportunities for women. Additionally, women are also exposed to violence and harassment when using public spaces, especially when using public transport (SUTP, 2018). Women commuters remain at the constant risk of theft or assault while at the bus stop or in the vehicle, and to the threat of being sexually harassed, either physically or verbally (United Nations, 2016). As per a global study on 15 capital cities, Delhi, the capital city of India, was ranked as the fourth most dangerous city for women using transport services (Reuters Foundation, 2014). As per a study conducted for the city of Bhopal, 51.4% of women faced sexual harassment while using public transport and 49% of men have witnessed women being harassed (Fia Foundation, 2016). To overcome the challenges of personal security, women generally develop their own coping mechanisms, which include, refraining from travelling on certain routes, or at night alone, to carrying pins while travelling on the bus for self-protection (ITDP, 2018).

In order to address the growing challenge of women's safety and security, the Government of India created the 'Nirbhaya Fund' over 2013–16. A total of Rs 31 billion was allocated for the installation of CCTV Cameras and Live GPS Tracking, reserving first coach for ladies in Delhi Metro, operating special ladies buses and dedicated cab fleet (She Taxi), creation of Safety Apps (Himmat – Delhi Police), and provision of separated sections for women in the buses and reserved seats (UITP, 2018). However, the Fund needs to be effectively utilized, as only 30% of the fund has been used so far (Indian Express, 2018). Technological interventions such as installation of CCTV monitoring and GPS Tracking of transit vehicles can significantly strengthen women's safety but currently these interventions are restricted to mass transit systems, such as metros and few city bus services, and therefore need to extended to private buses, autos, and taxis.

A sense of safety and security for women commuters is definitely a prerequisite in ensuring inclusivity in mobility. Safe, affordable, convenient, transport can play an important role in not only help in meeting the requirements of women's travel, but

also lead to empowerment through access to social and economic opportunities (ITDP & Safetipin, 2017).

4. Safety

The analysis of official road accident data from Ministry of Road Transport and Highways, 2016, reveals that on an average 1,317 accidents and 413 deaths take place every day on Indian roads which further translates into 55 accidents and loss of 17 lives every hour in the country (MoRTH, 2016). During the past decade (2007–2016), number of fatalities due to road accidents in India has increased from 1,14,444 to 1,50,785 which is quite alarming considering increase of 32% from 2007 level (MoRTH, 2016).

The high dependence on motorized transport modes poses serious threat to people who are dependent on non-motorized mode of travel such as walking and cycling, because of heterogeneous traffic conditions on roads. In most Indian cities, non-motorized modes, like cycling and walking, presently share the same right of way as cars and two-wheelers, thus, leading to unsafe conditions (NUTP, 2014). While there are measures being taken towards protecting people in cars, the needs of vulnerable groups of road users, primarily cyclists and pedestrians, are not being met. As per the report by Transportation Research and Injury Prevention Programme (TRIPP) published in 2016, data recorded from 33 Indian cities shows that between 2006 and 2016, only 15 cities recorded a decrease in fatality rates and for most of these cities; the decrease was less than 30%. While, in one third of these cities, the death rate increased by more than 50% in a period of 10 years; the total number of vulnerable road user (pedestrians, cyclists, and motorized two-wheeler riders) deaths in eight of these cities ranged from 84% to 93% and on the contrary, car occupant fatalities only ranged from 2% to 4% (TRIPP, IIT-Delhi , 2016). These figures clearly reflect that pedestrian and cyclist fatalities constitute a significant share in total road fatalities. Further, estimates also suggest that pedestrian fatalities constitute 33% of total fatalities due to road traffic accidents in the country (TRIPP, IIT-Delhi , 2016). However, this data varies greatly from what has been reported by Ministry of Road Transport and Highways which states that pedestrian fatalities constitute to 10.5% of total fatalities. The incoherency in data can be attributed to a poor accident recording system in the country which lacks scientific evidence gathering, leading to inaccurate and under reported figures (TRIPP, IIT-Delhi , 2016).

The main reason behind the rising fatalities of vulnerable road users is due to inequitable distribution of road space. Furthermore, only a part of the ‘right of way’

of the road is generally developed, leading to unorganized and unregulated traffic, which is unsafe for pedestrians and cyclists (Bhatt et al., 2013). Hence it is important that Urban Local Bodies (ULBs) ensure the provision of dedicated footpaths and cycle tracks, which are not encroached by street vendors and parked vehicles so as to provide a hurdle free pathway for pedestrians and cyclists.

Furthermore, enforcement of traffic rules and regulations is the key to reducing the number of road accidents. As per data published by Ministry of Road Transport and Highways, drivers' fault is single most important factor responsible for road accidents (84%), fatalities (80.3%), and injuries (83.9%) on all roads in the country during 2016 (Road Accidents in India, 2016).

Further, a comparison between urban and rural areas suggests that out of total 1,50,785 fatalities in the country in 2016, 57,840 deaths (38.4%) were recorded in urban areas as compared to 92,945 deaths (61.6%) in rural areas (Road Accidents in India, 2016). This is attributed to higher average speeds on rural roads as compared to urban roads where speed is generally restricted due to congestion on road. (Delhi, IIT, 2016). This clearly indicates need for stricter enforcement of traffic rules and regulation on rural roads, also especially on National Highways, which accounted for 29.6% of total road accidents and 34.5% of total road accident fatalities in 2016(Road Accidents in India, 2016) (MoRTH, 2016).

People follow traffic rules only when they perceive a substantial risk of being caught or punished, hence the lack of enforcement leads to rash driving behaviour resulting in over speeding, traffic light violation, drunken driving, etc. The cause for most of the fatal accidents in the country in 2016, have been due to over speeding of vehicles (66.5%) followed by other causes such as overtaking of vehicles (7.3%) and drunken driving (3.7%), etc. . In Indian cities, the traffic police are responsible for ensuring adherence of traffic rules, but due to lack of strict penalties coupled with inadequate policing, the traffic laws are not being followed properly. Technological interventions such as use of CCTV and automated number plate recognition (ANPR) cameras for traffic monitoring, use of vehicle interceptors, speed measuring devices and breath analysers to assist traffic police etc. need to be used to identify violators and strengthen enforcement.

Enforcement agencies i.e. State Transport department and State Police department are not only limited to enforcing traffic laws but also responsible for regulation of driving licensing system, driver training programs and inspection of vehicles. Since majority of accidents happen due to faulty and careless driving behaviour, it becomes imperative to follow a stringent mechanism for issuing driving licenses

which is not the case in most of the Indian cities. At present, driving licences are being issued by conducting manual driving tests wherein the quality of driving tests is often compromised. Although automated driving test tracks have also come up in a few Indian cities, the system is still in its inception stage. Also, the Ministry of Road Transport and Highways is setting up Driving Training Institutes (DTIs), Vehicles Inspection Centres (VICs), and Institutes of Driving Training and Research (IDTRs) which will help strengthen the system of driving and training in country.

In 2014, in light of increasing road accidents in the country, the Hon'ble Supreme Court of India constituted a Committee on Road Safety, and issued directions to the states to implement various policies, institutional and infrastructure-related measures in an effort to improve the standards of road safety and reduce accidents and fatalities. These measures amongst others include:

1. Establishing an institutional mechanism which includes setting up of State Road Safety Councils, District Road Safety Committees, Lead Agency, creation of Road Safety Fund and putting in place a Road Safety Action Plan, including Permanent Road Safety Cell
2. Identification and Rectification of Black Spots: Ministry of Road Transport and Highways (MoRTH) should be responsible for publishing a protocol for identification and rectification of black spots and take necessary steps for improving the design of roads to make them safe.
3. Strengthening traffic enforcement in all States and UTs and enforcing laws related to wearing helmet and seat belt, etc.
4. Conducting safety audits: State government and UTs are directed to carry out safety audits during design, construction and operation phases of roads and also for existing roads within a specified time frame. This audit must be carried out by auditors accredited by National Road Safety Audit Board[1].

Additionally, a Motor Vehicles Amendment Bill was introduced to amend the Motor Vehicles Act 1988, with an objective to improve the existing legislative framework for road safety in the country. The Bill recommends to enforce increased penalties on road violations, introduce unified licensing and vehicle registration systems, establish 'road safety board' etc. The Road Safety Board will act as national agency for development and regulation of traffic management system as well as set road safety standards for planning, design and construction of highways in the country.

[1] National Road Safety Audit Board must consist of Senior officers from National Highway Authority of India (NHAI), MoRTH, of respective State Governments as well as Road Safety Experts who are trained road safety auditors.

5. Recommendations

The discussion above clearly indicates that sustainable mobility in the Indian context is multi-dimensional and will need to address a range of issues, in particular inclusivity, gender, and safety. In order to achieve this, the paper recommends the following:

5.1 Pro-poor urban transport options

The government's policies in the past have mostly focussed on building road infrastructure and therefore, the investments have been benefiting mostly motor vehicle users (Shah, 2016). Generally, plans and strategies for improving access and mobility overlook the aspects of social integration. There is a need to drastically change the current approach and adopt measures that integrate social inclusivity in mobility.

- Since low income population significantly depend on NMT, such as cycling and walking, government investments for transport infrastructure should focus on promoting adequate infrastructure, such as dedicated cycle lanes and pedestrian walkways.
- Adequate accessibility to mobility services should be provided in areas inhabited by low income groups. A number of measures have been adopted in cities around the world to improve accessibility for economically marginalized sections of society. For instance, in Hong Kong escalators have been installed to link settlements located at different levels of the city, to the industrialised centre of the city (BBC, 2016). In fact, cities in developing countries have also provided special access to marginalized communities, as in the case of Mexico. The cable cars in Mexico, popularly called as the *Mexicable*, connects the poor hillside neighbourhoods to the city centres. Although, such indigenous measures have the potential to be replicated in India, they may prove to be highly investment-intensive. It is recommended that public transport be improved through provision of buses to cater to the mobility needs of the low income sections of society.
- Since in a number of Indian cities, there is limited access to formal transport systems (M Kumar et al., 2016), policies and plan should aim for improvement of the intermediate public transport (IPT). The informal or intermediate public transport (IPT) systems, such as autos and rickshaws (*gramin seva* or *tuk-tuks*) are generally unregulated. It is recommended that IPT is regulated and be integrated with the formal systems to ensure connectivity. The regularization of

intermediate transport system will ensure better connectivity and safety of the passengers and regulate the prices.

5.2 Improving rural transport

As roads are being built to improve rural connectivity, it is recommended that a policy framework be developed for providing mobility for appropriate vehicles and their frequency. The framework should make provisions for replacing the existing public and intermediate public transport vehicles with energy efficient and safe public transport.

5.3 Improving access for the disabled and elderly

To promote inclusive mobility, universal design standards need to be strictly incorporated in designing of transport infrastructure so as to provide equal opportunity of access to disabled and elderly.

Improving access for the disabled

- Universal design accessibility standards, such as Indian Road Congress (IRC) codes and United Traffic and Transportation Infrastructure (Planning & Engineering) Centre (UTTIPEC) guidelines should be strictly followed while designing sidewalks, crossings, parks, public spaces, and amenities.
- Buses and metros stations should have designated areas for wheelchair users, special seats for elderly and people with disabilities. Braille-enabled ticketing machines, audible guides at entrances, escalators, and tactile guide paths should be installed to promote inclusive mobility. For example, the Delhi Metro has provided tactile paths for visually impaired, provision of reserved wheel chairs spaces inside metro trains, provision of ramps, etc.
- Apart from provision for physically disabled in public transport vehicles, provisions should be followed while designing bus stops which include facilities, such as kerb ramps and tactile paving, etc. For examples, the bus stops managed and operated by JCDecaux (private enterprise engaged for the operations and maintenance of bus shelters) in New Delhi Municipal Corporation (NDMC) administrative area. It is recommended the model should be replicated for other bus stops in Delhi and also in other states.
- Training and capacity building of drivers and other public transport staff on the needs of people with disabilities is essential to ensure effective delivery of accessible services. As services become fully accessible, operators should

ensure that accurate and up-to-date information is made available in appropriate (audio/visual) formats for disabled people.

Improving access for elderly

- Provision of at-grade crossings, such as table top crossings, since foot over bridges and underpasses are difficult for elderly people to use as a crossing. Roads managed under the NDMC have incorporated such crossings at several places for example, ITO crossing, Lodhi road, etc. Measures such as these should also be employed in other Indian cities as well.
- Provision of facilities like pedestrian refuge islands to help elderly people cross the road in stages, especially on undivided roads. For instance, such pedestrian refuge islands are proposed at Park Circus, AGC Bose Road, CR Avenue, etc., by the Kolkata Traffic Police. Although cities like Delhi and Mumbai have also installed pedestrian refuge islands, it is imperative that other Indian cities should also develop road infrastructure on the same lines.
- Provision of speed calming measures, such as speed breakers, rumble strips, speed tables, etc., to reduce the speed of motorized traffic at intersections.
- Speed limit signs should be installed in vulnerable areas, such as crowded intersections, commercial places, schools, and hospitals, so as to enhance safety of commuters.

5.4 Improving mobility for women

It is important to integrate gender consideration when devising mobility strategies and plans, so that it reflects the diversity of users and their needs and rights.

- Constituting Women Safety Committee in transit authorities to ensure regular monitoring of issues related to safety and security of women as well as infrastructural deficiencies in the transit vehicles and terminals. The Committee should also be in charge of ensuring that local governing bodies and transit agencies work together to integrate safer transport solutions, such as installing emergency buttons in public transport vehicles, information system for bus-service at stops, well-lit bus stops and public vehicles, deputing women home guards in public-transit vehicles during night trips, etc., for improving public transit vehicles for women.
- Either the front door or backdoor of buses should be reserved for exclusive entry/exit of women and seats be reserved for women, especially on crowded routes. For example, the buses in the state of Kerala and Bengaluru have

similar provision in order to ensure hassle free travel for the women who commute using these buses. Best practices as discussed above should be adopted in other Indian cities to promote ease of travel in public transport for women.

- Conduct mandatory gender training sessions for bus conductors and drivers to improve behaviour of transport personnel towards women and raise awareness with respect to issues like women security in public transit. Furthermore, conduct capacity building programmes to increase the work force participation ratio of women in the public transport sector.
- Women and girls' cycling mode shares are low across India, which is primarily due to male preference in the ownership of personal motor vehicles within a household (Safetypin and ITDP, 2017). The ownership of NMT among women commuters can be promoted through schemes like the one introduced by the Bihar state government (wherein, every 14-year old school girl enrolled in state government schools was given the money to buy a bicycle). Promotion of bicycle as a mode of travel would promote accessibility of female students for educational services and should be replicated in other states as well, especially in rural districts.
- Security measures such as installation of CCTV monitoring devices at metro stations, bus stops should also be coupled with installation of GPS tracking devices in public transport vehicles to ensure safety of female commuters.
- Operating special ladies buses and dedicated cab fleet. For instance, pink taxis which are operated in Noida (NCR); pink taxis offer services like pepper spray, emergency button, and 24 hour women-helpline. Another such example is the pink autos in Cuttack and She Taxi which employ women drivers for on-hire vehicles facilities. Measures to ensure safe travel in intermediate and shared mode of transport should also be practiced in other Indian cities.

5.5 Promoting Non-Motorized Transport (NMT) Infrastructure

The exponential increase in number of private motor vehicles coupled with policies adopted in the past skewed to favour further motorization, have led to decline of pedestrians and NMT users. For instance, 55% of the total funds allocated under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) was allocated for construction of road and flyovers and only 5% was allocated to improve other urban transports (excluding mass-transit system) (Ghate and Sundar, 2013). Therefore,

there is a need for a shift from providing provisions for motorized transport to promoting non-motorized transport.

- Provision of dedicated right of way for cyclists and pedestrians
- Provision of mandatory crossing facilities as well as speed calming measures near schools, temples, hospitals, etc.
- Creation of parking infrastructure for bicycles at transit interchanges and commercial areas
- Provision of exclusive pedestrian phasing in traffic signals to incorporate movement of pedestrians at intersections as well as at mid-block crossings.
- Rent-a-bike and share bicycle scheme should be encouraged to promote cycling
- Designing safe residential areas by restricting maximum speed limit (such as 30 kmph) or by creating speed restriction zones for safety of cyclists and pedestrians
- Further, strict compliance should be mandated in all the states regarding standards related to reflectors as all bicycles are required to be fitted with a set of 10 reflectors to make them more conspicuous on the road, especially during night.

5.6 Enhancing Road Safety

Presently, road safety is one of the most pressing issues being faced in India. The Government of India has been focussing on '4E' approach for prevention of road accidents and promoting road safety. The concept of 4E, enumerated as follows, is widely accepted and is considered adequate for achieving road safety.

- **Engineering:** Strict enforcement of road safety audits during design, construction, and maintenance of roads, identification and rectification of accident black spots, provision of safer roads by improving road signage, providing crash barriers and blind curve mirrors, adopting junction improvement plans, providing retro reflective markings, providing traffic calming measures, such as curb extension, chokers,[2] speed bumps, speed tables, etc., at intersections on major roads. Speed breakers, rumble strips, solar blinkers, etc., should also be installed at all major crossings, especially on rural highways.

[2] Chokers are a form of curb extensions that narrow roadways to a single lane at certain points

- **Enforcement:** Constitution of National Level Regulatory Authority for Road Safety, strengthening enforcement by constituting a state level road safety cell and establishment of dedicated road safety fund. Increasing enforcement and patrolling on rural roads through dedicated highway patrol vehicles, mandatory use of wearing helmets and seatbelts, mandatory use of daytime headlights in two wheelers, BPRD (Bureau of Police Research And Development) norms should be followed by traffic police for estimation of staff and equipments, such as vehicle interceptors, laser speed guns, breath analysers, etc. The police department should include a maintenance budget for repair and maintenance of old equipments, effective vehicle management through establishing inspection centres, and mandatory driver training programmes in driving training institutes.
- **Education:** Promoting road safety by conducting awareness programmes to educate users regarding traffic laws, mandatory inclusion of road safety modules in curriculum of schools and colleges across all disciplines, especially in the curriculum of Bachelor of Engineering/Bachelor of Technology Civil Engineering programme. Measures of capacity building should also be adopted by conducting regular workshops and training sessions for engineers in government departments responsible for construction and management of roads such as public works department, urban local bodies, etc.
- **Emergency services:** Improving post-accident emergency care services like centralized ambulance system with a dedicated emergency service number and developing trauma care facilities as per capacity building guidelines issued by Ministry of Family and Heath Welfare is recommended.
- The Motor Vehicles Amendment Bill, 2017, acknowledges the roles and responsibilities of civic agencies and engineers and contractors in road design and construction for ensuring road safety. The Bill is a first-its-kind, as it holds civic agencies and engineers and contractors accountable for faulty design and construction or poor maintenance of roads leading to accidents. It also prescribes increased road penalties for road violations, centralized driving licensing system, strict regulations on Heavy Duty Vehicles (HDVs), safety provisions for pedestrian and non-motorised transport, etc. The amendment bill is expected to be passed soon by the Parliament. It is recommended that once the Bill is passed, it should be expeditiously implemented.

- It is recommended that the measures prescribed in the Bill, need to be adopted by the road owning and managing agencies, including ensuring no new roads greater than 5 km length, are constructed without a road safety audit.

In order to ensure inclusivity, gender sensitivity, and safety in mobility, it is essential that the above recommendations be adopted. Even though the existing National Urban Transport Policy (NUTP) was formulated with the objective to ensure 'safe, affordable, quick, comfortable, reliable, and sustainable access to all residents', it has not been successful in incorporating the social aspects of sustainable mobility. Only 63 of the 458 Indian cities (with 100,000 or more inhabitants) have a formal city bus system for public transport and out of these 63 cities, only 15 cities have a bus or rail based mass rapid transit system (ITDP, 2016). Provision of public transport, lacking in majority of the Indian cities, plays a key role in enabling mobility for all. There is a need to enforce an integrated and comprehensive policy that mandates the integration of measures that address social inequalities in the mobility plans, policies, and strategies and investments. The mobility plans and strategies should be evaluated for the social parameters and approved only if they have been considered. It is further recommended that financial allocations and incentives should be provided for plans and strategies that have integrated measures and those that address social aspects of mobility. Further, regular monitoring of progress of the plans and strategies should be adopted to achieve desired objectives. It is recommended that the policy direction should be derived based on the recommendations suggested above. These recommendations, however, do not address institutional gaps and arrangements in detail. Presently, the responsibility for urban transport is divided amongst governments and within governments. It is recommended that cities establish a robust institutional mechanism and bring all the functions under one umbrella, to achieve inclusive sustainable mobility, in an integrated manner. The National Urban Transport Policy encourages establishment of Unified Metropolitan Transport Authorities (UMTAs) in all million-plus cities 'to facilitate more co-ordinated planning and implementation of urban transport programmes and projects and an integrated management of urban transport systems'. The UMTAs/unified transport body should be made responsible for ensuring the integration of the social parameters in mobility. These institutional arrangements, along with a tie-up with financial institutions, are necessary for incorporating social aspects in mobility.

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