

Smart mobility in India from an equity perspective

Dr. Yamini Jain

Position Paper
Smart mobility in India from an equity perspective

Dr. Yamini Jain
Urban and Transport Planner

August 2023



Contents

Foreword	v
Preface	vi
1.0 Introduction: Smart mobility	1
2.0 Social sustainability of smart mobility	4
2.1 Assessing smart mobility in India on parameters of social sustainability.....	4
2.2 User Demographics.....	5
2.3 Gendered mobility around the world and in India.....	6
2.4 Digital literacy.....	7
2.5 Neglected geographical areas.....	9
2.6 Safety.....	10
3.0 Survey of users and professionals	11
4.0 Conclusions	14
5.0 Recommendations: Practice and policy	16
5.1 Data sharing.....	16
5.2 Integrating social sustainability evaluations into technocratic assessments of transport.....	16
5.3 Designing of e-vehicles for women drivers.....	16
5.4 Regular appraisals of legal provisions that encourage an increase in shared mobility.....	17
5.5 Regulatory mechanisms: Safety, employment and fares.....	18
5.6 Passenger and driver safety.....	18
5.7 Employment conditions.....	18
5.8 Rationalising fares.....	18
5.9 Digital literacy.....	23
5.10 Gaps in the guidelines.....	19
References	20-21

List of figures

Figure 1: Growth of smartphones in India (Since 2010 and projected up to 2040).....	9
Figure 2: Types of smart and shared mobility used by respondents.....	11
Figure 3: Characteristics that users associate with smart and shared mobility in India.....	11
Figure 4: Improvements that respondents' would like in smart mobility services in India.....	13
Survey form on Smart Mobility	22-24

Foreword

The transportation sector is critical to economic development. It facilitates access to jobs, markets and social services such as healthcare or education. But, in countries like India, economic imperatives often override inclusive growth. Thus, advances in the urban transportation sector have addressed the challenges of first and last-mile connectivity, but not effectively, and not for all. Smart mobility, a digital revolution spin-off, has gained momentum in India. It has laudable objectives, it addresses economic, social and environmental issues, but in reality, the benefits accrue to a few, not to the needy, and its contribution to restricting emissions and urban congestion is not discernable. This is due to service providers restricting their objectives, over time, to mainly profits.

The quality of public sector transportation has the drawbacks of inadequate access to finance and insensitivity to changing commuter needs, in the face of rapid urbanisation and the increase in numbers of peri-urban settlements.

India has been able to at least, conceptually integrate technology-based solutions for increasing efficiency and efficacy of the mobility system. It aims to create a robust transportation system which reduces the need for private ownership of vehicles, a well-integrated multi-modal transportation system which has ease-of-use, with well-laid out infrastructure. And, all this supported by data analytics, the internet of things, artificial intelligence, machine learning, and so on, to evaluate and evolve the existing system. How much of that is functional and will be impactful, is yet to be seen.

Accessibility, affordability and availability of mobility services, let alone smart mobility services, still remain a challenge across India. This is mainly due the present socio-cultural paradigm, restrictive, and discriminatory practices against certain sections of society, rising income disparity, and poor infrastructure. Combine this with pressure on resources and ecological damage that the transportation sector is contributing towards—use of fossil fuels, air pollution, noise pollution, and destruction of forest cover for construction of rail and road networks.

Under its Social-ecological Transformation work line, FES India Office is developing knowledge and networks of sustainable urban development with environmental sustainability, economic stability and equity as its core. With this Position Paper, the FES India Office would like to introduce a fresh approach to smart mobility, one which is embedded in the values of equity and justice. This paper should create greater awareness amongst different stakeholders and consumers of mobility on social justice aspects of the sector, and inspire readers to question the present prejudiced system, and encourage them to adopt practice and policy recommendations within their areas of influence. FES India Office would also like to support dialogues and alliance building of these stakeholders jointly to address this challenge and work collectively towards creation of an inclusive, just and equal smart mobility system.

FES would like to thank Dr. Yamini Jain, for her in-depth research, expertise, and value-based assessment of the sector that contributed to the development of this position paper. We hope it will contribute towards the narrative of change in the smart mobility sector.

Richard Kaniewski and Mandvi Kulshreshtha

August 2023

Friedrich-Ebert-Stiftung, New Delhi

Preface

The paper is prepared for Friedrich-Ebert-Stiftung, India office, and key stakeholders in the 'Social-ecological Transformation' project. It seeks to inform government departments, state agencies, policymakers, decision makers, urban planners, smart mobility service providers, citizen groups, and the general public on the discourse on equality in smart mobility services in India¹. It will discuss how smart mobility services are, are not or may be, equally accessible across income segments, gendered groups and geographies.

The objective of this position paper is to present a social justice perspective to the current construct of smart mobility in India—its elements, vision and implementation. And, what more needs to be added to the current narrative for making it more inclusive, just and equal for all.

Rapid urbanisation, increased pollution and traffic congestion have long since called for more efficient transport systems in India, and around the globe. The COVID-19 pandemic has accelerated changes that will fundamentally alter the mobility landscape. The transition from conventional to smart transport systems is no longer a need, but an imperative. Many metropolitan and cosmopolitan cities in the country have tried, accepted and enjoyed the benefits of smart mobility. However, there is very limited data or evidence on how the benefits may be distributed or enjoyed by different segments of society.

Transportation is categorised as a 'social good' and is also planned, in theory, to bring benefits to all segments of the society. But, in practice, transportation is not equally or equitably distributed amongst citizens. Smart mobility is no different. What makes it more complex is that smart mobility services are often private businesses and not public services. Thus, social equity or equality is not always high on the agenda. This position paper is envisaged within that context.

An evidence based mixed-methods approach has been adopted, using both qualitative and quantitative research. The paper includes surveys of users and professionals working with smart mobility, urban mobility, urban planning and transport planning, along with an extensive review of existing literature. The survey had detailed questions about current and futuristic prospects of smart mobility, positive and negative characteristics of the same and suggestions for the future. The literature review focuses on the global as well as the Indian smart mobility sector and thus gives an overall view of the sector's position in the Indian mobility market.

¹ Smart Mobility Services find application in 'passenger' as well as 'goods' transport, however, the focus of this paper is on 'passenger' transport services only.

1.0 Introduction: Smart mobility

Smart mobility may be defined as components of 'smart cities' that focuses on mobility made smart with the latest technology (Singh 2019; 2021). It can also be described as a spectrum of mobility options and services that are termed 'smart' because the latest technologies—internet and telecommunication devices—are integral to their operation and provision (Singh, 2021). Smart mobility solutions range from on-demand ride services (called ride-sourcing services), real-time ride-sharing services in cars and on bikes (called shared mobility services), multimodal trip planning apps, smart traffic control functions and self-driven vehicles.

Ride-sourcing services are also known as 'on-demand-rides' or 'ride-hailing' services (Rayle et al, 2016) and allow users to book a ride from anywhere, using smartphones through an app, and are often seen as a smarter version of the conventional taxi.

In India, two of the dominant companies offering ride-sourcing services are Ola and Uber. A few ride-sourcing companies also offer a shared version of booking rides by allowing users to share rides with other passengers for the whole or part of their routes, and this facility is called 'ride-splitting' or 'ride-sharing'. A relatively new service in India is that from Blu Smart which offers ride-sharing in electric vehicles; Blu Smart is trying to cash in on the trend of users being fashionably sustainable. Various other apps allow commuters to use shared car and bike rides; parking; and shuttles. Roland Berger Consultants (2014) conducted a detailed study on shared smart mobility and stated that "in the world of shared economy—shared goods, services, money, accommodation and mobility, in terms of revenue—the mobility sector is one of the fastest-growing segments". It even projects that the growth rate of this market will reach 20–30 per cent per annum, forecasting smart mobility to be a sector worth 30 billion Euros by 2025, and it is fascinating to know that just Uber, which is present in 30 countries, had a valuation of about Euros 17 billion in 2014. The same report suggests that the reasons for growth of smart mobility can be identified as the high penetration of smartphones; asset-light businesses that work on sharing of resources rather than owning an inventory of vehicles; people's changing attitudes from owning to simply using; awareness of climate change; and scarcity

of space and resources. In addition to that, sharing has never been more convenient and cheaper than owning, today. Singh (2021) says that the introduction of smart mobility services tapped the huge potential of smartphones and apps. This laid bare the size of the huge mobility market that had been untapped.

Mobility is now literally on one's finger tips and the combination of the cars, the drivers, and the commuters using technology is truly amazing. Smart mobility services are often also called disruptive because a new market and value network invariably disrupts existing markets. However, while we assess the sustainability of these services, the sustainability of their business models is also a question because it has been found that disruptive mobility services have a high shock value and often a short life (Bradshaw, 2018). Singh (2021) also adds that the speed at which innovation is taking place and new business models are being created, tested and implemented, each disruptive mobility service is soon disrupted by another—more creative, competitive, affordable or superior in service. They are especially disruptive because regulatory bodies do not have laws or regulations to govern them appropriately as these technologies and business models were not expected at the time those policies or regulations were drafted or implemented. Most businesses also change, get overtaken by new technologies or simply perish, and thus have a short lifespan.

In India, particularly, the decreasing efficiency of public transport and increase in disposable incomes of people has led to the gradual privatisation of public transport and introduction of app-based ride-hailing services or 'cab aggregator' services. Basu (2019) reports on the state of smart mobility in the country in detail. This report finds that the majority of commuters were satisfied with availability, reliability, cost-effectiveness, safety, cashless option, driver behaviour, comfort and absence of bargaining; the drivers were also found to be content with their improved earnings. It is important to note that by calling the industry the 'cab-aggregator industry', Indian markets clearly refer to them as taxis and these are the most commonly used smart mobility services. Service providers claim that their services save people from the hassles of finding parking space, negotiations over fares,

and the frustration of driving on congested roads. This shows that the cab-aggregator industry is targeted only towards a section of society that drives and is not accessible to all socio-economic segments. Basu (2019) adds that Indian consumers are smart, very demanding and are highly price-sensitive with no brand loyalty. In such a market, smart service providers have to innovate constantly to maintain their customer base and optimise cost at all levels.

The growth of Ola Cabs (launched in 2010) has been phenomenal. Its network of over 200,000 cars with about 600,000 drivers (Virkus, 2017) across 102 cities in India handles on an average 150,000 booking requests per day (Sharma, 2015). Though Ola has the majority share of all app-based cab services, it is presently facing very stiff competition from Uber (launched in India in 2013). In order to cater to a wider customer base, Ola introduced auto-rickshaw services in Bangalore city (Abudheen, 2014) and currently Ola auto services are available across 10 cities (Shukla, Chandra and Jain, 2017). It also provides different types of cab services to its passengers ranging from economy rides to luxurious ones catering to different kinds of demand, however, none of their services cater to the poorer sections of society. By 2016, Uber Cab services were available in 545 cities across 66 countries (Shukla et al., 2017) and about 26 cities in India. It also allows cash payments for its services, takes away the barrier of online payment, and becomes more accessible to people who either do not have access to online payment platforms or do not wish to use them for some reason: a large proportion of the Indian population is not very comfortable with online transactions.

Mulukutla (2021) points out that radio-frequency identification tags may be used for digital payments/automated fare collection. In India, the National Common Mobility Card is a single smart card that commuters can use for booking travel. It is yet to be accepted in all the states and cities as system up-gradations are needed. This is one way of including technology in mobility. At the same time, he says that without increasing transport service levels and access to all sections of society, smart mobility is not really smart.

To attract more users from different economic sections, some mobility services—such as UberPool, OLAShare, Lyft line, Didi Chuxing and Hitch—are also offering on-

route ride sharing to multiple commuters like paratransit modes. Ride-sharing services are cheaper than ride-hailing services and can be attractive to more people.

In the beginning, cab-aggregators attracted drivers by offering incentives as high as INR 5,000 for a single trip per day but as the business gained ground, tips have come down drastically—to INR 750 for a minimum of 10 trips per day. This has irked drivers and they do not feel as enthusiastic about this business model anymore. From the professional point of view, aggregator companies carry out a background check, collect personal and professional information and run police verification checks for all drivers. In some cases, a training programme is also conducted for drivers involving behavioural training, etiquette, grooming, etc. They also encourage micro-entrepreneurship by offering drivers huge discounts on cars and an affordable repayment scheme. However, drivers then have to stay with the same company for the loan period.

Singh (2021) says that most of these smart mobility services are offered by private companies, whose priorities are earning profits. Social sustainability, equality or equity is not integral to their business models. These mobility systems are just like any other business venture, they also have a target customer group, and as some reports have confirmed, these services target customers from Generation Y and Z (Roland Berger, 2014). These people are young, more conversant with smartphones, their applications, social networks, and are also more accustomed to swapping and sharing over smartphones and apps. They are also very choosy, less adaptable and long-lasting loyalty is not their major concern. There is also little predictability about which service will come next, which will be pulled off the market, which will continue and what changes will be made to services or continuing them.

Docherty et al. (2017) finds that advocates or sellers of smart mobility services portray these services to be crucial inventions leading to reduced wastage of productive time spent in congestion, improved well-being, reduced carbon footprint, etc., whereas in reality these benefits are secondary outcomes and not the primary goals of mobility. The primary goals of mobility include equitable distribution of transport resources by giving everyone equal access to opportunities in cities. Smart mobility providers' claim that they will eventually

reduce mobility needs altogether, when in fact they increase mobility by tapping into unmet lifestyle needs to expand their customer base (Priya Uteng et al., 2019).

2.0 Social sustainability of smart mobility

Sustainability has been described as “...development that meets the needs of the present without compromising the ability of future generations to meet their own needs” in 'Our Common Future' (Brundtland 1987), a report—submitted to the United Nations by the World Commission on Environment and Development—which stated that social equity, economic growth and environmental protection are simultaneously possible based on the three concepts—social, economic and environmental sustainability. They are the three pillars of sustainability. Of these, historically, environmental sustainability has been given more priority simply because of increased mass awareness about continuing environmental degradation. Social sustainability has remained largely ignored.

According to the United Nations Global Compact, “Social sustainability is about identifying and managing business impacts, both positive and negative, on people” (UN Global Compact, n.d.). Many actions by businesses to achieve social sustainability unveil new markets, new business partners and are the cornerstone of innovation for new products and services. Smart mobility is one of those innovations. It reinvents an existing business model using technology. However, does it have social sustainability built in?

Hemani and Das (2016) reported that even though sustainable urban development is widely accepted as a balance between social, economic and environmental dimensions, environment and technological advances dominate the thinking of sustainable cities in India as evidenced by the rating system in the National Mission on Sustainable Habitat in 2010; or the Leadership in Energy and Environmental Design, more commonly known as LEED-INDIA, adopted by the Indian Green Building Council in 2011. In addition to LEED certification for buildings, there is also LEED certification for neighbourhoods and city plans. The social dimension is, however, almost always under-represented and restricted to poverty alleviation or slum up-gradation programmes. India has a poor Human Development Index (HDI) record. It was ranked 136 amongst 187 countries in 2013 (UNDP, 2013); this ranking changed marginally but more or less remained the same at 132 out of 191 countries in 2021 (UNDP, 2022). They also say

that social sustainability can no longer be seen as social tolerability of environmental policy measures, expanded to cover social equity, social design and environmental justice.

Priya Uteng, Singh and Helen Hagen (2019) assessed the social sustainability of smart mobility in theory: an assessment based it on many indicators including social equity (accessibility), safety considerations, and health impacts. Of these, social equity can be expanded to be about: access of services to different income groups (accessibility due to affordability); access to different age groups (children, the young, the elderly); access to different genders (male, females, others); and access, irrespective of education or literacy (in this case, regular as well as digital literacy).

India is a large country and every state has vastly different demographics, and different transport services. Culture plays a large role in mobility of people—the selection of modes, and when they go mobile—so it is not possible to speak for the entire country in one tone. However, this paper assesses social sustainability of smart mobility in India using parameters on social equity as described above.

2.1 Assessing smart mobility in India on parameters of social sustainability

In this section, the social sustainability of smart mobility in India will be examined from the perspective of different user groups—age groups, gender groups, income groups, digitally literate groups; and also geographical access to these services. To begin with, it is important to understand who is using smart mobility services. It is clear by now that out of the many smart mobility services, ride sharing (bike-sharing and car-sharing) is not all that popular in the India. The most popular is ride-hailing, a taxi like service. The second most popular, by quite a large margin, is ride-sharing. Ride-hailing services are also called cab-aggregator services in India. The following section in this chapter reveals the findings of a study of users of smart mobility services in Kolkata, India: it will give us a sneak peek into smart mobility user demographics.

2.2 User demographics

There are not enough published studies about user demographics and their attitudes/ experiences while using smart mobility services in India. A detailed survey (Basu, 2019) in Kolkata, India, of 80 passengers of cab-aggregator services revealed that all the respondents had an overall minimum travel experience of at least five times by app cabs. About 69 per cent of the respondents were male and rest, 31 per cent, female. One can immediately see a skew in this composition.

From the age point of view, it was seen that 37.5 per cent of the passengers were below 30 years of age, followed by 32.5 per cent between 30 - 45 years, 18.75 per cent were 46 - 60 years, while only 11.25 per cent were above 60 years of age. As only a little more than 11 per cent were elderly users, it is clear that the services did not appeal to this age group. As expected, the younger section of people (up to 45 yrs of age) find these services most apt for their mobility.

The educational level of commuters was also studied and it was found that expectedly, the highest user group were graduates (42.5 per cent), followed closely by those with school level education (38.75 per cent), while 12.5 per cent of the respondents were post graduates. Interestingly, 6.25 per cent of the respondents were either illiterate or did not have any form of formal education exposure but yet used apps to book rides which indicated that the booking procedures may not be very complicated or perhaps that someone booked the trips for them.

Looking at income groups—it was found that the upper middle-income group with monthly incomes of INR 51,000–70,000, led with 30 per cent of total cab usage. The middle-income group with monthly incomes ranging from INR 31,000–50,000 formed 28.75 per cent of the user base. The lower and higher income groups were comparatively less inclined towards app cab usage and that can be explained easily. Low income groups cannot afford these services and rely more on public transport or shared paratransit modes. The highest income group often own automobiles and also have drivers. Hence, their inclination towards these services is less.

The studying of occupational backgrounds of users

revealed that the salaried service class was the largest user group at 32.5 per cent, while not so far behind was the business class at 30 per cent. About 10 per cent of passengers represented the young student community. Those, not formally employed (unemployed, freelancers, housewives, etc.) represented 12.5 per cent of users.

While analysing frequency of commuting, it was surprising to note that the proportion of daily commuters was the highest at 46.25 per cent. About 31.25 per cent users used cabs on a weekly basis, 11.25 per cent used cabs fortnightly. Finally, monthly and occasional travel frequencies were the lowest at 2.5 per cent and 8.75 per cent respectively.

Most of the above results are likely to be very similar in other metropolitan cities² or million plus cities in India. At the global level, the results were also similar. As Singh (2019) reports after reviewing a plethora of global literature on the same, most of the users of smart mobility services in North America are more likely to be Caucasian, male, between the ages of 20 and 35, and well educated, when compared to the general population (Shaheen et al, 2014; Dill et al, 2015). Giesel and Nobis (2016) found that car sharing users in Germany were predominantly male (up to 80 per cent), with higher education, full-time employment, from a 1–2 person household, and who earned more than the average national income. A study conducted by Virginia Tech's urban planning students, documented key demographics of Capital Bikeshare users and found that women were more likely to be casual users than regular members.

Another study of bike-sharing in five cities—Mexico City, Minneapolis-Saint Paul, Montreal, Salt Lake City and Toronto in 2013—found that compared to the general population, bike-sharing members tend to be wealthier, more educated, younger, more likely to be Caucasian and male (Shaheen et al., 2014). Thus, it does not come as a surprise that the most common user description of smart mobility services in India is male, educated, employed and belongs to the upper middle to middle income earning segment who uses these services for work.

² Million plus cities are those with a population of more than one million people.

At the beginning of this section itself, it was clear that about 70 per cent of users were male, and only 30 per cent were female. The gender gap is evident. There is enough evidence in literature on the gender gap in urban mobility and how it impacts women's access to services in cities. The next section discusses the gender gap in urban mobility and how smart mobility may be widening, rather than closing, the gender gap.

2.3 Gendered mobility around the world and in India

Singh (2019-2021) reports that globally, mobility studies, have shown that men and women have different travel patterns. The latter make more trips related to work as well as for household chores. These trips are often during off-peak hours, for shorter distances, and for multiple purposes using different modes of travel such as public transport or walking (Crane, 2007; Gustafson, 2006; Hjorthol, 2008; Peters, 2013; Priya Uteng, 2011a, 2011b; Queirós et al, 2016). This pattern exists in developing and developed nations alike. Due to the dissimilarity in their roles in the job market and at home, women and men have different demands for mobility. Peters (2013) points out that women have complex travel needs because they are managers of households, engage with communities, take care of children and the elderly, and often also work to earn. She further says this is not a case of 'different but equal', but an 'unequal burden' on women, especially considering the roles they are expected to play in patriarchal societies. These patterns hold true for even developed countries, perhaps to a lesser extent. For example, a study in Sweden (Gustafson, 2006) showed that the presence of young children reduced travel activities of women, but there was no such effect on men. Another comprehensive survey examining commuting trends in the entire United States of America (USA) from 1985 to 2005 also concluded that gender and gender-based societal roles are the reasons why there are gendered differences in travel, housing and labour market dynamics, and that women still exhibit a greater likelihood for trip chaining (combine multiple trips for different purposes), work closer to home or stay home altogether (Crane, 2007; Peters, 2013).

Talking specifically about developing countries, including India, Priya Uteng (2011a) concludes that women carry out many non-work trips related to the

running of households, and caring for children and the elderly. So, women resort to trip chaining and depend on low-cost modes of mobility such as public transport or walking. Due to their need to combine multiple trips for different purposes in different locations, women value flexibility over time-efficiency. Another study by GTZ (2007) in developing countries, found that since income-generating trips are valued more than domestic trips, vehicle use is also higher for those trips. Vehicles could include individual cars, motorcycles and bicycles as well as paid transit and usually, it is men who benefit first. With an improvement in social status or incomes, men are first to motorise; and women only benefit from a trickle-down effect where they inherit the older mode for their own use. The same study reports that women are more concerned about safety and personal security aspects of the modes of transport and this plays a critical role in decision-making and selection of that mode. They may seek less efficient or more costly alternatives when there is a perceived threat. Women also choose to walk rather than pay for transport and this reduces their mobility and increases travel time. Needless to say, these choices or lack thereof, have ramifications on access to opportunities and services. As research in Delhi suggested, girls are choosing relatively less interesting colleges because they have safer routes (Bhattacharya and Kopf, 2017). This shows how safety or lack of it affects the lives of women and their growth.

Most women have to travel for different purposes, such as, to a school or doctor and for shopping and work. Increased distances between these places make trip chaining extremely difficult and travel activity takes much longer. The sad state of public transport, or walking and cycling conditions, in developing countries also makes it difficult for most women to carry out their daily activities. Another factor that impacts women's mobility is the historical preferential treatment given to the movement of cars above people. After the industrial revolution, there was a trend of increased motorised movement and car ownership. However, cars were predominantly driven by men and hence a gender gap in urban mobility was created.

If movement of women is not given enough attention, they stand to lose out on educational, employment, medical and even recreational opportunities that may be available in cities. Addressing equity in urban mobility is pertinent as improved access to employment, education

and other urban services are important for higher social productivity and economic growth (Martens, 2012). The basic economic unit, the household, is also strengthened by enabling women to better meet the needs of the household (Worldbank, 2012; Garde, 2014).

Thus, in order to create inclusive and sustainable development, cities must focus on improving public transport services and walkways, since that is mainly how most people, who do not use cars, are mobile there. This should also encourage men to become more sustainable in their travel behaviour and walk, cycle or use public transport more.

When smart mobility services were introduced, experts and proponents of smart mobility services had opined that these services would be accessible to disadvantaged sections of the society, including women, and could potentially improve mobility of those sections by providing cheaper, faster and more available mobility (Shaheen et al., 2016). However, as global and Indian evidence suggests, smart mobility services have not fulfilled that promise. As mentioned earlier, women have lower access to financial instruments, resources, give more preference to safety, and often make non-work trips. Therefore, women do not find ride-sourcing attractive enough as these can cost more than public transport and/or paratransit modes. Access to smartphones and affinity for digital payment instruments are also low in women and the elderly. These factors directly impact access to smart mobility services by women and the elderly. These are preliminary conclusions based on an understanding of these services and Indian urban societies. However, to arrive at more accurate conclusions, studies have to focus more on finding out what is keeping women, elderly persons, and low-income groups from benefitting from these services. Thus, *prima-facie*, it appears that smart mobility services are widening the gender gap in urban mobility instead of closing it. Let us understand the other roadblocks that impact accessibility of these services.

2.4 Digital literacy

A Swedish report (Trafikanalys, 2016) compiled trends in digitalisation and its effects on gender equality. It reported that, to begin with, technology and technical designing has a gender imbalance with more men involved in these processes. This means that there is

insufficient capacity to understand the social consequences of these services, especially on women; or even user-friendliness for women, the elderly and other such user segments. Further, the report adds that if services are available only on smart devices, then it is working on the presumption that those wishing to use them not only have the devices but also the know-how (also called 'digital literacy') to use them. This is not entirely true as women generally have lower incomes than men and have potentially higher impediments to using new technologies. Similar conditions exist for the elderly as well as people from low-income households. Roland Berger (2014) states that smart mobility services are targeted at the new generation of younger people who are more technology savvy, more educated, possess more disposable income, and want instant mobility services. A large percentage of the population does not fit in to this target group.

Durand et al; (2022) did a review of twenty-five papers on digital inequality and transport services. They found that vulnerability to digitalisation in transport services exists along dimensions of age, income, education, ethnicity, gender and geographical region. The term 'digital divide' became popular in the nineties, in the USA, during a decade of surging growth of the internet and personal computers (Lupač, 2018). Although initially, 'digital divide' referred to material access to technology, over time it has been agreed and widely accepted that having material access to technology does not mean that people benefit from what technology has to offer (Zhang, Zhao and Qiao, 2020).

Smart cities and smart mobility depends on technology and digitalisation. Digitalisation promises to simplify mobility and provide more choices for mobility to people (Shaheen and Cohen, 2020), however, it is also true that lack of skills, limited knowledge in the use of smartphones and apps can lead to a real digital divide. (Durand et al, 2022) says that internet penetration can be misleading to professionals if considered on its own; it is also important to combine it with literary and numerical skills. Using an example, the study shows that the Netherlands has the highest internet penetration rate in Europe (98 per cent) and is, with Sweden, a European country with the highest (87 per cent) use of the internet with smartphones (Statistics Netherlands, 2018). Yet, in the Netherlands, one in six people aged 16 or older have low numeracy and or literacy skills (Netherlands Court of

Audit, 2016). This means that there will be difficulty navigating the digital world and hence access to travel information which will lead to negative outcomes in mobility. Similarly, low-income people with lower education levels are vulnerable to digitalisation because they cannot afford credit cards, maintain bank accounts, and are less likely to have internet services or even a smartphone. Other than low-income families, women are also more likely to be vulnerable to digitalisation in transport services, especially in developing countries or countries where women are less emancipated (Van Dijk, 2019; Zhang et al. 2020). One of the striking observations reported in (Durand et al., 2022) by (Pangbourne et al., 2010) is that adults have often complained about small keypads and pictograms while people with language barriers felt that there was too much information displayed on a single screen; spelling mistakes were also not forgiven. This led to frustration caused by low user-friendliness of mobility apps. Elderly people also form a group of people who may not be very comfortable with digitalisation. They may be able to afford and access digital services, but most of them have not kept up with digital trends and technology, thus making it difficult to access smart mobility services. In many emerging economies, where there already are issues of basic literacy, the issue of digital literacy only compounds the problems related to people's access to smart solutions and services. Compared to western countries, Indians show less trust in digital systems or payment methods. Although that is changing at a fast pace with Paytm, RuPay and others, there are still consumers who prefer to use cash for payments. In recognition of that group of consumers, Uber India also allows for cash payments for its services since a large section of Indian population is not very comfortable with online transactions. It takes away the barrier of online payment and becomes more accessible to people who either do not have access to online payment platforms or do not wish to use them for some reason. problems related to people's access to smart solutions and services. Compared to western countries, Indians show less trust in digital systems or payment methods. Although that is changing at a fast pace with Paytm, RuPay and others, there are still consumers who prefer to use cash for payments. In recognition of that group of consumers, Uber India also allows for cash payments for its services since a large section of Indian population is not very comfortable with online transactions. It takes away the barrier of online payment and becomes more accessible

to people who either do not have access to online payment platforms or do not wish to use them for some reason.

Governments at national, state and local levels need to tackle this digital literacy gap. India launched the National Digital Literacy Mission in 2014 to make at least one adult from each household digitally literate by being able to utilise various kinds of technology—the internet, smartphones, computers, tablets, etc. (S.Sharma, 2016). It is a central government sponsored scheme but has received funding from multinational corporations like Google, Microsoft and Intel for opening up training centres. Such steps can assist in reaping the benefits of smart mobility services and consequently create higher equity in transport. An appraisal of the success of National Digital Literacy Mission will shed light on its successes and failures.

In India, there were close to 750 million smartphone users in 2020 and that number has increased to more than 930 million in 2022 (Figure 1); smartphone penetration countrywide is around 28-30 per cent. According to a Deloitte analysis, India is expected to have one billion smartphone users by 2026 and this will be driven by sales in rural areas (Deloitte, 2022). The BharatNet project which aims to digitally connect all the gram panchayats and villages in India by 2025 will also be a key push factor. However, it is important to know how Indians are using smartphones, in urban as well as rural areas. After COVID-19 hit India, the use of smartphones increased considerably and their most substantial use is chatting, calling and streaming content to watch, much like having a personal television with content you can choose from, and at your preferred times. Looking forward, if smartphone penetration is expected to be mainly in rural areas, then it is less likely to impact access to smart mobility services as these are available only in urban areas.

An intersectional analysis of 34 national and sub-national policies on mobility in India was carried out by Kakar, Peden and Jagnoor (2021) to understand how mobility inequities were faced by vulnerable groups since most policies only acknowledge their inequities; there are not enough transformative actions, nor do policies include voices of the vulnerable in their making.

There is also the issue of women's safety, as Trafikanalys,

(2016) pointed out. While higher digitalisation and use of autonomous vehicles can help in avoiding risky situations, it also means that stalking and illegal activities like prostitution become easier.

The study by Kumari and Singh (2019) assessed the impact of e-mobility and apps on female safety in public transport. The field study was conducted in the Munirka area of South Delhi. In-depth, face-to-face interviews were conducted at various bus stops in Munirka. Inputs were also taken from a workshop conducted for school going girls, and from one focus group discussion. The parameters for selection were age and income levels. Participating women commuters were classified in age brackets of—below 18 years of age, 18-40 years, 40-60 years, and 60 years and above. Input data was analysed to assess technological and policy inputs for technology developers and policymakers. Most of the respondents were aware of the environmental benefits of electric vehicles. The introduction of 'e-rickshaws' (electric three-wheelers) has enhanced their mobility. Due to its smaller size, with standing impossible and direct contact with the driver, women felt more comfortable in e-rickshaws and made more frequent rides, and in less time (Mahadevia et al., 2018; Mohanty and Kotak, 2017).

Some of the most important IT features desired by the respondents are 'real-time information' and CCTV cameras in the e-vehicles in order to make women passengers feel safer. The respondents recommended that colour codes be added to apps/ websites for commuters who are illiterate. Respondents with smartphones were aware of the government's 'Himmat' app through which mobile police vans can be contacted in case of harassment. However, economically less privileged women commuters were not aware of this app, which shows that awareness campaigns have somehow missed this social group of women. At the time of study, public transport had no women drivers and it was hoped that the design of e-vehicles, could be made suitable for both men and women to drive. This would encourage women to drive public transport.

2.5 Neglected geographical areas

When discussing social equity, it is also important to recognise that social groups are also geographically grouped. There is a risk that commercial initiatives that develop their transport services primarily based on digital infrastructure (such as ride-sourcing platforms) shun certain neighbourhoods because they are not profitable

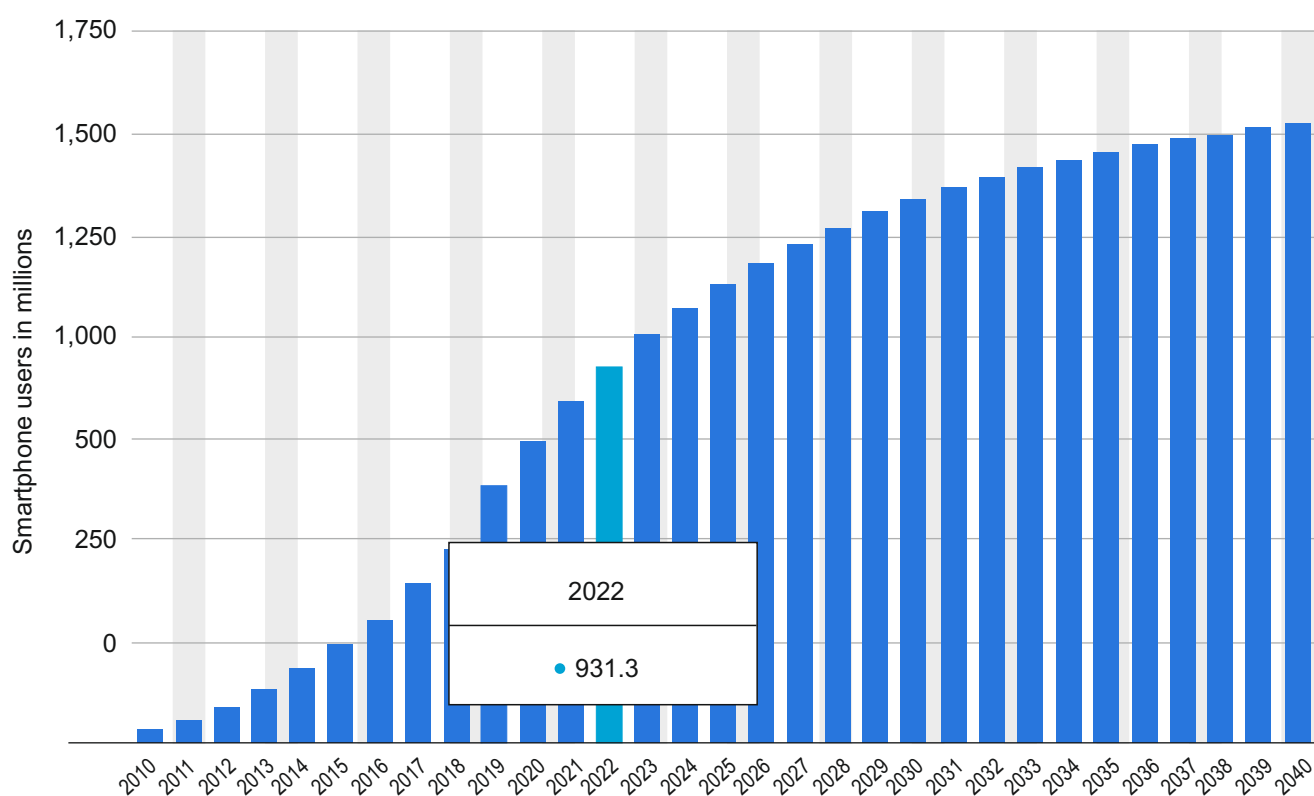


Figure 1: Growth of smartphones in India (since 2010 and projected until 2040)

enough. In India, often auto-rickshaw drivers are found to refuse rides to areas from where they are less likely to find a ride back, especially during off-peak hours. Similarly, ride-hailing drivers may also refuse rides to areas where they do not see commercial benefits. Until a few months ago, drivers working with ride-hailing service providers were not informed about the booked ride and destination until they picked up the person who had booked the ride. Now, it is possible for drivers to see the destination of the booked ride, and as reported by mobility service users and also newspapers, drivers cancel rides if they have reservations about going to that destination. This can lead to neglect of areas that may not be commercially advantageous.

2.6 Safety

Ride-hailing is one of the most popular forms of smart mobility, especially in India. However, there have been some setbacks in terms of safety because cases of drivers' sexually assaulting female passengers have emerged in India: it has also been observed across the globe (Priya Uteng et al; 2019). In response to such incidents, companies have started conducting background checks on drivers and, in some case, provide the requisite sensitising training. This issue is, however, trickier than it seems. Under the model of the ride-sourcing services, drivers are often independent contractors who may be provided with incentives but are not subject to other employment conditions in some countries like the USA (APTA 2016). It must be noted that these efforts should have come in as preventive measures rather than as a response to women's safety needs. All collective and public transport solutions must have the elements of security inbuilt at the inception stage, rather than as an afterthought in the wake of violence against women. Given the emerging demand for safe transport services for women, women-only ride-hailing services (exclusively women drivers for women passengers) have been launched in many countries, such as Riding Pink in Malaysia, LadyDriver and FemiTaxi in Brazil, See-Jane-Go in the USA: there are similar services in India. In Indonesia, where people often hitch rides, two women-only, motorcycle ride-hailing services, LadyJek and Sister Jek, were launched.

Some of the other safety checks that can suffer due to contractual relationships between drivers and ride-hailing companies are: alcohol and drug testing; liability

and occupational safety training; and higher vehicle safety, inspection, and insurance requirements. The smart mobility agenda must cover these topics.

3.0 Survey of users and professionals

In the months of July and August of 2022, an online survey was conducted of users, and/or transportation, urban professionals about smart mobility services in India. The respondents were briefed on what the term covers, since these terms have different meanings in different forms of communications. After the orientation, a total of 12 questions were asked about their views on smart mobility, its accessibility, user-friendliness, growth prospects of the sector, characteristics of the services and problems being faced by the users and drivers. The complete questionnaire is attached in Annexure 1. There were a total of 16 responses to the questionnaire even though it was shared widely by the contractor and the client amongst their social media and personal contacts. However, more than quantity, quality of response was critical to a good understanding of the sector.

Most of the respondents were found to have used the ride-hailing service as anticipated and, half of them had also used ride-sharing. However, only a few had used bike-sharing (Figure 2). Bike-sharing services are not popular, nor are they easily accessible. Many bike-sharing stands at Delhi Metro Rail Corporation stations in Noida were taken over for cars. The stands were also used by rickshaw drivers, parked nearby, for hanging articles, and sometimes even by roadside vendors. Clearly, the most preferred, or well known, smart mobility service is ride-hailing.

Respondents had to make multiple selections on the question related to different characteristics of smart mobility. According to the respondents, the main benefits of smart mobility services are accessibility, availability and user-friendliness (Figure 3).

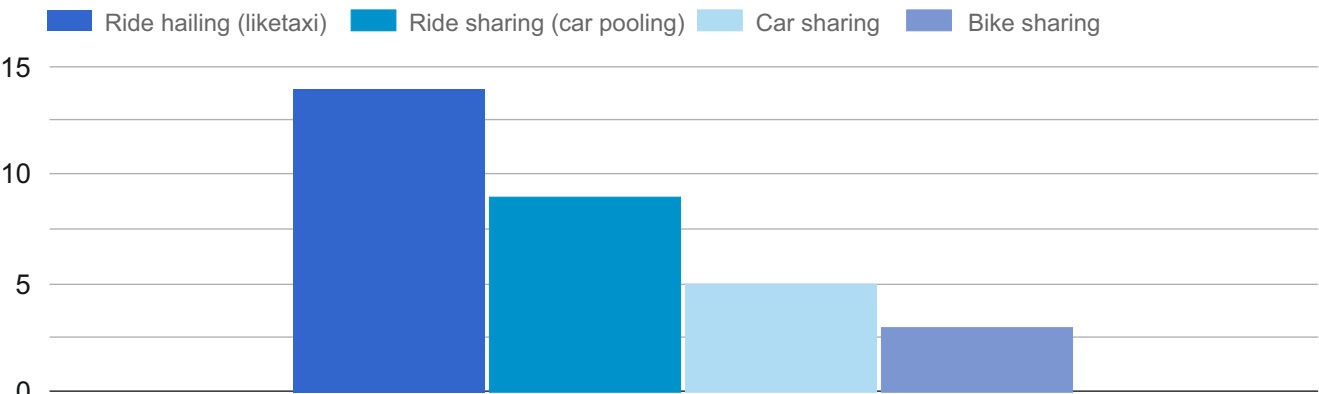


Figure 2: Types of smart and shared mobility used by the respondents

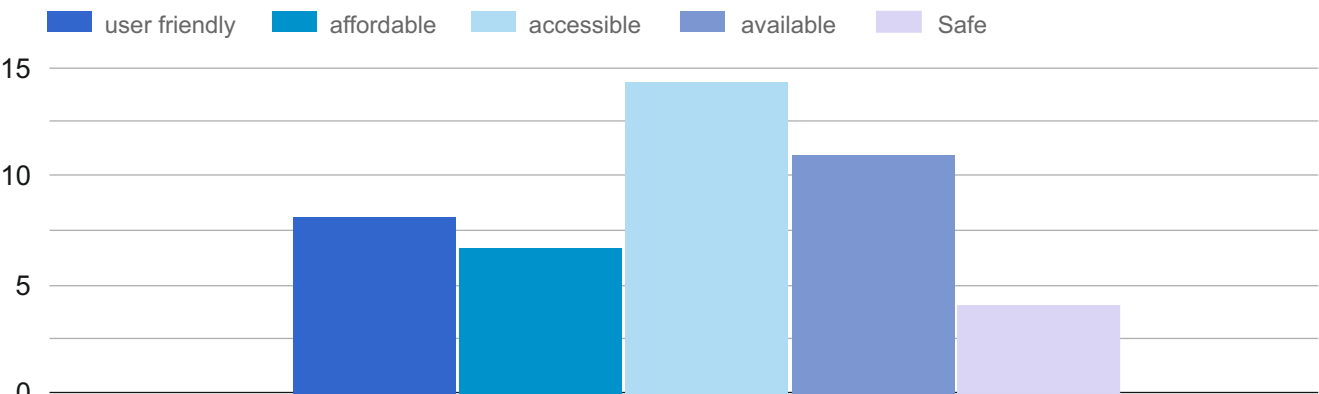


Figure 3: Characteristics that users associate with smart and shared mobility in India

Their detailed responses on characteristics were: user-friendliness; ease of booking; faster than public transport; easier to access and makes access to other areas better; provides first and last mile service; door-to-door and hence convenient; cost-efficient; safe; and it makes travel planning easier. Some of the answers also included: less polluting; reduced carbon emissions; and eco-friendliness.

However, without any empirical evidence for India, it is difficult to corroborate that smart mobility services have replaced car trips and effectively led to environmental benefits.

More than 85 per cent of the respondents believe that smart mobility use will increase, and the rest opine that smart mobility has reached its saturation point and will either stay the same or decline in the coming years.

Globally, the biggest concern related to smart mobility services is that instead of luring car drivers to make the modal shift from personal to shared vehicles, these services may be taking away riders of public transport, and thus shift away from a more sustainable pathway. As a part of this survey, respondents were asked if they found a modal shift from public transport and about half of them replied that public transport riders are not moving to smart mobility services because their commuting choices are highly price-sensitive though they might sometimes use smart mobility services for the last-mile connectivity. The other half believes that the shift from public transport is because of comfort, flexibility, quality of service and connectivity offered by smart mobility services. The COVID-19 pandemic has also encouraged this trend. However, one respondent added that in tier-3 cities, people often have bikes and small cars of their own so these services are not popular there. Apparently, only the mobility needs of men was considered in this response as women are less likely to own private vehicles in tier-3 cities in India. When asked if car-owners are shifting to smart services, the response was mixed. Some believed that services were only used when going to places with parking problems or accessibility issues: environmentally conscious people may choose to use these services in order to reduce carbon emissions. Otherwise, these services are going through a phase where they are no longer that user-friendly and the quality of service has deteriorated over time.

Another important question was about inducing new travel demand. Globally, it has been claimed by experts that smart mobility services often induce new demand rather than creating a modal shift from less sustainable to more sustainable modes. Most of the respondents agreed; attributing this to reasons such as opening up mobility to people of different ages and income groups who are not eligible to drive or cannot own private vehicles, increase in incomes of people thus allowing them to use smart services, and due to latent demand.

Specifically, in the context of social equality, the survey asked the respondents if they believed that smart mobility services are attractive to different social and economic groups. The overall opinion was that only upper middle or high income families could afford these services on a regular basis. Women, tourists, and young people could also access these services for their mobility needs.

As mentioned in earlier sections, smart mobility services evolved from adapting the conventional taxi model by adding smart technologies. This was done by the private sector and so it is essentially a business model which driven by profits, not social equity. Respondents were also asked if they were aware of any public-run smart mobility services and almost 94 per cent of them responded in the negative. When asked if they would like that to happen, the majority responded positively, stating reasons such as: lack of accountability and focus mainly on profits; no mass outreach in existing services; the need for standardisation and regulation; and the need for socially equitable services. The ones against the idea had reasons such as: the public sector should only plan and regulate while private players should operate services; public run services are a cost to the public exchequer and have largely proved to be inefficient; and the public sector is often not innovative enough to cope with changing rider needs.

They were asked to look forward and suggest changes they would like in smart mobility services. Almost 44 per cent of them wanted them to be more attractive to all economic and social groups. They said that, given the reducing level of service, a better consumer redressal or customer care system was the next most important improvement they wanted to see. These results are given in Figure 4.

The experiences that respondents have shared are consistent with observations of a much larger population. It has been reported that cab-aggregator services have become highly inconsistent, undisciplined, and there is little or no grievance redressal or customer care system to correct these issues.

People in India are generally unhappy with service unpredictability of smart mobility which is often inevitable in profit driven business models; they use the services in the absence of better alternatives. In 2021, there have been strikes by the drivers. Since, their returns have dropped they try to recover their costs by cancelling

unprofitable trips. Drivers do not switch on the air conditioners, ask for payment in cash, quarrel with customers who do not cancel unprofitable trips, and most importantly their driving behaviour has become very rash and unprofessional. There is hardly any effective way to raise a complaint. Customers have often complained of having to book and rebook 3-4 times to get somebody to accept their trip and this experience is common across cities. Thus, it appears that even though the design of smart mobility services is user-friendly and intended to be a social good, recent developments have proved otherwise.

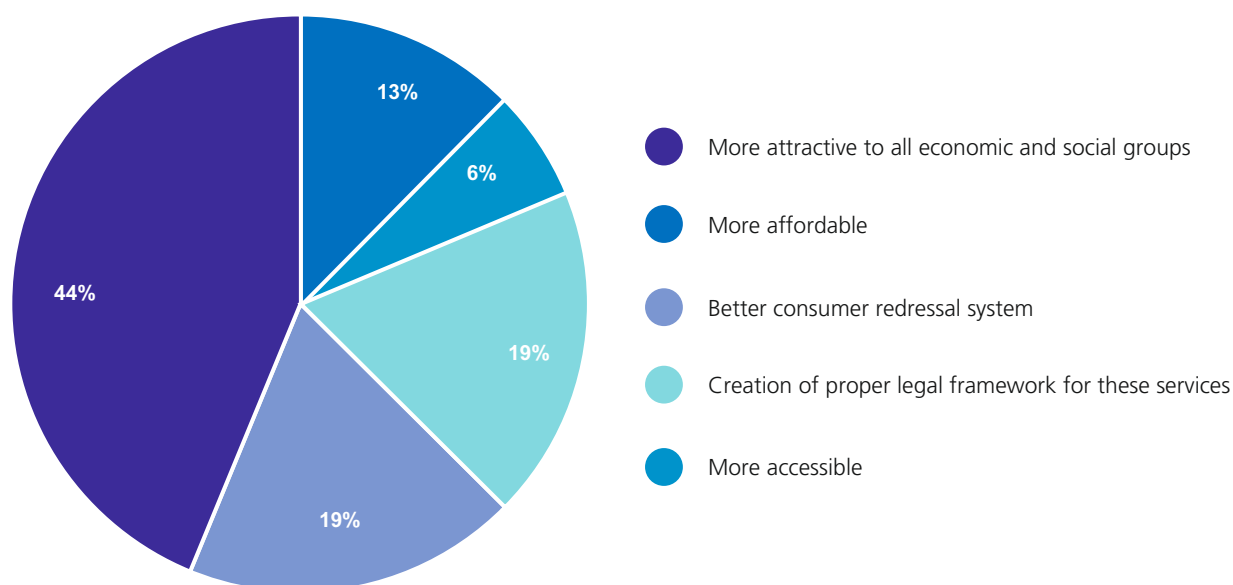


Figure 4: Improvements that respondents' would like in smart mobility services in India

4.0 Conclusions

The growth of smart mobility around the world and in India has offered many benefits while also posing several challenges. This sector of mobility offers great levels of accessibility, freedom, flexibility and of course, mobility; it has also disrupted conventional mobility services and added to safety, legal, and social equity challenges. As mentioned earlier, the focus of this paper is on 'passenger' transport and not 'goods' transport services.

Transportation is a 'social good' that allows members of society to benefit from mobility that it provides to access various services, opportunities for employment, education and so on, and to make living better for its users. However, much like all other social services, transportation is often not equally or equitably distributed or accessible. Provision of these services by the public sector ensures that social equity and equality will be the riding goals of the providers, even though that also means the provision will be hampered by (often) lower financial and technical capacities of the public sector. Smart mobility is primarily driven by the private sector which is again driven by profit. Thus, smart mobility is expected to create socially inequitable conditions.

India's smart mobility sector offers a variety of smart mobility services such as ride-hailing, ride-sharing, bike-sharing, electric vehicles sharing, and so on, although ride-hailing services remain the most popular. In India, particularly, growth of smart mobility services has been helped by the decreasing efficiency of public transport in many cities and increasing disposable incomes of people. Yet, there are several issues that need to be addressed.

Cab-aggregator services started out as very appealing to their drivers, however, they have changed their business model which is not so attractive any more to drivers. At the same time, smart mobility providers/ cab-aggregators now have new rules to follow which were non-existent when they started off as these were new disruptive services with few rules/ laws that applied. Some of these rules are regarding carrying out background checks of the drivers, running police verifications of them, conducting training programmes, behavioural training, etiquette, grooming and so on. Until recently, the legal framework was not adequate to regulate and

monitor app-based ride-hailing services. Although there seem to have been some positive developments, the issues are not completely resolved. The power to change the legal framework is distributed between the central and state governments and that can sometimes compound the problem, not solve it.

Demographically, users of smart mobility services in India were found to be predominantly male, young (less than 45 years of age), well educated, and with good incomes. These findings match global trends. Hence, it does not come as surprising that smart services are inaccessible or not useful to low-income groups, the elderly, less educated, most women and digitally illiterate people. Lack of social equality is clearly an issue here. There have also been issues regarding women safety and neglect of geographical areas where services are not provided due to less demand, leading to social and geographical exclusion of people.

An online survey of transport professionals working with and using smart mobility services revealed that they consider these services to be accessible, available, user-friendly. However, there is also no evidence to prove the environmental benefits of these services as it is not clear if car trips have reduced due to availability of these services. There has to be a modal shift from cars, not public transport, in order that environmental benefits accrue from smart mobility. The level of service has also reportedly gone down as it has become unpredictable, not very user-friendly, and unprofessional.

Going forward, the gaps in the smart mobility system need to be filled. Most importantly, the gap between the public and private sector in the mobility sector needs to be bridged. Policies and legal frameworks need to be complete and comprehensive so that social equity is not compromised and that is not possible until the public sector has a complete insight into these privately run services. Data sharing, hence, becomes essential between the public and private sectors.

We also need to gather more data on impacts of smart mobility services as currently there is limited data on how the environment, society and the economy are impacted by these services. There is speculation, but not enough

evidence. Without this data, policy may not fit well or resolve current problems.

As mentioned earlier, the legal framework needs to be clear so that service providers get enough room, freedom and flexibility to provide a good level of service. However, there is also a need for corresponding compliances that service-providers must ensure so that the safety of drivers and passengers are not compromised. They should also provide a proper grievance redressal system, in the absence of which, users are left in the lurch.

To keep services affordable and accessible to a large number of social groups, fare fixation cannot be left unregulated and this is another area where the public sector needs to involve itself by way of making appropriate policy.

To conclude, smart mobility services in India that started with a bang, have had their share of ups and downs. There have been various developments around the business models, the customer base, the legal framework, increased compliances, and more. Since transportation and mobility are 'social goods', it is important to ensure that these services also have a positive social impact. Thus, it is important to bring public and private sector together and create a framework where business meets social goals. With that in mind, a few recommendations have been made in the following section.

5.0 Recommendations: Practice and policy

The Government of India administers and regulates the transportation sector through an apex ministry in consultation with several ministries and organisations at federal and state levels. The additional layer of 'smartness' in transportation makes administration and regulation more complex. Therefore, smart mobility protagonists and other stakeholders need to be brought into a dialogue with the aim of learning through co-creation and co-production. In this section, we make some recommendations to make smart mobility more socially sustainable even as it continues to be a profit-driven business model.

5.1 Data sharing

Private companies running smart mobility services may be reluctant to share travel pattern data of users so the government must mandate sharing that data with all other stakeholders. This will help in understanding overall travel patterns; unmet travel demand; and user profiles and demographics. This is critical for developing a policy for the sector. Gaps may be filled by transit agencies so as to ensure social equity objectives.

The Bangalore Political Action Committee (BPAC, 2020) proposed a 'data sharing framework' for mobility services to develop data on users. Datasets with the government would be coupled with those datasets, thus adding value to co-creation. In a more open system, mobility service providers would also share data with each other. The Beckn protocol designed by Open Shared Mobility Foundation (a non-profit) co-founded by Indian visionaries promotes and encourages open data infrastructure that induces trust and scales up open data efforts around mobility.

Interestingly, the state of Karnataka tabled the 'Karnataka Innovation Authority Bill, 2020' in February 2020, to provide a limited window of exemption to innovators and help regulators frame laws to keep pace with disruptive technologies. Calling it a 'regulatory sandbox', BPAC (2020) said that if the Bill is approved, then this sandbox will be available where innovative technologies can experiment and pilot their solutions at specific locations in Bengaluru for a specific time. It provides a legal framework that broadly describes a set

of conditions under which innovative technologies can be tested. The innovator would share data which would help in gauging and assessing the impact of the services in connecting public transit and in reducing congestion. In this way, public transport services can be improved and disruptive services mitigated.

5.2 Integrating social sustainability evaluations into technocratic assessments of transport

The public sector needs to make detailed assessments of smart mobility services since it is imperative to have an evidence based understanding of the impact of these services on the environment, social structures and economic sustainability. NITI Aayog (2018) reported that shared mobility has potential benefits such as increasing "...system efficiency, higher asset utilisation and improved connectivity", while also reducing emissions, and so on. However, it is not clear how they arrived at these conclusions. Currently, there is no evidence of the same.

A few surveys have been conducted (Basu, 2019) to understand who are using the services and the characteristics of these users. We may speculate, but there is not enough evidence on whether these services are really unaffordable and inaccessible to large economic and social groups in Indian cities. If these services only add on to options available for those who already have access to mobility, then we have overlooked the social sustainability of these solutions.

Something that stands out in NITI Aayog's observations is that like other transport solutions, these solutions are also seen primarily from environmental point of view. Transportation as a social good is still not under consideration.

5.3 Designing of e-vehicles for women drivers

Many surveys on women's safety in public transport have time and again stressed the presence of more women drivers and more women staff in managing and

operating public transport services. This would assure women commuters of more comfort and greater safety. However, most vehicles have been designed for men. Women-friendly design, particularly, of the driving area and seats in vehicles would make it much easier for women drivers to become a part of the transportation sector. The Government of India is promoting e-vehicles; and especially for public transport or paratransit vehicles.

Vehicles designed for both men and women drivers will promote gender inclusivity and safety for all women. One such element was the height of the vehicle floor from the road. Until some years ago, all the buses in cities were 'rural' buses with very high floors and steps at entry and exit gates. Now, 'urban' buses have been brought into cities and they have a low floor to road height with no or fewer steps. Women, the elderly and children can get in and out much more easily. Thus, women-friendly design of public transport or paratransit vehicles is important for inclusivity.

5.4 Regular appraisals of legal provisions that encourage an increase in shared mobility

The Motor Vehicles Act, 1988 specifies two types of community transport—stage carriage and contract carriage. A stage carriage is a shared vehicle that runs on predefined routes with multiple stops to pick up and drop passengers. A contract carriage provides a service between a fixed origin and destination. Currently shared mobility operators work with 'contract carriages', but this may be an issue with ride-sharing services where vehicles need to pick up passengers along the way and drop them at different points. A mix of stage and contract carriage permit provisions are needed for shared services. Some states, like Delhi, Haryana, Kerala and Tamil Nadu, licence shared mobility vehicles as stage carriages. Further, the Motor Vehicles Act, 1988 prohibits people from earning profits from private vehicles, and so it does not permit the Uber type of shared services because personal vehicles may not be legally used by owners for commercial purposes. But, car-pooling or ride-sharing and bike-sharing services are more attractive to lower-income households for whom ride-hailing services are too expensive. The 'Taxi Policy Guidelines' by the Ministry of Road Transport and Highways (2016) stated that the taxi permit system

should be liberalised and sharing of personal and commercial vehicles should be recognised (BPAC, 2020).

BPAC (2020) states that the Motor Vehicles Act (1988) had no provisions for shared mobility. However, recent amendments in 2019 have redefined cab-aggregators as digital intermediaries or market places. Prior to this, these aggregators were expected to comply with the IT Act 2000.

The guidelines now include smart and shared mobility in India in 2020 (PIB, 2020). The guidelines allow states to create schemes and issue permits to such schemes to promote first and last mile connectivity, reduce congestion, improve transport and safety, better utilise transport assets, increase mobility and accessibility for people, and so on. This legislation covers passenger as well as transport for delivery of goods, etc.

The new guidelines of 2020 have taken many steps in the right direction.

- They allow the use of personal vehicles for smart mobility services if they offer a maximum of four intra-city trips per day.
- Two-wheeler taxi permits have also been allowed as they are more likely to be affordable, and accessible to economically lower income groups. Women, elderly and children will, however, be less likely to avail these services.
- Ride-sharing has been allowed and women may choose if they want to travel with women only.

The guidelines reduce the confusion in the case of interstate travel policy variations as different states have different rules regarding shared/ smart mobility options. However, the guidelines still allow states a lot of room for individual state priorities while working within the centrally defined regulatory system. For example, states are allowed to make rules regarding the propulsion system of vehicles used for shared and smart mobility and all service providers will have to follow them.

Recently, the Government of Delhi has proposed the Motor Vehicles Act Aggregator Scheme, 2022 which mandates a shift to electric vehicles among e-commerce,

delivery and transport logistics service providers. The hard deadline for e-commerce, delivery, and transport logistics service providers to completely migrate to electric vehicles from internal combustion engines is 30 April 2030. The proposed guidelines for passenger transport mandate that bike taxis plying in the mobility space have to necessarily be electronic bikes in order to be authorised as passenger transport vehicles. Discussions have taken place between stakeholders in the gig economy of shared smart mobility and goods delivery in Delhi.

Now that the guidelines are finally in place, it is important to regularly review and appraise the situation and see how some more changes may be required in order to improve the working conditions of the drivers, riding experience of commuters and, more importantly, the social outreach of these services.

5.5 Regulatory mechanisms: Safety, employment and fares

A regulatory fare mechanism to include taxis, shared mobility and cab-aggregators was needed and recognised by the Ministry of Road Transport and Highways in its 'Taxi Policy Guidelines' of 2016. The Motor Vehicle Aggregator guidelines issued in 2020 further increased the compliances operators have to adhere to for getting a license, such as, passenger and driver safety, employment of drivers and fare pricing.

5.6 Passenger and driver safety

In 2018, NITI Aayog reported that it was necessary to regulate smart mobility services to ensure safety of passengers and drivers. In view of the many cases reported by the media about sexual harassment of women using cab-aggregator services, this conclusion was welcome. As mentioned earlier, it is important to build safety measures at the inception stage, rather than as an afterthought in the wake of violence against women. The guidelines for cab-aggregators, 2020 (PIB 2020) have made certain compliances mandatory for cab-aggregators.

- Drivers should not have been convicted for any cognizable offence including fraud, vehicle theft, sexual offences and drunken driving in the last three years.

- The aggregator must ask for, and receive from the police a certificate of good moral character for the driver.
- A picture of the driver must be seen on the app so that the passenger can check if s/he is riding with a registered driver. All data must be recorded and kept for a minimum of at least three months and up to a maximum of 24 months.
- All vehicles must have a GPS installed and child locks must not be used.
- The aggregator should ensure women's safety and protect their rights, and women must be allowed to choose to travel only with women in ride-sharing services if they wish.

5.7 Employment conditions

The aggregator must ensure compliances with conditions for drivers according to the guidelines. Some of which are found below.

- Drivers must have a complete medical examination, including an eye check-up, done by a hospital.
- The aggregator needs to insure their drivers with health and term insurance. Passengers who travel in commercial vehicles owned by cab-aggregators must also be covered by insurance.
- The driver cannot drive for more than 12 hours on a single day.
- The aggregator needs to conduct a five-day induction training programme which includes gender and disability sensitisation.

5.8 Rationalising fares

The guidelines of 2020 have used a formula to fix the charge from 50 per cent to up to a maximum surge price of 150 per cent of the base fare. Recently, it was reported that intra-city travel in Bengaluru by a ride-hailing service was more expensive than the domestic flight from the city to Mumbai (Banerjee, 2022). Thus, even with fare regulations, these services seem to be extremely expensive in some cities and routes. However, from another perspective, instead of focusing on regulating

them, it may be more important to encourage other options that are available such as the Metro, the sub-urban train services or even the special airport buses that are available for travellers. These modes are already more accessible and affordable, however, probably not entirely user-friendly.

The new guidelines also allow both drivers and riders to cancel the rides with a penalty of 10 per cent (up to a maximum of INR 100) per trip. While this has good intentions, in reality it has led to a fall in the consumer experience because rides are cancelled by drivers based on where they (the drivers) want to go. This may lead to geographical exclusion of areas and thereby the people in those areas, affecting their access to these services. It is important to review these conditions after some time of observation.

5.9 Digital literacy

The guidelines say that smart mobility apps should be available in English, Hindi and a regional language. This will solve the problem for people literate in any one of these three languages. Digital literacy is increasing and this will allow consumers to be more comfortable booking the rides, paying for them online, and making complaints online, if necessary.

Based on the learnings from various studies on digital literacy and human-tech-interface, it is recommended that smart mobility apps do not have too much information displayed on a single screen, and specifically mention if cash payments are allowed. In some cases, commuters have reported that some drivers insist on cash payments, but this should actually be the choice of the rider and not the driver, and this is where digital literacy and understanding of the app are important. The use of colour codes and pictograms are also encouraged for the benefit of commuters who are less or not literate.

5.10 Gaps in the guidelines

The consumer redressal system is still unregulated and that is also a stress-point for consumers with many complaining that there is almost no consumer grievance redressal system in place.

Although the guidelines released in 2020 are a highly

welcome move in this space, there are still increased reports of rash driving, drivers complaining of lower returns, drivers not switching on air conditioners and not showing elderly or gender sensitivity. The guidelines have fixed 80 per cent of the fare as the driver's share and 20 per cent goes to the aggregator. In spite of this, drivers are not very happy with their financial returns, eventually impacting rider experience. This begs the question if something is still missing. A detailed study into this aspect will be necessary to make sure that some loopholes have not gone overlooked.



References

- APTA (2016). Shared mobility and the transformation of public transit. American Public Transportation Association.
- Banerjee, Disha (2022). CEO shows how cab fare from Bengaluru airport to city costs as much as flight to Mumbai. Available at: <https://www.storypick.com/bengaluru-airport-cab-mumbai-flight-cost/>
- Basu, Anindya (2019). Viability assessment of emerging smart urban para-transit solutions: Case of cab aggregators in Kolkata city, India. *Journal of Urban Management*, 8 (3), 364-376. Available at: doi: <https://doi.org/10.1016/j.jum.2019.01.002>
- Bhattacharya and Dan Kopf (2017). For their own safety, Indian women are choosing to go to worse colleges than men. Available at: <https://qz.com/india/1138346/data-shows-that-women-in-delhi-are-choosing-to-go-to-worse-colleges-than-men-for-their-own-safety>
- BPAC. (2020). Sustainable Mobility For Bengaluru - March 2020. India: Bangalore Political Action Committee and Uber.
- Bradshaw, Tim (2018). E-scooter sharing start-ups 'not sustainable', says scooter maker. Available at: <https://www.ft.com/content/0bf24c92-09c5-11e9-9fe8-acdb36967cfc>
- Brundtland, G.H. (1987) Our Common Future: Report of the World Commission on Environment and Development. Geneva, UN-Dokument A/42/427.
- Crane, Randall (2007). Is there a quiet revolution in women's travel? Revisiting the gender gap in commuting. *Journal of the American Planning Association*, 73 (3), 298-316.
- Deloitte's (2022). Big bets on smartphones, semiconductors, and streaming service: Deloitte's 2022 TMT Predictions for India. Available at: <https://www2.deloitte.com/in/en/pages/technology-media-and-telecommunications/articles/big-bets-on-smartphones-semiconductors-and-streaming-service.html>
- Dill, Mathez, Nathan and Steven Howland (2015). Who Uses Peer-to-Peer Carsharing? An Early Exploration. Paper presented at the 94th Annual Meeting of the Transportation Research Board, Washington D.C.
- Du Pisani, Jacobus (2006). Sustainable development – historical roots of the concept. *Environmental Sciences*, 3 (2), 83-96. doi: 10.1080/15693430600688831
- Durand, Zijlstra, van Oort, Hoogendoorn-Lanser and Serge Hoogendoorn (2022). Access denied? Digital inequality in transport services. *Transport Reviews*, 42 (1), 32-57. doi: <https://doi.org/10.1080/01441647.2021.1923584>
- Garde, Stephanie (2014). Empowering Women for Better Household Economics. Geneva, Switzerland: ECLT Foundation.
- Gender Equality and Development. (2012). Washington D.C.: The World Bank.
- Giesel and Claudia Nobis (2016). The Impact of Carsharing on Car Ownership in German Cities. *Transportation Research Procedia*, 19(Supplement C), 215-224. doi: <https://doi.org/10.1016/j.trpro.2016.12.082>
- GTZ (2007). Gender and Urban Transport: Smart and Affordable Sustainable Transport: A Sourcebook for Policy-makers in Developing Cities: Deutsche Gesellschaft für Technische Zusammenarbeit
- Gustafson, Per (2006). Work-related travel, gender and family obligations. *Work Employment & Society*, 20 (3), 513-530. doi: DOI: 10.1177/09500170060066999
- Hemani and Amarendra Das (2016). Humanising urban development in India: call for a more comprehensive approach to social sustainability in the urban policy and design context. *International Journal of Urban Sustainable Development*, 8(2), 144-173. doi: 10.1080/19463138.2015.1074580
- Hjorthol, Randi (2008). Daily mobility of men and women - a barometer of gender equality In T. Priya Uteng and T. Cresswell (Eds.), *Gendered Mobilities* (pp. 193-210). Ashgate Publishing Ltd., Surrey
- Kakar, Peden and Jagnoor, Jagnoor (2021). Intersectionality based policy analysis: Equity in mobility in India. *Transport Policy*, 101, 2021, 14-22. doi: <https://doi.org/10.1016/j.tranpol.2020.11.010>
- Kumari and Rajbeer Singh (2019). E-Mobility Through RRI to Achieve Social Sustainability: A Case Study of Women Commuters of Delhi, India. Paper presented at the STS Conference Graz 2019.

- Lupač , Petr (2018). Digital Divide Research Beyond the Digital Divide: Contextualizing the Information Society (pp. 45-131): Emerald Publishing Limited, Bingley.
- Martens, Karel (2012). Justice in transport as justice in accessibility: applying Walzer's 'Spheres of Justice' to the transport sector. *Transportation*, 39 (6), 1035-1053. doi: 10.1007/s11116-012-9388-7
- Mulukutla, Pawan (2021). How can Smart Mobility change the way cities move? Available at: www.wricitiesindia.org_website:https://www.wricitiesindia.org/content/how-can-smart-mobility-change-way-cities-move
- NITI Aayog, Rocky Mountain Institute, and Observer Research Foundation (2018). Moving Forward Together: Enabling Shared Mobility in India.
- Peters, Deike (2013). Gender and Sustainable Urban Mobility Global Report on Human Settlements 2013: UN Habitat.
- PIB (2020). Motor Vehicle Aggregator Guidelines issued to regulate shared mobility and reducing traffic congestion and pollution, Press Information Bureau
- Priya Uteng, T. (2011a). Gender and mobility in developing world World Development Report 2012 - Gender equality and development: The World Bank.
- Priya Uteng, T. (2011b). Gendered Bargains of Daily Mobility- Citing cases from both Urban and Rural settings: The World Bank.
- Priya Uteng, T., Singh, Y. J., & Helen Hagen, O. (2019). Social sustainability and transport: making 'smart mobility' socially sustainable. In M. R. Shirazi & R. Keivani (Eds.), *Urban Social Sustainability: Theory, Practice and Policy* (pp. 59-77). London: Routledge.
- PTI. (2022). India to have 1 bn smartphone users by 2026: Deloitte Study. Retrieved from Business Today website: <https://www.businesstoday.in/technology/story/india-to-have-1-bn-smartphone-users-by-2026-deloitte-study-323519-2022-02-22>
- Queiros, da Costa, Morgado, Vale, Guerreiro, Rodrigues and Anibal Almeida (2016). Gender equality and the City: a methodological approach to mobility in space-time. 9 (2), 143–157. Available at: <https://doi.org/10.6092/2281-4574/5061>
- Rayle, Dai, Chan, Cervero, and Susan Shaheen (2016). Just a better taxi? A survey-based comparison of taxis, transit, and ridesourcing services in San Francisco. *Transport Policy*, 45, 168-178. Available at: <https://doi.org/10.1016/j.tranpol.2015.10.004>
- Roland Berger (2014). Shared mobility: How new businesses are rewriting the rules of the private transportation game. 1st ed. [ebook] Roland Berger Strategy Consultants GMBH, p.10. Available at: https://www.rolandberger.de/media/pdf/Roland_Berger_TAB_Shared_Mobility_20140716.pdf
- Shaheen, Martin, Chan, Cohen and Joseph Pogodzinski (2014). Public bikesharing in north america during a period of rapid expansion: Understanding Business Models, Industry Trends and User Impacts (Vol. MTI Report 12-29, pp. 234). California: Mineta Transportation Institute.
- Sharma, N. R. G. (2015). Ole,Ole,... "Ola... ". *Cases in Management*,(4), 219-246.
- Sharma, Sumer (2016). How India is inching closer to becoming digitally literate. Accessed at: <https://yourstory.com/2016/06/national-digital-literacy-mission/>
- Shukla, Chandra and Himanshi Jain (2017). Ola vs Uber: The battle of dominance. *IOSR Journal of Business and Management, Building Research & Analytics in Sciences, Technology, Operations Research & Management*, 73-78.
- Singh, Yamini (2019). Is smart mobility also gender-smart? *Journal of Gender Studies*, 1-15. doi: 10.1080/09589236.2019.1650728
- Singh, Yamini (2021). *A Comprehensive Guide on Transit- Oriented Development for Developing Countries*. India: Copal Publishing Group.
- Trafikanalys (2016). Gender equality analysis of trends in the transport sector. Trafikanalys, Stockholm.
- UNDP (2013). *The Rise of the South: Human Progress in a Diverse World*. United Nations Development Programme, New York,
- UNDP (2022). *Uncertain times, unsettled lives: Shaping our future in a transforming world*. United Nations Development Programme, New York.
- UN Global Compact (n.d). Do business in ways that benefit society and protect people. Available at <https://www.unglobalcompact.org/what-is-gc/our-work/social>

Smart and shared mobility in India - A survey

For the purposes of this study, smart and shared mobility has been defined as any smartphone app-based mobility service that allows you to book a ride or mode of transport. You may take a single ride, or carpool or share cars, bikes and such. These services are also called ride-hailing, ride sharing, car sharing, bike sharing services.

MaaS (Mobility as a service) is another component of smart mobility where a single app tells you all the options of going from A to B, shows all modes, allows you to book your rides on modes (such as bus, train, ride sharing, ride hailing, car sharing services etc.) and even allows you to pay for these transactions.

With this survey we wish to understand your views and opinions on smart mobility. You can be a mobility professional, urban planner, an academician, a user, a critic or a combination of these. Your views matter and we are very keen to learn about them through this survey.

1. Your Name

.....

2. Place

.....

3. Profession

.....

4. Which of the following type of smart or shared mobility have you used?

Tick all that apply.

Tick, if yes	Ride hailing (like taxi)	Ride sharing (car pooling)	Car sharing	Bike sharing
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

5. How often do you use smart mobility? Tick all that apply.

	Everyday	Regularly	Often	Seldom	Never
Tick, if yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

6. Smart mobility has many benefits and costs (to users, non-users, workers, economy, environment, urban mobility and more). What are the benefits according to you ?

.....

.....

.....

.....

7. And what are the costs of smart mobility ?

.....

.....

.....

.....

8. Do you think smart mobility services are growing in India? Tick only one box

<input type="checkbox"/> Yes, with a high annual growth rate	<input type="checkbox"/> Yes, with a moderate annual growth rate	<input type="checkbox"/> No, it has reached a saturation point
--	--	--

9. Which of the following characteristics do you associate with smart shared mobility in India? Tick all that apply.

	User-friendly	Affordable	Accessible	Available	Safe
Tick, if agree	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

10. Do you think commuters are moving away from public transport towards smart mobility ? If yes, why ? if no, why not ?

.....

.....

.....

11. Do you think commuters are moving away from private cars/scooters towards smart mobility ? If yes, why ? if no, why not ?

.....

.....

.....

12. Do you think smart mobility is inducing new travel demand ? If so, how ?

.....

.....

.....

.....

13. Is smart mobility attractive for different social groups and economic groups ? Give your reasons.

.....

.....

.....

.....

14. Most smart mobility services are run by private companies. Are you aware of any services run by the public sector ? Tick only one box.

☐

Yes

☐

No

15. Do you think public sector should venture into providing these services ? If yes, why ? if no, why not ?

.....

.....

.....

16. Going forward, How would you like to improve the smart mobility services ? Tick only one box.

☐

More affordable

☐

More accessible

☐

Creation of a proper legal framework for these services

☐

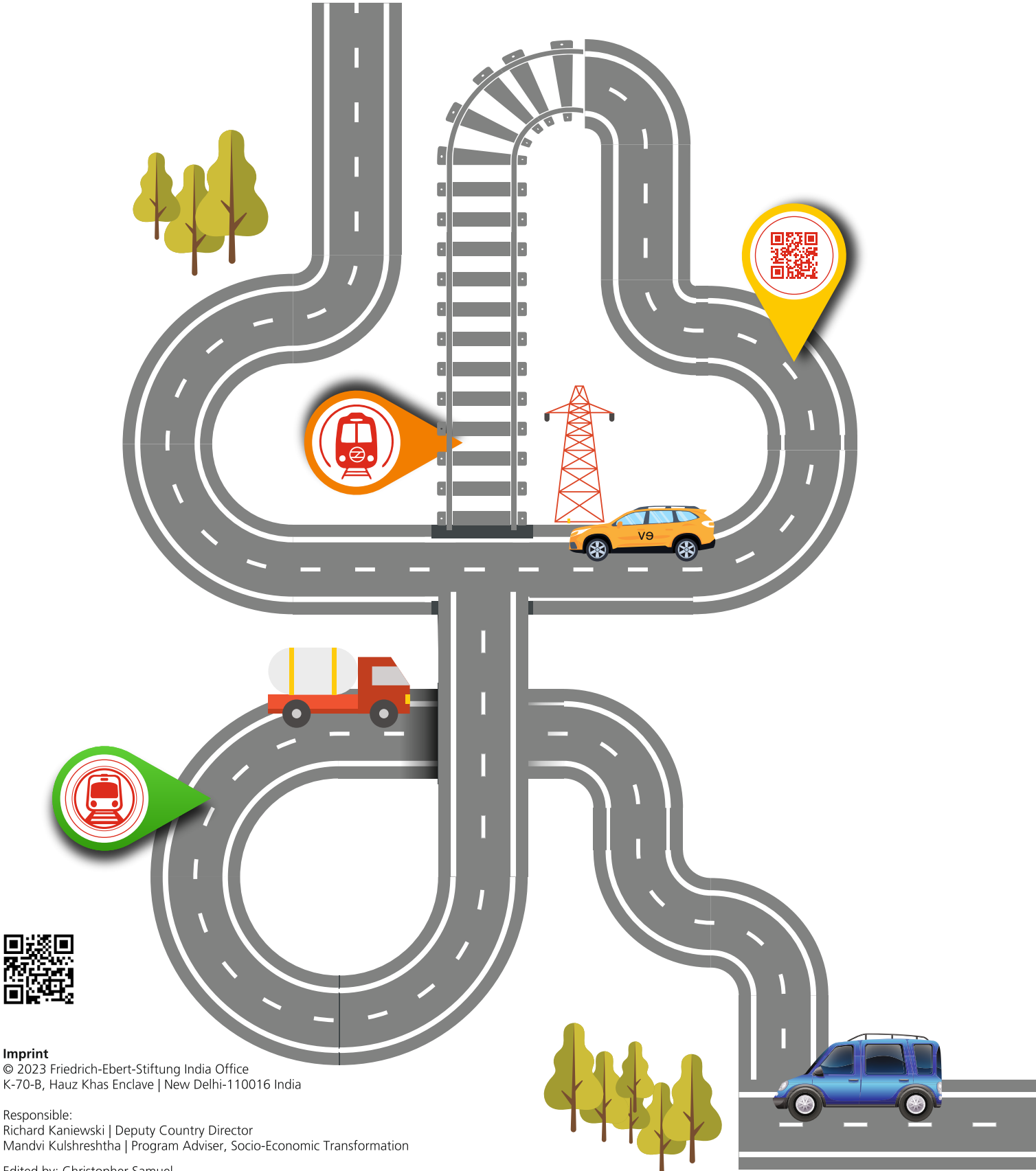
Better consumer redressal system

☐

More attractive to all economic and social groups

☐

safer



Imprint

© 2023 Friedrich-Ebert-Stiftung India Office
K-70-B, Hauz Khas Enclave | New Delhi-110016 India

Responsible:

Richard Kaniewski | Deputy Country Director
Mandvi Kulshreshtha | Program Adviser, Socio-Economic Transformation

Edited by: Christopher Samuel

T: +91 11 41413300

facebook.com/FriedrichEbertStiftungIndia
twitter.com/FESinAsia
youtube.com/FESglobal

To order publication: info@fes-india.org

Disclaimer:

The views expressed in this publication are not necessarily those of the Friedrich-Ebert-Stiftung.

Commercial use of media published by the Friedrich-Ebert-Stiftung (FES) is not permitted without the written consent of the FES. Publications by the Friedrich-Ebert-Stiftung may not be used for electioneering purposes.

Friedrich-Ebert-Stiftung (FES) is the oldest foundation in Germany. The foundation was named after Friedrich Ebert, the first democratically elected president of Germany. FES is committed to the advancement of both socio-political and economic in the spirit of social democracy, through civic education, research, and international cooperation.

About the author

Dr Yamini Jain is an urban and transport planner with more than two decades of international experience in research, consulting, and academia. After consulting with Government of India agencies and the private sector in India for almost seven years, she moved to the Netherlands for her PhD.

She has, since, worked on various urban and mobility projects, has authored a book, contributed to a number of international publications, given two TEDx talks in the Netherlands, and has been featured in magazines, podcasts and radio interviews. She currently teaches geography to senior high school students in the Netherlands. More details about her may be found on her website www.yaminijsingh.com.