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RESOURCES INSTITUTE

Creating Innovative Solutions for a Sustainable Future

IMPACT OF COVID-19 ON URBAN MOBILITY IN INDIA: EVIDENCE FROM A PERCEPTION STUDY



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Executive **Summary**

The urban transportation landscape is likely to undergo significant changes due to the ongoing COVID-19 crisis. Increased risks associated with crowded places combined with social distancing measures in public and shared transport are likely to affect modal choices of commuters.

Urban freight needs may also alter with the change in the use of e-services.

To assess the likely nature of such a shift, an online survey was conducted, which was designed to elicit the perceptions of respondents related to work trips, online grocery shopping, and food delivery pre and post COVID-19.

About 35 per cent of respondents stated that they are likely to change their mode of transport for work trips post COVID-19. A sharp decrease has been reported in the usage of bus and metro services, and instances of shared mobility have dropped as well. This is expected to shift to the use of private vehicles and intermediate public transport (IPT) such as taxis and auto-rickshaws. Share of non-motorized modes may also increase, especially for short-distance trips. Overall, the perception study indicates an increase in private vehicles in cities post the COVID-19 crisis. The problems of congestion and pollution that plague most Indian cities could worsen in the near future.

The results for e-commerce services suggest changes in the demand for urban freight. There is an increase in online grocery shopping but food delivery services may witness lesser demand in the near future. However, increased online transaction may reduce demand for passenger transport. The overall environmental impact will depend on the interplay between these factors and the technologies used in vehicles in the future.

Given the expected shifts post COVID-19, proactive measures are necessary to reverse the amplification of negative externalities.

Ensuring the safety and availability of public transport will be essential for facilitating economic activity and minimizing negative environmental impacts.

Promotion of non-motorised transport is essential to prevent an increase in the use of private vehicles. Improved cycling and walking infrastructure combined with increased public awareness are required to achieve sustainable urban mobility.

Investments in public transport and non-motorised transport will have to be prioritized over infrastructure for private vehicles.

Focus on demand moderation efforts like work from home and staggered working hours should be adopted.

Introduction

India's road transport system has long been struggling with inefficiencies, such as high congestion levels, limited multi-modal integration, inadequate public transit systems, degraded footpaths, and non-existing cycle tracks. This has led to increased vehicular emissions and noise pollution from this sector. Recent years have seen the government implement several measures to make the road transport sector more sustainable. The COVID-19 crisis will create many new challenges for this sector, especially in urban areas with high travel demand.

The COVID-19 pandemic has put the lives of many on hold and prompted people to rethink their choices and behaviour. There may also be a greater sense of responsibility towards the environment. Amongst all the day-to-day activities and businesses that the pandemic has impacted, the transport sector in general and the travel behaviour of people, in particular, are likely to change as the country moves towards a new normal.

As cities begin easing out lockdown restrictions, public transport services will need to ply with limited capacity to comply with social distancing norms. Even cabs and other shared services will be affected due to similar rules. People may try to shift from public and shared transport services due to higher perceived risks, leading to increased use of private modes of travel. As Indian cities are struggling to reduce the dependence on private motor vehicles this crisis may further give way to adverse outcomes created by high motorization rates. There is a need to understand the possible nature of the shift in mobility patterns and devise appropriate strategies to promote sustainable modes of travel in the coming days.

The pandemic has led to a marked transition in people's perceptions and behaviour, which shall likely affect urban freight transport demand as well. Higher risk perception associated with visiting crowded places such as grocery stores,





markets, etc., may lead to changes in demand for contactless services provided by e-commerce platforms. As the delivery needs of these services are primarily met by the light commercial vehicles (LCVs) and two-wheelers, increase in urban freight demand could lead to adverse outcomes for congestion, road safety and pollution.

These changes in both passenger and freight mobility segments may impact energy demand and pollution levels. The effect on greenhouse gas (GHG) emissions will also depend on the technology used in these vehicles. Hence, the framing of policies for the adoption of cleaner technologies will also be crucial to enhance the sustainability of the sector in the long term.

The eventual impact of the pandemic will depend upon how well medium- and long-term policies can deal with shifts away from sustainable transport modes. Presently, there is tremendous uncertainty regarding how individuals will behave in the aftermath of the COVID-19, making it difficult to develop appropriate plans. This study attempts to assess the likely nature of the shift in the urban transportation landscape based on the perceptions of individuals assessed through an online survey. Subsequently, measures to mitigate the negative implications of the COVID-19 on sustainable mobility are also put forward. This will be useful for government stakeholders as well as private players in planning their future strategies.

Methodology

This study aims to understand the change in the urban transportation landscape due to disruptions in passenger and freight demand in the wake of COVID-19 outbreak. Due to the lack of available secondary data and uncertainty during this time, a survey was developed to understand people's perceptions related to travel behaviour. The target population for the survey was India's urban population with access to Internet and e-commerce services. Given the lockdown, the use of an online medium for conducting the survey was found to be the most appropriate to capture this population. Further, demographic data of respondents were collected in order to better assess their range of choices in transport modes. Social media platforms and electronic mails were used to conduct an online stated preference survey. Sampling bias may arise from the 'convenience' sampling used to identify

online respondents. However, considering the current scenario of national health emergency and the urgent need to address uncertainty on the medium- and long-term effects of the same on consumer behaviour, the sampling technique was found to be appropriate

Other than demographic details including the city of residence, income, and education, the survey posed questions regarding their behaviour related to work travel, online grocery shopping, and food deliveries, followed by specific questions on whether they would change their choices after the lockdown is lifted.

India imposed a nationwide lockdown on 23 March 2020 and the responses were collected between 7 to 26 April 2020.

Survey Results

The results of the survey are presented separately for different travel demand categories: work trips, grocery shopping, and food orders. Responses regarding work trips were assessed overall and separately for Delhi, Bengaluru, and Kolkata since a sizeable sample was available for these cities.

Sample Characteristics

A total of 438 responses from 51 cities were received from the online survey. Figure 1 reports some of the important demographic characteristics of the sample:

- 1** **Gender:** Both genders were evenly represented with men having a slightly higher share (55 per cent).
- 2** **Household income:** The sample captured mostly those individuals with high household incomes, where 76 per cent of the sample reported a household income of above 5 lakh and only 4 per cent reported their income to be below 2.5 lakh. The skewness towards respondents with high household is possibly due to the survey being conducted online. Lower-income groups are often captive users of NMT and public transport. Capturing higher-income groups could be more appropriate for capturing COVID-19 induced modal shifts since people from these groups have the option to choose from different transport modes.
- 3** **Occupation:** The occupation of a person also influences their choice of transport modes. A large part of the sample consisted of people employed in the service sector (61 per cent). The other groups that were adequately represented were students (16 per cent), self-employed people (8 per cent), and government employees (6 per cent).
- 4** **Vehicle ownership:** Car ownership was highest in the sample with 67 per cent of respondents owning at least one car – this is in line with the high-income nature of the studied sample. Two-wheeler ownership was also high, with 51 per cent owning at least one two-wheeler vehicle. Bicycles were owned by 33 per cent of the sample respondents.

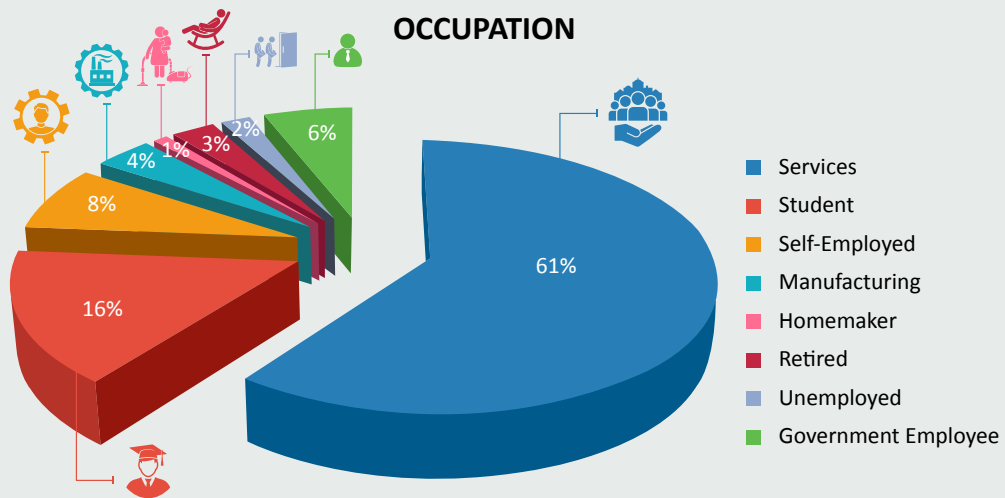
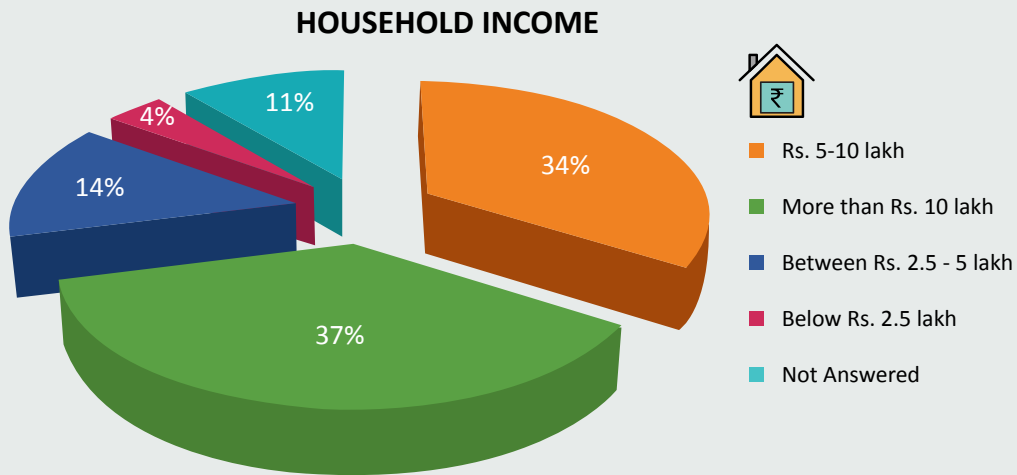
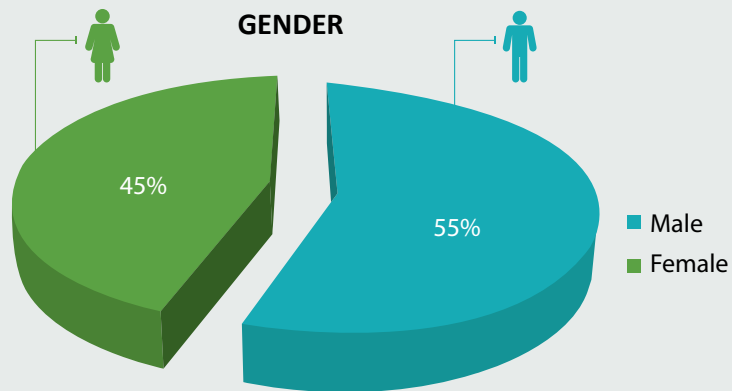


Figure 1 Demographic characteristics of the sample

Passenger Travel Demand

Share of Transport Modes Before COVID-19

As per the survey, the share of different primary modes of travel before COVID-19 is captured in Figure 2. The stated mode choice survey found high usage of private cars with 23 per cent of respondents using their own cars for work trips. Public transport was well represented, as metro and bus services were availed by 25 per cent and 9 per cent of the respondents, respectively. The intermediate public transport (IPT) modes, such as private taxis and autorickshaws constituted about 15 per cent of the sample. The high usage of public transport in the sample despite the availability of private cars and high-income levels in the sample suggests the prevalence of choice users. Several respondents walked to work as well. Only 2 per cent of

POST COVID-19

35%

of respondents likely to change their mode of transport for work trips.

respondents reported that they cycled to work despite more respondents owning at least one bicycle. Distance between home and workplace might hinder cycling to work but this could also be attributed to the lack of cycling infrastructure in Indian cities. Two-wheelers were also represented in the sample with 9 per cent of respondents choosing this mode.

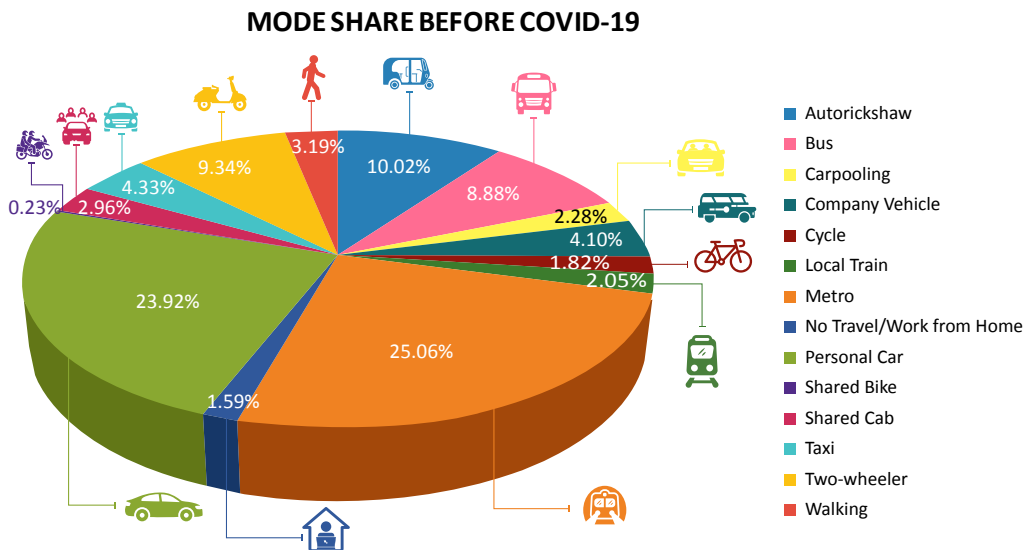


Figure 2 Share of different transport modes used by respondents pre COVID-19 (work trips)

Modal Shift Post COVID-19

Respondents were asked if the COVID-19 crisis would influence their choice of transport modes. Most respondents (65 per cent) said, there would be no change in their choice. This was expected, as a large proportion of respondents used private cars and non-motorized transport (NMT) for their commute, anyway. Only 9 per cent responded that their choice would be altered by the crisis. The rest of the sample (26 per cent) responded with maybe – this could be a result of prevailing uncertainty at the time of filling the questionnaire. Overall, the results suggest that the transportation demand could be significantly altered with almost 35 per cent of the sample potentially switching to different modes.

To understand the nature of the shift, respondents were asked about their choice of transport post the COVID-19 crisis. Out of the respondents who said, maybe, 66 per cent provided a mode choice for the post-COVID-19 scenario, which was different from

their initial choice of transport mode. These responses were included while estimating the modal shift.

A sizeable decrease was observed in the usage of public transport services. Figure 3 shows the stated post-COVID-19 modal choice of initial metro users. About 36 per cent of metro users said, they would switch to other options. Most respondents, who wished to switch, preferred to use private cars and two-wheelers. Substitution of metro services with intermediate public transport, such as autorickshaws and taxis was also evident. Some also stated that they would prefer shared cabs overtaking the metro.

Figure 4 shows that 41 per cent of initial bus users stated that they would shift to other modes. Similar to metro services, the most common change was a shift towards private vehicles and intermediate public transport. Additionally, some bus users stated, they would shift to non-motorized modes such as cycling and walking. The decrease was also witnessed in the use of local trains, mostly by residents in Mumbai.



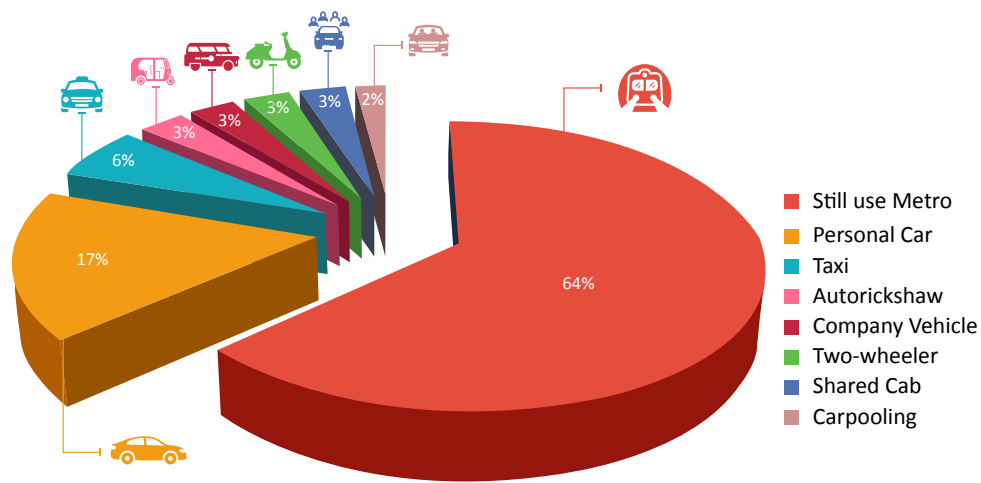


Figure 3 Stated post-COVID-19 modal choice of initial metro users (work trips)

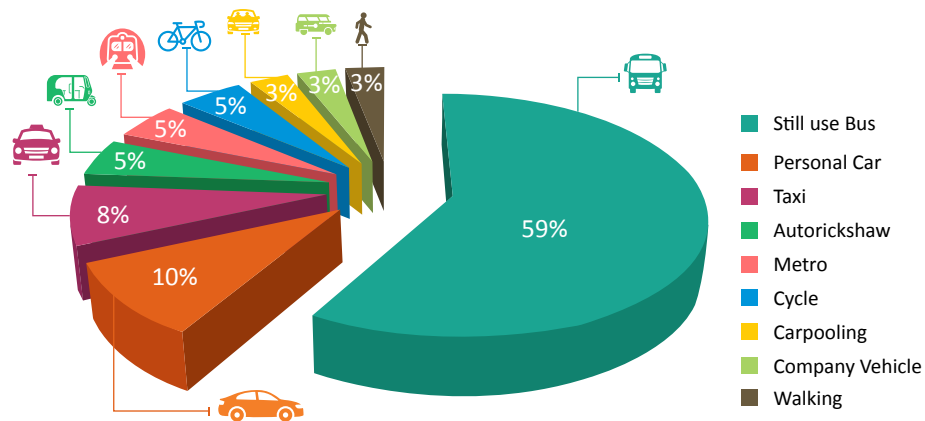


Figure 4 Stated post-COVID-19 modal choice of initial bus users (work trips)

Figure 5 shows the overall stated modal share for the sample pre and post COVID-19. The largest decrease was seen in the modal share of metro services (9 per cent) followed by buses (4 per cent), and local trains (1 per cent). The decrease in these modes is compensated by a significant increase in the private modes of travel. The share of private cars and two-wheelers increased by about 10 per cent.

The share of private taxis also increased by about 2 per cent. The share of shared taxis decreased by a margin while the share of carpooling increased. The use of non-motorized transport showed an increase with the modal share of cycling and walking (combined) increasing by around 3 per cent. Some respondents also stated that they would not travel to work post COVID-19 and prefer working from home, instead.

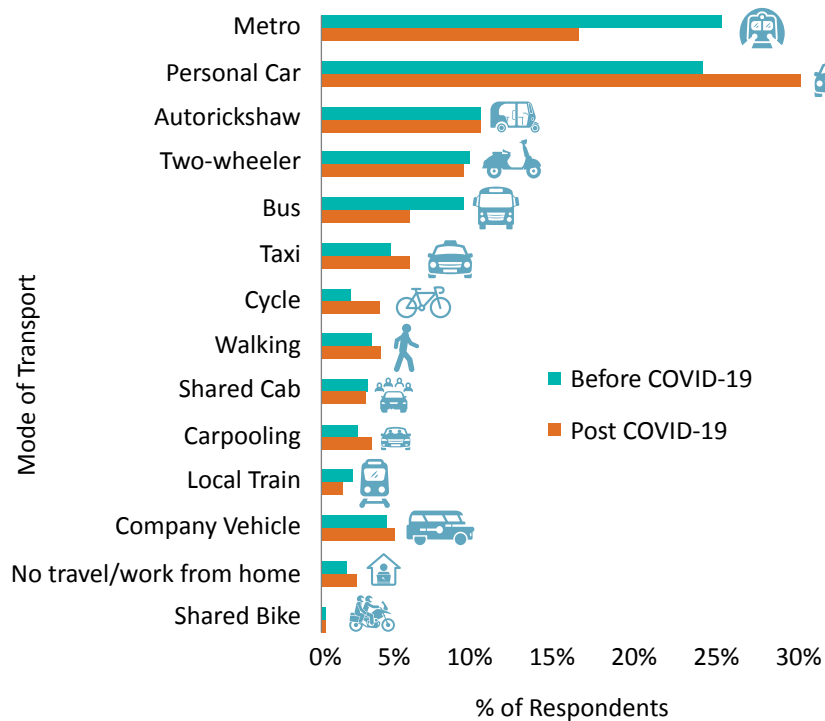


Figure 5 Modal share in pre- and post-COVID-19 scenario for the sample

Sample Characteristics and Modal Shift

The modal choice affected the characteristics of the respondents too. The post-COVID-19 modal choice of public transport users was analysed separately in terms of distance (from home to work), household income, and age.

Distance travelled: All initial public transport users, who planned to switch to NMT, travelled less than 10 km to reach their workplace, with the majority travelling less than 5 km (Figure 6). A significant number of respondents shifting to personal vehicles and IPT also travelled less than 10 km. There is a possibility that these users could be nudged to shift to NMT if the right infrastructure was available. Most respondents, who

wished to continue using public transport travelled more than 20 km. Shared cabs were also mostly opted for by those people who travelled more than 20 km, thereby suggesting that distance does influence a commuter's choice between private taxis and shared modes. A considerable share of respondents who stated that they will continue to use public transport belonged to high-income groups (Figure 7).

Household income: People shifting to private vehicles included both high- and lower-income respondents; lower-income respondents mostly opted for two-wheelers. One surprising finding was that people shifting to NMT also belonged to higher-income groups. This suggests that there is a willingness in people to shift to NMT irrespective of their income.



Age: The link between age and the post-COVID-19 modal choice is shown in Figure 8. Limited inferences can be drawn from this figure as the sample consisted of mostly 18–30-year-olds. The older respondents made up a large part of that population planning to shift to private vehicles and

IPT. Some of the respondents planning to shift to NMT were also older respondents, suggesting that this could be a viable mode irrespective of the age difference. This may also signal a higher awareness of the benefits of using NMT among older respondents.

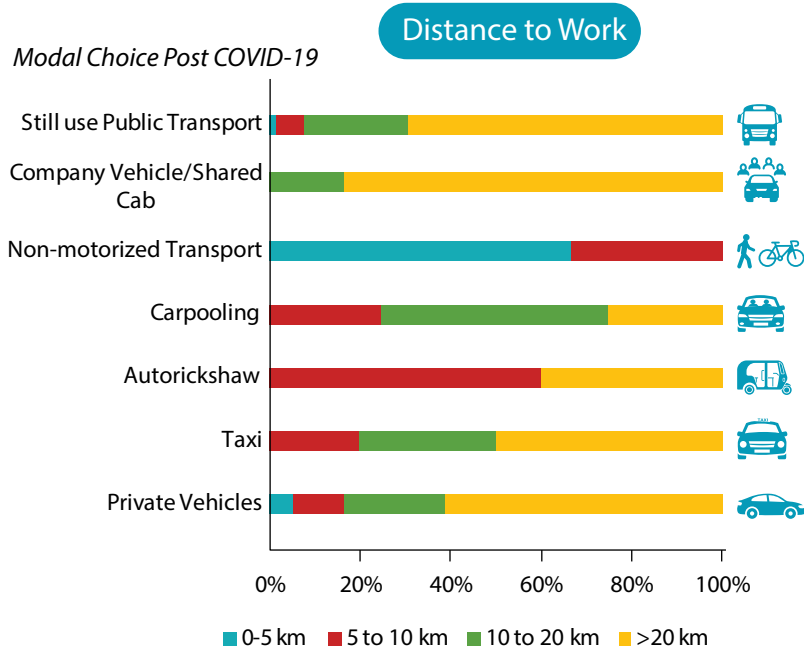


Figure 6 Distance to work and post-COVID-19 modal choice of initial public transport users

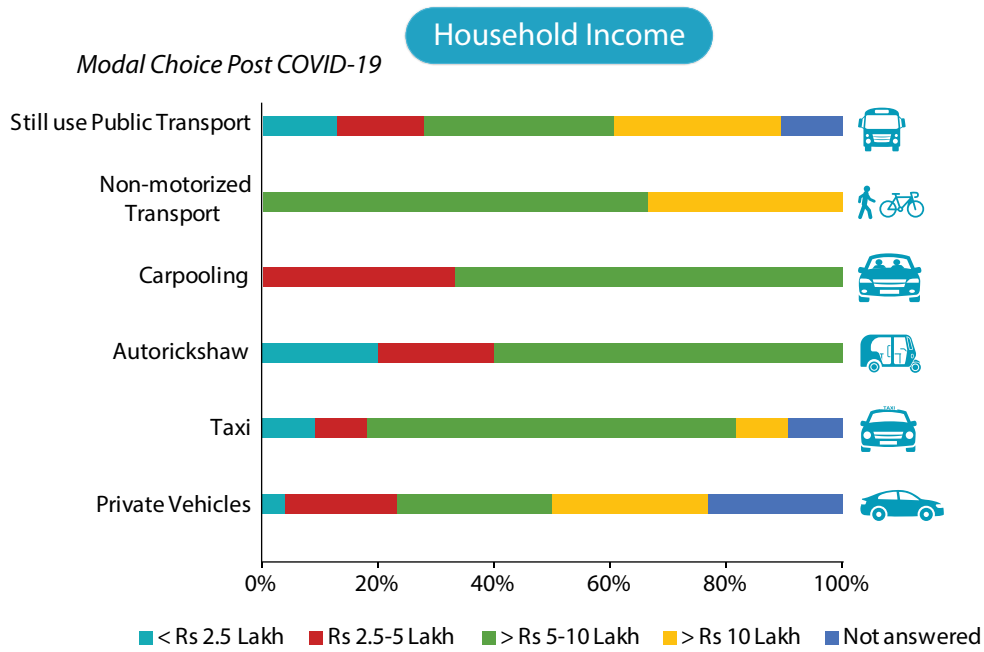


Figure 7 Household income and post-COVID-19 modal choice of initial public transport users

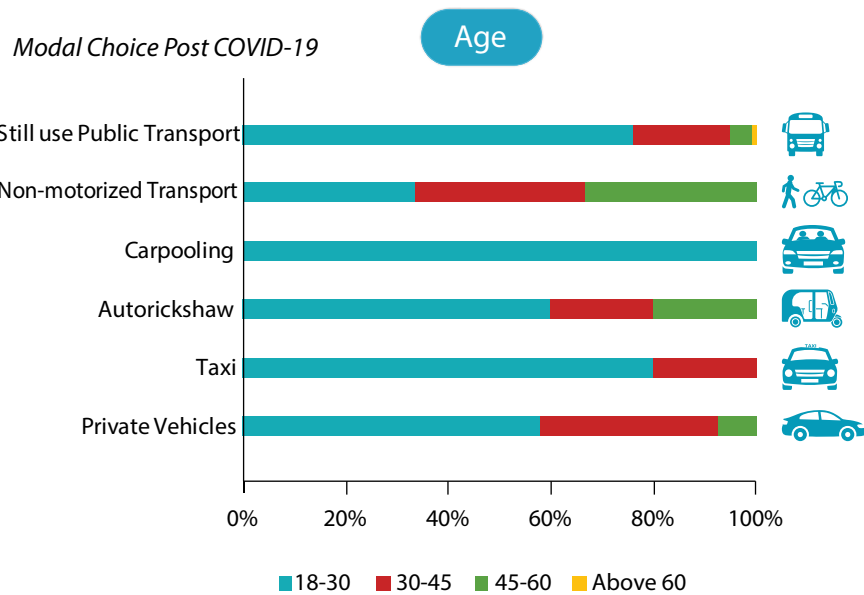


Figure 8 Age and mode choice of initial public transport users in the post-COVID-19 scenario

City-Level Findings

The survey was taken by respondents across 51 cities in India. The city-wise respondents were primarily categorized as per the United Nations Department of Economic and Social Affairs (UNDESA) classification, as shown in Table 1.

Table 1 Population classification¹

Category	Population Classification	Total Respondents (in %)
Tier 1	More than 10 million (1 crore)	72
Tier 2	Between 5 million and 10 million (50 lakh–1 crore)	17
Tier 3	Between 1 million and 5 million (10 lakh–50 lakh)	6
Tier 4	Less than 1 million (10 lakh)	5

Note: Noida, Gurugram, Ghaziabad, and Faridabad are considered part of tier 1 cities

The trip pattern varies for every city and the available options are different across cities. Therefore, the results for the three major cities were analysed separately. In India, there are four cities in the tier 1 category – Delhi, Mumbai, Kolkata, and Chennai. These cities have high car ownership rates despite having adequate public transport in the form of suburban rail/ local trains, metro trams, and city buses. Delhi has the highest ownership rate of 157 cars per 1000 population, followed by Chennai with 127 cars per 1000 population (TERI, 2017).

The tier 2 cities such as Bengaluru, Pune, Surat, and Hyderabad have bus

infrastructure along with limited metro services. Bengaluru has around 76 buses per lakh population. The cities in tier 2 and tier 3 categories also have a high share of two-wheeler population.

Mostly, cities in tier 3 and tier 4 have limited public transport and are highly dependent on a private mode or the intermediate public transport, which act as main haul public transport.

The stated modal choices from the survey followed a similar pattern and a comparative tier-wise analysis is given in Figure 9.

¹ https://www.un.org/en/events/citiesday/assets/pdf/the_worlds_cities_in_2018_data_booklet.pdf

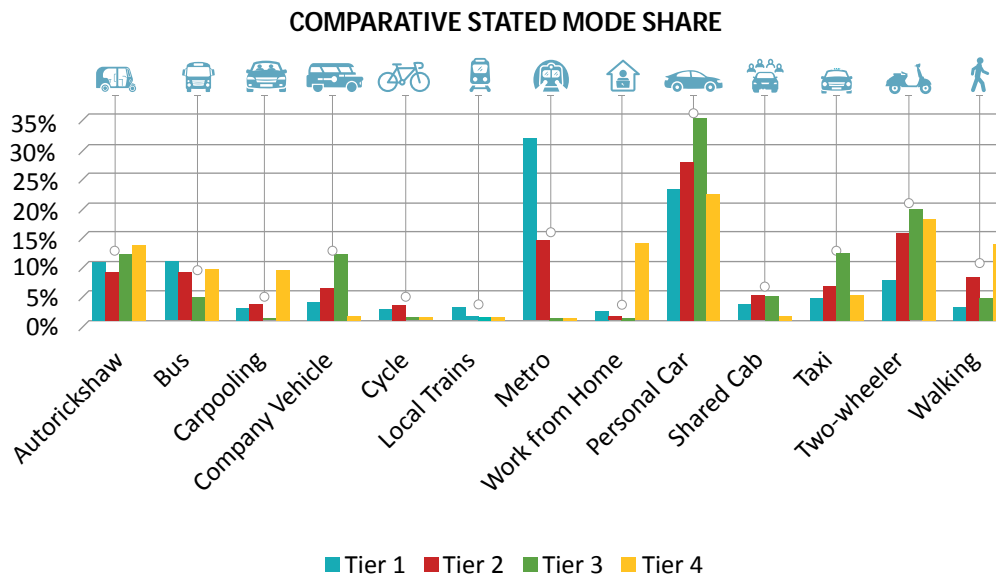


Figure 9 Tier-wise comparative stated modal share

Delhi-NCR

The capital of the country is among the most polluted cities in the world. The congestion level is also very high within the city. During the lockdown period, Delhi residents revelled in a blue sky. Post lockdown, however, the survey shows a shift towards personal vehicle usage. As per the survey, there will be a decrease of 13 per cent and

4 per cent in the stated share of metro and bus users, respectively, with almost all the users shifting to personal vehicles. Minor increase of 1 per cent and 2 per cent is also observed in the share of intermediate public transport services of autorickshaw and taxis, respectively (refer to Figure 10). This will not only increase the congestion but also further degrade the air quality of Delhi.



POST COVID-19

13%

decrease in the share of metro services in Delhi-NCR.

Need to promote alternate low emission modes of travel.

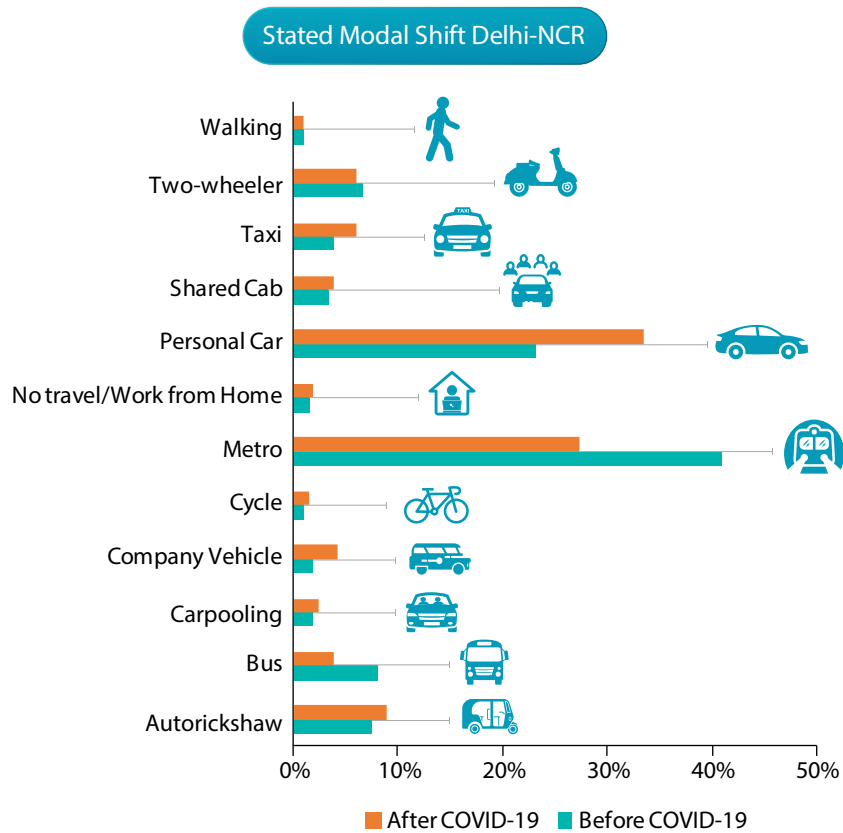


Figure 10 Stated modal shift for Delhi NCR

POST COVID-19

16%

decrease in the share of metro services for female commuters in Delhi-NCR.

Need to ensure adequate mobility options for women.

Before the onset of COVID-19 pandemic, 50 per cent of the total female respondents were metro users. This share is stated to decline to 34 per cent post-COVID-19. Moreover, it is observed that there will be a 9 per cent increase in the share of

women using personal cars. The share in the usage of autorickshaws and taxis is also observed to increase by 3 per cent and 4 per cent respectively, by women commuters (refer to Figure 11).

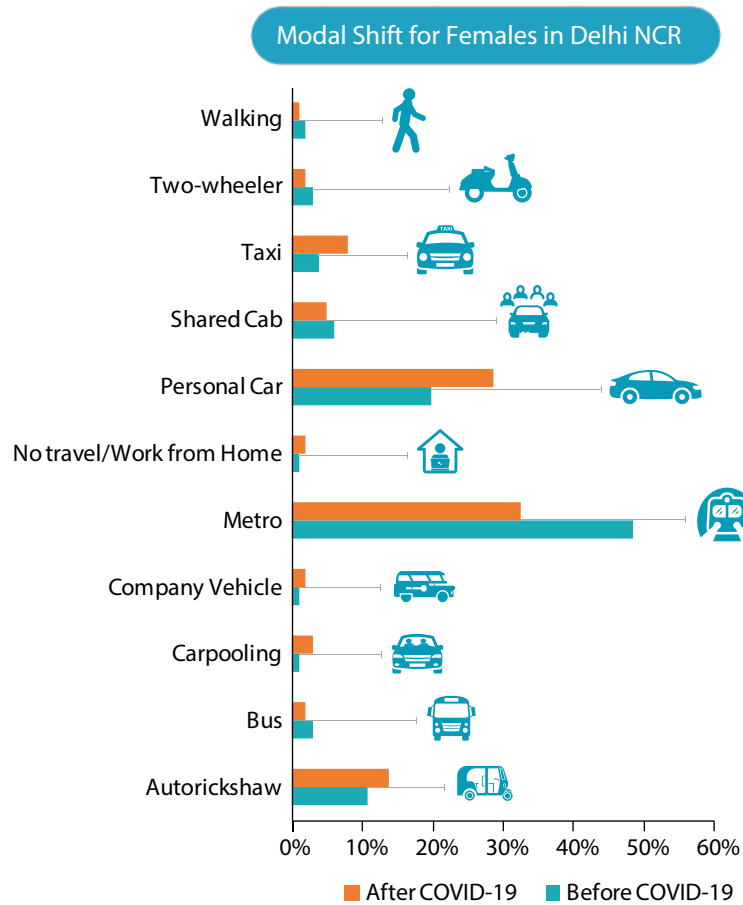


Figure 11 Stated modal shift in Delhi-NCR for female respondents

Bengaluru

Bengaluru is one of the most rapidly growing cities in India with an urban agglomeration population of 95.88 lakh as per Census 2011. The rapid development in the city has been coupled with high levels of congestion and greenhouse gas emissions. The social cost of congestion alone has been estimated at Rs 38,000 crore (USD 5.92 billion) annually (Times of India, 2020). The transportation sector is a major source of air pollution in Bengaluru. Though the lockdown has been a relief for the congested roads in the city, it is perceived that post lockdown there will be an increase in car usage. The stated sampled survey for Bengaluru observes a decline of 5 per

cent in the mode share for both metro and buses in the post-COVID-19 scenario. As per the survey, 50 per cent of public transport users will switch to cars and two-wheelers, 25 per cent will work from home, and the remaining 25 per cent may opt for carpool. There will also be a 3 per cent and 5 per cent increment in the share of taxi and autorickshaw, respectively (refer to Figure 12).

Most female respondents stated that they would prefer to use public transport and intermediate public transport modes rather than the private mode of transportation. Post COVID-19, the female respondent will switch from public transport to autorickshaws and taxis as a 14 per cent

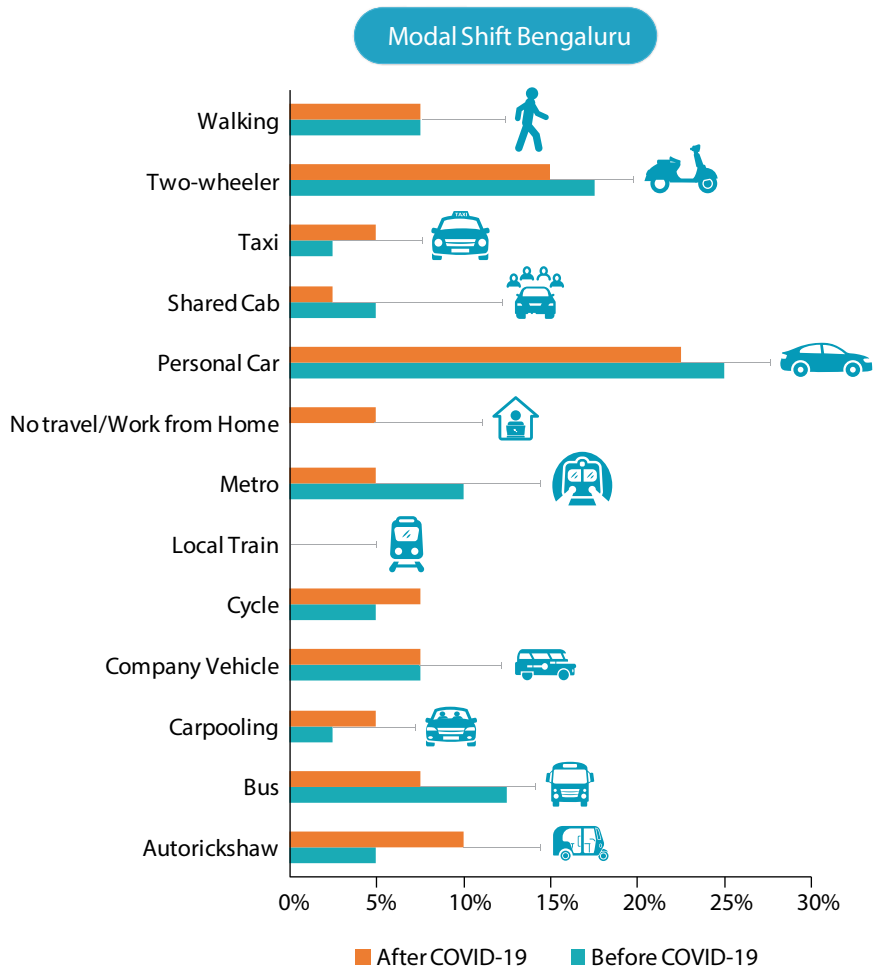


Figure 12 State modal shift for Bengaluru

POST COVID-19

12%

increase in the share of autorickshaws and taxi for women in Bengaluru.

Resilient intermediate public transport required.

decline is observed in the public transport mode share and 12 per cent increase in the share of intermediate public transport. There

was no change in the share of walking but cycling increased by 3 per cent.

Kolkata

Kolkata is one of the most densely populated cities in India. Historically, the city is known for a variety of public transport options such as trams, metro, buses, and even ferries. This high rate of motorization has led to various transportation problems such as congestion and vehicular emissions.

As per the survey, post COVID-19, there will be a 12 per cent decline in the total share of public transport in Kolkata with both bus and metro showing a decrease of 6 per cent. A 10 per cent increase was observed in the share of personal car usage.

POST COVID-19

10%

increase in the share of personal car in Kolkata.

Reduced travel demand could provide significant environmental benefits.

The stated survey observed a decline of 1 per cent in the share of taxi and subsequently a minor increase of 1 per cent in the share of autorickshaws. A minor increase of 1 per

cent is observed in the share of cycle and walking (refer to Figure 13). Among the female respondents, a 9 per cent increase is observed in women car users.

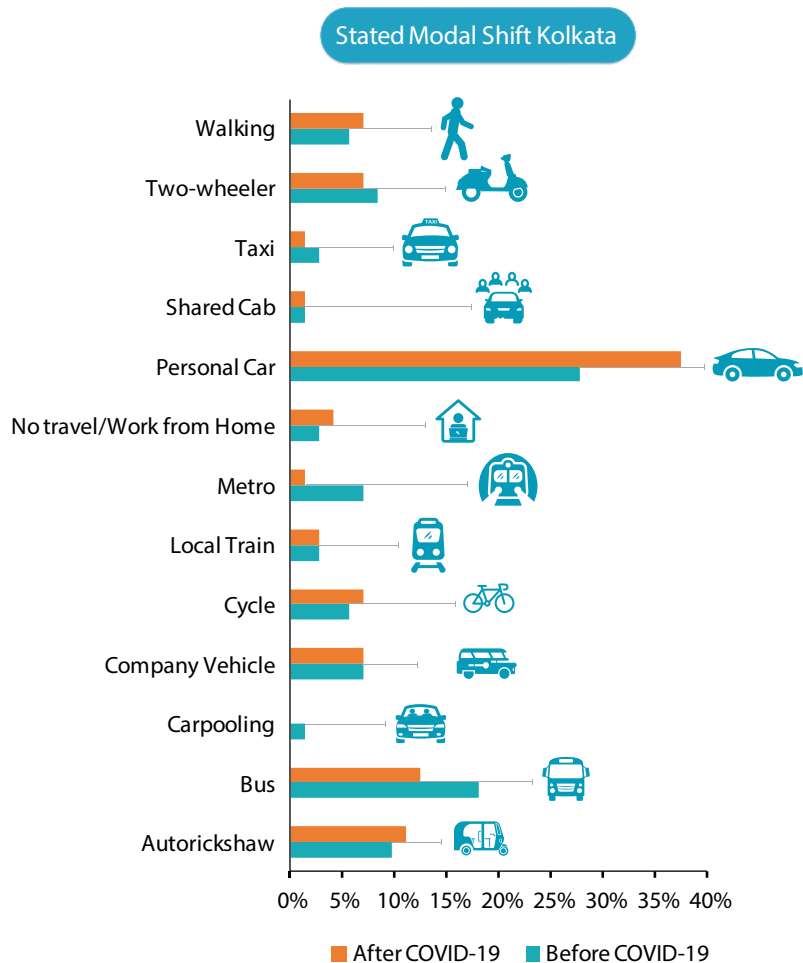


Figure 13 Stated modal shift for Kolkata

Urban Freight **Demand – Findings**

The results for urban freight are analysed separately for grocery shopping and food delivery as COVID-19 is likely to have a distinct impact on these two sectors.

Online Grocery Shopping

Before the crisis, 45 per cent of the respondents said they availed online grocery shopping services. On average, respondents availed these services three times in a month. Among these respondents, 9 per cent had completely switched to online shopping during the lockdown period, whereas 31 per cent went to local shops to buy their grocery. Among the respondents who never used online services, 30 per cent said they had begun using these services during the lockdown period.

Indian e-commerce market is expected to more than double from the current USD 32.7 billion to USD 71.9 billion in 2022 (ET Retail.com, 2019).

Need for sustainable urban freight vehicles.



Overall, 40 per cent of the sample felt there was a higher risk associated with physically going to grocery stores even after the lockdown period was over. Among initial users, 54 per cent reported that they would increase their use of online grocery shopping services after the crisis. Similarly among respondents that did not use online food delivery earlier, 24% said they would begin to do so (see Figure 14).

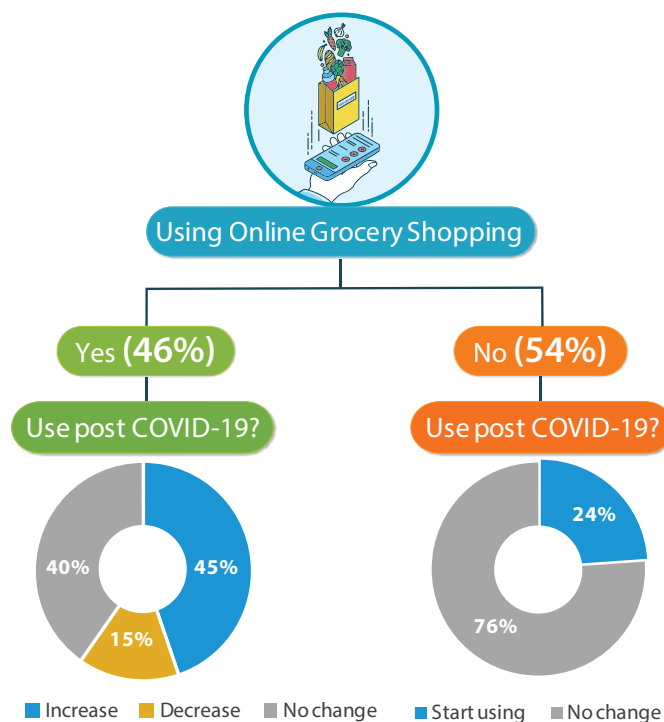


Figure 14 Change in use of online grocery shopping services in the post-COVID-19 scenario

Online Food Delivery

Most respondents (84 per cent) said they ordered food online before the COVID-19 crisis. On average, people ordered food twice in a week or eight times in a month. However, only 27 per cent continued to order food online during the lockdown. Significantly, 51 per cent of the respondents who usually ordered food online said they would reduce the frequency of using the service even after the situation normalizes. Some initial users (20 per cent) also said they would increase the frequency of online ordering; these were people who did not associate a higher risk with ordering food online. There is also a possibility that dining out trips will be substituted with home



delivery in the future. Similarly, among respondents who did not avail online food delivery earlier, 22 per cent said they would begin to do so post COVID-19.

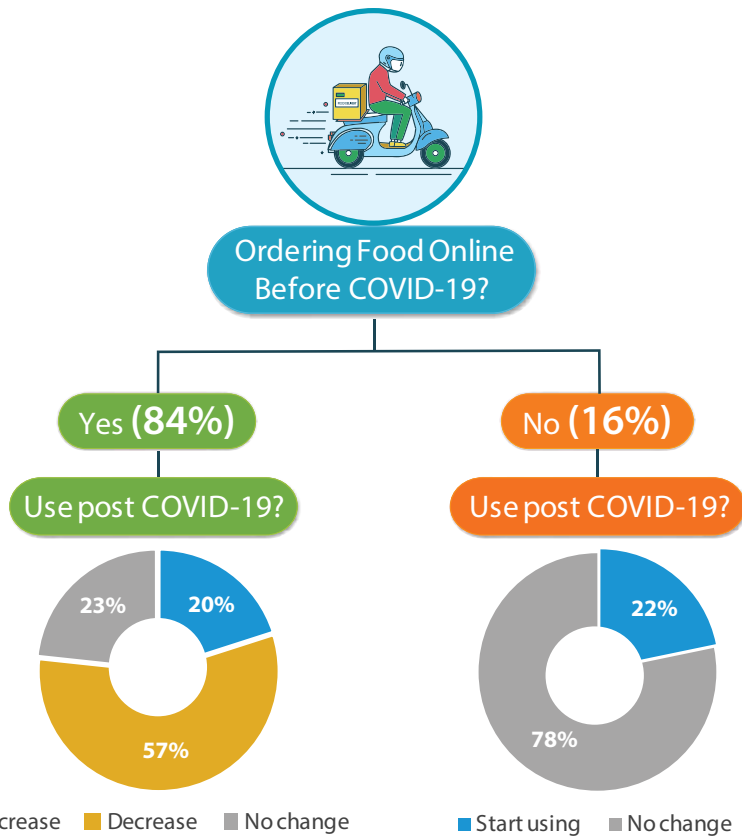


Figure 15 Change in use of online grocery shopping services in the post-COVID-19 scenario

Conclusion

The results of the survey suggest that there could be a shift away from public transport services for work trips in the near future. This is seen at a pan-India level as well as for three major cities where large samples were available. The decrease in public transport is mainly compensated by an increase in the use of private vehicles. This suggests that vehicle km travelled by private vehicles in major cities could increase significantly. Car and two-wheeler sales may also increase. An increase is also seen in the modal share for NMT, especially cycling. People from different income groups and ages showed a willingness to shift to NMT. This suggests that there is significant scope of NMT becoming the short-distance mode of transport for users instead of the more common polluting modes. The overall effect on shared mobility is unclear as the share of commercial shared taxis shows a decrease, but carpooling is seen to have a higher share post-COVID-19 in some cities. The urban transport scenario is likely to see a huge change in the near future but there is scope for policy intervention to minimize negative externalities associated with these changes.

The sample for the survey mostly captures the choices for high-income respondents with access to private vehicles and high incomes. In India, a large part of public transport users are captive users who may be unable to shift away from public transport. This could be due to the lack of available

alternatives as well as the distance travelled to get to work. The demand for public transport from these users is likely to remain the same.

Survey findings also suggest a change in the demand for e-commerce services. Responses show that the use of apps for grocery shopping has increased while that of food ordering services has declined during the lockdown. Most respondents who availed online grocery shopping, before the lockdown, said they would increase the usage. Some of the respondents who did not use these services earlier said they would start to do so.

For online food ordering, the responses suggest a decline post the crisis. The decline in usage due to higher perceived risk could somewhat be compensated by people increasing online ordering instead of dining out. Some responses recommending an increase in these services is suggestive of this.

Overall there is reason to believe that the change in demand for e-commerce services would lead to an increase in demand for urban freight, especially two-wheelers and autorickshaws. However, increased online transaction may reduce the need to travel and could reduce demand for passenger transport. The overall environmental impact will depend on the interplay between these factors and also the technologies used in vehicles.

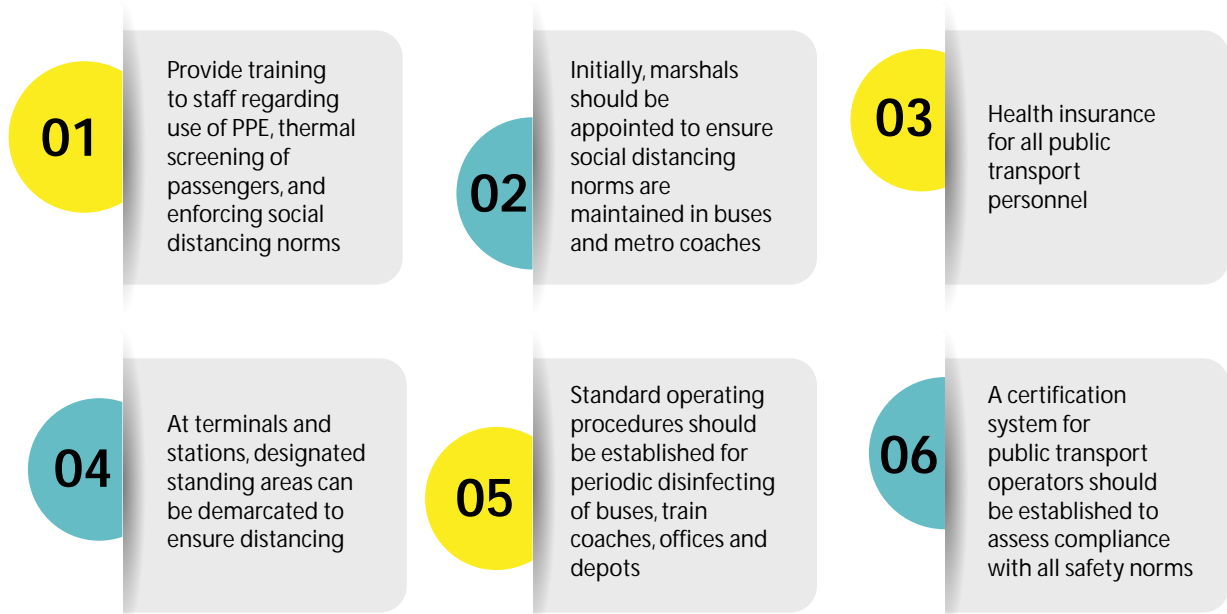
The Way **Forward**

With the expected behavioural changes, active steps will be necessary to ensure that the COVID-19 crisis does not amplify negative outcomes associated with the road transport sector. The overall aim should be to make public transport safe and accessible and to prevent a large increase in private vehicles on the road. Public transport is also essential in facilitating economic activity by ensuring mobility of workers, especially those who do not have access to alternate

modes. Promoting non-motorized transport would provide alternate travel options for many commuters. Studies have shown that the average distance travelled for work trips in India is ideal for cycling and walking. For urban freight, the negative externalities from increased vehicles on roads could be negated, to an extent, if there is a push towards cleaner technologies.

Some specific areas of focus are listed as follows.

Safety measures on public transport



Reduce travel demand and encourage corporates to promote sustainable modes of travel

1

State government should collaborate with private companies to facilitate increased adoption of work from home arrangements. Government agencies should take the lead by adopting work from home arrangements in their offices

2

The staggering employee working hours or working days should be implemented to avoid increased congestion during peak hours

3

When the occupancy of the car for work trips is low, carpooling arrangement among employees can be encouraged. It should be done while adhering to the social distancing guidelines when travelling in cars

4

The government can set up public bike-sharing arrangements and improve pedestrian infrastructure near areas with a high density of offices

5

Corporates should facilitate the use of non-motorized transport options amongst its employees

Increase the capacity of public transport services

Facilitate the use of additional buses for public transport in cities. This will require providing temporary permits and setting up monitoring mechanisms

Increase the frequency of metros and add coaches to prevent overcrowding in trains and stations

Shift investment focus from infrastructure for private vehicles to infrastructure for public transport

Build resilience in public transport systems

01

Design changes in buses and metro with prefabricated sheets for segregating the driver and passengers

02

Improve tracking and information systems for buses and metros. This information should be easily accessible to commuters to better plan travel

03

Use intelligent transport systems to provide crowding-related information to the passenger so that people can optimize their travel to minimize contact

04

Contactless ticketing through online ticketing and establishing automated ticket sale points across the city

05

Integrated ticketing systems across different transport modes and cities, and the need for 'one nation, one card' concept

06

Organized data collection mechanisms are required to capture travel demand data

Promote non-motorized transport

01

Set up designated cycling lanes and increase road space for cyclists

02

Designate pedestrian-only streets/zones

03

Widen pavements/footpaths for pedestrians

04

Provide pedestrian crossing infrastructure such as tabletop, pedestrian signals

05

Create awareness programmes to highlight the benefits of walking and cycling

06

Ensure proper lighting of the streets at night to promote safety

Sustainable urban freight

Promote the usage of e-vehicles in urban freight.
Encourage e-commerce services to avail government subsidies for purchasing new electric vehicles

Safeguarding mobility for all

Elderly:

01

Government to nudge corporates to create the database for the present illness, especially of the elderly population and promote work from home wherever required

Children:

02

- Schools and colleges should use online classrooms to minimize travel
- Usage of non-motorized mode should be encouraged to facilitate active mobility among children
- Travel guidelines for school children using buses and vans

Differently abled:

03

- Assess the effects of social distancing norms on accessibility for differently abled persons
- Include the differently abled in the planning process
- Allocate designated spaces for the differently abled

