Chapter 10
The Contagion Effects of COVID-19 and Public Transportation System: Conceptualizing the Shifting Paradigm in India

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Abstract The global outbreak of coronavirus disease 2019 or COVID-19 and the subsequent policies of social distancing and the nationwide lockdown have changed the whole scenario of the world’s public transportation system. It has affected the transportation sector in multiple ways. The virus’ outbreak has instantly affected the traveling behavior of the people, which has ultimately resulted in complete stagnation of the transport sector worldwide. As most economic activities are directly or indirectly associated with the transportation system, transport-related activities are also severely affected. Thus, it has become a necessary consideration for economists and geographers to understand the overall scenario. This paper explores the impact of COVID-19 on the Indian public transportation system during and post lockdown period using some statistical facts and figures. Analyzes have been done based on the primary and secondary sources of information collected from the primary survey, different news reports, and published research articles. The study reveals a massive reduction in demand for mass transportation modes to get around the fear of spreading the virus and lockdown policy.

Keywords Coronavirus disease · Pandemic · Lockdown · Public transportation · FTA

10.1 Introduction

The transportation system, especially public transportation, is considered the vein of the economy because all the other economic sectors are directly or indirectly associated with it. It provides mobility and access to essential and recreational opportunities. India boasts of having the largest and most diverse transport sectors in the
world, which caters to the needs of nearly 1.3 billion people.\(^1\)\(^2\) In 2016–2017, the total contribution of the transport sector together with storage, communication, & services related to broadcasting was about 6.76% to India’s gross value added (GVA) at the current price. The majority of this is shared by road transportation, with 3.14% of the total share followed by the railways (0.77%), airways (0.15%), and waterways (0.05%).\(^3\) Ministry of Statistics and Program Implementation (GoI) has estimated the growth in GVA (2018–2019) for the Trade, Hotels, Transport, and Communication and Services related to Broadcasting services at 6.9% as against a growth of 8.0% in the previous year (2017–2018).\(^4\) A large proportion of the public assistance recipients do not own a car and rely on public mobility services. Besides, the tourism industry is mostly dependent on public transportation services. The total contribution from travel and tourism to India’s economy was 247.37 billion US dollars during 2018. In 2017, India had more than 10 million international tourists generating over 27.31 billion US dollars of foreign exchange earnings.\(^5\) However, the scenario has changed due to the outbreak of coronavirus disease 2019 or COVID-19 or SARS-CoV-2 worldwide (Singh and Neog 2020). Currently, public transportation services are likely to undergo significant changes during these challenging times (TERI 2020). The impetuous expansion of coronavirus disease 2019 has caused a complete halt in the people’s daily routines and the extreme cases, taking many lives. The first confirmed case of this newly discovered disease was traced in the Wuhan city of Hubei Province in China on December 31, 2019, and within a concise period, it has extended in other parts of the world (Cui et al. 2019; Lai et al. 2020; Shereen et al. 2020; World Health Organization 2020c). On January 30, 2020, the World Health Organization (WHO) has announced it as a global public health emergency. At the date of March 11, 2020, coronavirus disease caused 80955 infections in China, with 3162 deaths and 43010 infections with 1518 number of deaths outside China (World Health Organization 2020b). On the same date, the novel coronavirus has been proclaimed as a pandemic by WHO. In India, the first case of coronavirus disease 2019 was traced at Kerala’s Thrissur district on January 30, 2020.

Interestingly, this is not the first coronavirus-associated epidemic, emerged by a species leap from wild animals to humans. Prior to this pandemic, there was Severe Acute Respiratory Syndrome coronavirus (SARS-CoV) in 2003, and the Middle East Respiratory Syndrome coronavirus (MERS-CoV) in 2012 (Azhar et al. 2019; Cui et al. 2019; Lai et al. 2020; Shereen et al. 2020). SARS-CoV-2 often causes a respiratory disease similar to SARS and MERS, ranging from mild upper respiratory illness to severe interstitial pneumonia, also requiring intensive care (Chen et al.

\(^1\) According to the World Bank, see: https://www.worldbank.org/en/news/feature/2011/09/23/india-transportation.

\(^2\) 2019 Population estimation by the World Bank, see: https://data.worldbank.org/indicator/SP.POP.TOTL?locations=IN.

\(^3\) For detailed statistical tables, see: http://statisticstimes.com/economy/sectorwise-gdp-contribution-of-india.php.

\(^4\) For more details, see: http://mospi.nic.in/sites/default/files/press_release/Presss%20note-%20for%20first%20advance%20estimates%202018-19.pdf.

\(^5\) For detailed statistical tables, see: www.statista.com.
COVID-19 is poised to become one of the most severe factors hindering public health and the economic crisis world is facing in the twenty-first century.

Along with the sweeping loss of lives and labor productivity, the virus is likely to impact various sectors and human lifestyle over a long period. The combination of the policies regarding social distancing and lockdown is expected to be down, or even a complete stop of production and consumption activities for an uncertain time and cause business in the hospitality and retail sectors to close (Chauhan 2020). Public transportation systems, including shared mobility services like Taxi, Toto, Ola, and Uber, are severely affected by the norms of social distancing. The present study tries to explore the impact of coronavirus disease on the Indian public transportation system during and post lockdown period.

First section of the chapter introduces the concepts of the public transportation system and its vulnerability to COVID-19. The second section deals with the behavioral changes of the citizen, their changing preferences, and the effects of coronavirus disease 2019 on different modes of transportation sectors during and post lockdown periods in India. Subsequently, government initiatives and guidelines toward the public transportation system have been analyzed.

The study is primarily based on the secondary sources of information collected from the World Health Organization, Ministry of Health and Family Welfare (India), International Association of Public Transport (UITP), covid19india.org, and various news reports and published research articles. The primary sources of information are also used for the study, collected through a pre-structured Google form. A total of 212 participants have been surveyed from different parts of India. Different social media platforms and electronic mail have been used to reach the participants of various age cohorts and professions in both the rural and urban areas.

10.2 Public Transportation Under the “New” Threat

Public transportation services are one of the worst-affected economic sectors by the coronavirus disease 2019 or COVID-19. The sector has experienced a demand-cum-supply shock. There is an unprecedented reduction in travel and commercial activities. Consequently, the impacts have surged over transport activities more severely. In India, the Gross Value Addition (GVA) from the transport sector accounts for 4.8%, where a significant proportion is covered by road transportation (3.1%) followed by the railways (0.8%), airways (0.2%), and waterways (0.1%). Besides these, the motor transport records more than 1.3 million employment in 2017 (8.7% of the total industrial employment) (Kumar and Sankar 2020).

The transportation system availed by the general public based on requisite fare and ply with scheduled times is called the Public Transportation System (PTS), which includes both the freight and mass transportation services (Robert Wood Johnson Foundation 2017). The present chapter mainly focuses on mass or passenger transportation as it primarily depends on the demand of the people, unlike the freight transportation system, which is dependent on the movement of the essential goods
and commodities. The rate of virus transmission is less in freight transportation compared to mass transportation because mass transportations are directly associated with the carriage of people between the places. According to WHO, the coronavirus spreads primarily through direct contact or saliva droplets from an infected person while sneezing, talking, singing, or coughing (World Health Organization 2020d).

The higher risk of disease transmission in PTS is sourced by its nature of accommodating a large number of people in a confined space with limited ventilation. There is no infrastructural access to control or identify potentially sick persons and a variety of common surfaces to touch, such as money, tickets, handrails, windows, seats, and doorknobs (I & I Editorial Board 2020). WHO, together with the scientific community, has declared that there is a possibility of coronavirus transmission through aerosols in the absence of aerosol-generating procedures, particularly in an indoor setting with poor airspace (World Health Organization 2020a, d). Public transport is an essential service to provide mobility, also in times of pandemics, not least to provide access to health care facilities (Leigh 2020). The key objective for public transport operators, therefore, has to be continuing the operation. Consequently, public transport operators should focus their pandemic plan efforts on staff, trying to protect them, and preparing to deal with absenteeism (UITP 2020).

The exact span and severity of the impact of the present pandemic on the economy are still unknown. However, Evan and Over (2020) has provided some potential economic channels of COVID-19 for the low and middle-income group of countries. The “aversion behaviour”6 of the citizen during an epidemic or pandemic is likely to affect most on the economic condition, and this behavior comes from the preferences and choices of the individuals for travel, going out, and other social activities (Fig. 10.1). To avoid the chance of virus infection, people have no alternative but to try minimize the outing (as the vaccine or the medicinal support is still unknown). Government mandates (lockdown and social distancing) and institutional protective decisions to avoid the infection also result in the shortfall in revenue collection of every sector, including trade and transportation.

### 10.3 The Pandemic Trapped Indian PTS

The negative impact of coronavirus outbreak exhibits its severe face in developing economies like India by disrupting almost all existing human-centric sectors. The transportation sector is not an exception. The transportation system in India has long been struggling with insufficiencies such as high congestion level, limited multimodal integration, inadequate public transportation system, degraded footpaths, an exploding growth in the number of private vehicles (especially motorcycles), and the non-existence of dedicated cycle tracks. All of these together have impacted

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6Aversion behavior is behavior of people that comes with a feeling of dislike or repugnance toward something with a desire to avoid or turn from it. See the meaning of aversion: https://www.merriam-webster.com/.
the natural environment in the long term, causing a significant increase in carbon emission and noise pollution levels being the most rampant. The imposition of the lockdown has allowed the natural environment to revive. Besides, the loss of human resources to accidents and mishaps have reduced drastically (Fig. 10.2). The revenue, however, from the transport sector and the economic dependency on the sector has been significantly compromised. The government in the pre-pandemic world had been working and trying to improve the condition in order to implement different developmental measures to make the road transportation system more sustainable. However, the sudden disruption is likely to act as a hindrance to the existing inclusive policies concerning PTS. Also, the coronavirus outbreak has created new challenges for this sector, especially in the cities, where high travel demand is prevailed (Shakti Foundation 2016; TERI 2020).
The mobility behavior of the population is dynamic, and its magnitude and pattern are subject to change in response to socioeconomic security. Figure 10.2 shows the changing trend in visits and length of stay at places during the pre-lockdown, lockdown, and partial lockdown period from February to May 2020 in India. The baseline is taken as the median value for the corresponding day of the week during the five weeks (January 3–February 6, 2020). Prior to the removal of complete lockdown, certain sectors had already started work so, and there were relaxations in specific essential sectors. The graph makes it clear that the visit to the workplaces, grocery, and pharmacy increases. The visit to transit stations had yet not shown a sudden increase as people were availing private mode of transport, visiting the retail and recreation spaces; however, were visited the least as the relaxations to reopen these spaces have yet to be given by the government.

### 10.3.1 Effect During the Lockdown Period

India earns considerable revenue from the major transportation modes (Table 10.1). Coronavirus 2019 outbreak, imposed lockdown, and “stay at home approach” has directly affected the supply and demand in the economy (Singh and Neog 2020). Disruption in the transport system is put to a standstill as the demand in the service sector is crucial for the Micro, Small, and Medium Enterprises (MSMEs), which are more fragile to market demand (Bouey 2020). The total exports including reexports in India during the month of July 2020 were 23.64 billion US$. As compared to July 2019, the overall exports in July 2020 registering a negative growth of $−10.21\%$. In terms of Indian Rupee, the total exports in July 2019 were Rs. 181190.34 crore,
Table 10.1  Gross revenue trends over the years in India

| Years | Railways (US$ billion) | Roadways (Toll fees) (Million rupees) | Airwaysa (Million rupees) |
|-------|-------------------------|----------------------------------------|--------------------------|
| FY17  | 25.02                   | 69379.2                                | 25094.2                  |
| FY18  | 24.64                   | 86306.9                                | 29834.9                  |
| FY19  | 25.56                   | 91876.7                                | 27648.5                  |
| FY20 (P) | 24.78               | NA                                     | NA                       |

NA: Data not available. (P): Provisional

*aRevenue earned from international airlines and flights passing through the Indian air zone

Data Source: Singh and Neog (2020), www.ibef.org and www.indiastat.com

Fig. 10.3  a Daily freight flow; b daily passenger non-suburban (intercity) special migrant rail ridership, and c daily passenger suburban rail ridership before and during the lockdown in India (Drawn by the authors following Kumar and Sankar 2020)

whereas in July 2020 the figure came down to Rs. 177305.79 crore, registering a negative growth of $-2.14\%$. A negative growth rate of $-28.40\%$ is also found in case of total imports in India during July 2020 (28.47 billion US$), as compared to July 2019 (39.76 billion US$).7

In India, passengers and cargo movement during the lockdown period was less than half of the pre-coronavirus level. The number of people availing the public road transport via buses per day is also decreased to 4 million (during May 2020) during the lockdown period compared to the pre-lockdown period’s figure (i.e., 70 million) (Kumar and Sankar 2020). Figure 10.3a shows the declining trend of freight flow from the pre-lockdown period to the lockdown period in India. The total volume daily freight flow has been decreased by 1 million tons from the pre-lockdown period to lockdown. In the case of daily passenger volume in both the suburban (Fig. 10.3c) and

7Press release by the Ministry of Commerce and Industry, Department of Commerce, Economic Division (GoI) on 14th August 2020. See: https://commerce.gov.in/ writereaddata/UploadedFile/NTESCL_637330240112020361_Press_Release_July_2020.pdf.
the non-suburban (intercity) special migrant rail ridership (Fig. 10.3b), a decreasing trend has been found. The satellite view of the national highway of Delhi near the India gate, for instance, shows a drastic reduction of vehicular movement from the pre-lockdown period to the lockdown period (Fig. 10.4).

Mishra (2020) has estimated the sector-wise expected loss in gross value added (GVA), published in Business Today (2020). According to the estimation (Table 10.2), there is a possibility of 8.76 lakh crore rupees loss in GVA. Nevertheless, the trade,
Table 10.2  Estimated loss in gross value added (sector-wise) due to COVID-19 outbreak

| Sectors                                      | Disruption severity                                      | Loss estimated in Rs. Lakh Cr. |
|----------------------------------------------|----------------------------------------------------------|--------------------------------|
| Mining and quarrying                        | Complete                                                 | 0.31                           |
| Manufacturing                               | Near-complete excluding medicine                         | 2.16                           |
| Construction                                | Complete                                                 | 1.06                           |
| Trade, hotel, transport, communication, and relating broadcasting | Near-complete excluding broadcasting | 2.42                           |
| Financial, real estate, and professional services | Near-complete excluding banking and healthcare           | 2.81                           |
| Total                                        |                                                           | 8.76                           |

Data source Mishra (2020)

hotel, and transport sector together could register 2.42 lakh crore rupees loss due to COVID-19, which could augment the total loss to 27.63% (Mishra 2020).

10.3.1.1  The Rail Transport System at Stake

India boasts for the world’s largest rail network extended over 123236 km, with 9141 freight trains and 13452 passenger trains transporting 23 million travelers daily from 7349 stations.8 The rail transport network of India is also recognized as one of the largest single management railway systems in the world. A major proportion of the Indian economy and industrial sector is directly dependent on the railway network because of its vast network and connectivity apart from being an energy-efficient mode of transport. Before the pandemic situation, train travel remained the prime preference for the majority of the people in India while traveling a longer distance. The outbreak of coronavirus disease in 2019 has severely affected the rail transportation system, causing a rapid decline in passenger volume from 8.44 billion in FY 2019 to 8.1 billion in FY 20 at the end of March (Fig. 10.5). After the nationwide lockdown, announced in the country, almost all the passenger train services have been suspended for an indefinite time, which ultimately results in the decrease in revenue collection from the passenger segment for the upcoming financial year. The railways’ projections estimated that the lockdown might result in a drastic fall in the estimated total earnings up to 1.48 lakh crore rupees for FY2020–21, increasing the earnings gap by 63,000 crore rupees. If it is added with the earlier resource gap of over 28,000 crore rupees for FY 2019–2020, the national transporter is looking at a deficit of a whopping 90,000 crore rupees (Sharma 2020).

8See the website of India Brand Equity Foundation, available under the URL: www.ibef.org.
10.3.1.2 Air Transport in a Fix

The aviation industry has emerged as one of the fastest-growing industries in India since the initial years of the last decade. The International Air Transport Association (IATA) predicts that India is expected to be the third-largest air passenger (international and domestic) market in the world by 2024. However, the situation has already changed with the coronavirus 2019 outbreak. The IATA forecast is likely to be incomplete, and it will take much more time, reaching the third position in the air passenger market. During the lockdown period, all the passenger carriages had stopped flying. Only the “Lifeline Udan” flights were operated by the Ministry of Civil Aviation (GoI) to transport essential medical cargo to remote parts of the country to support India’s fight against COVID-19. As a result, the Indian aviation industry is expected to suffer 24 thousand crore rupees’ revenue loss due to the pandemic (Manju 2020).

10.3.1.3 The Bottleneck of the Road Transport System

Similarly, public road transport services have been limited to essential services only as a part of the outbreak strategies. The ban on operations during lockdown has caused significant financial losses to operators. In a study by UITP and World Bank Group (2020) it is predicted that, when services resume, demand may not return to pre-lockdown levels.

The report says that around 20 lakh people have lost their employment. The Bus & Car Operators Confederation of India worries that approximately equal numbers are on the verge of losing their jobs as private bus and tourist taxi operators have seized the services due to the lockdown (The Economic Times 2020a).

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9See the website of India Brand Equity Foundation, available under the URL: www.ibef.org.
National Highway Authority India (NHAI) had suspended toll collection on all national highways as the 21 days nationwide lockdown was announced, which results in a massive impact on the revenue collection from the road transport sector (Livement 2020). The 57-day nationwide lockdown due to COVID-19 resulted in a sharp 13% downfall in toll collections and remittances, according to CRISIL Research (The Economic Times 2020b). As per the International Credit Rating Agency (ICRA) estimation, toll collections would fall to 6.5–8.0% in FY21, and there would be a significant impact on those industries and firms where employees are dependent on the revenue from public transportation (Businessline 2020).

10.3.1.4 The Gasping Tourism Sector

The transportation sector is not a standalone industry; it possesses many direct impacts on the other allied activities. The travel and tourism industry is one of the major industries, having significant concerns with the public transportation system. The coronavirus outbreak has also severely affected the tourism sector in India. The arrivals of foreign tourists in the country have reduced to below two million in 2020 till April (Fig. 10.6a). The statistics show an increase over a span of 12 years; if not for the virus, the graph would have a positive growth during the latest year.

According to the Ministry of Tourism (Govt. of India), there was around 25% growth in the total domestic tourist, whereas 8.9% growth in foreign tourist arrival during 2018 and 2019 (Table 10.3). However, this figure has definitely receded (Fig. 10.6a). A remarkable negative growth rate (−22.65) is found of Foreign Tourist Arrival (FTA) on e-Tourist Visa from January to March 2020. Only for March, the growth rate remains the lowest in the last few decades, i.e., −66.4% (FTAs in March 2020 counts 3,28,462 as compared to 9,78,236 in March 2019) (Table 10.4). There is an almost identical scenario regarding the foreign exchange earnings (FEE) from tourists in India during 2019 and 2020. There is a sharp decrease in FEEs during March 2020 (Rs. 5,833 crores) as compared to March 2019 (Rs. 16,214 crores). The growth rate was −15.6% in FEE for January to March 2020 and −64.0% for March 2019 to March 2020 (Table 10.5).

The FTA has suddenly witnessed a decline that results in a drastic lowering of the FEE from 29.96 million US $ in 2019 to 6.15 million US $ till April 2020 (Fig. 10.6b). This trend has made it clear that forthcoming months in the current financial year have a greater likelihood to experience more decline due to the ongoing situation.

10.3.2 The Post Lockdown Scenario

The second phase of unlocking has been initiated by the Government of India, with effect from July 1, 2020. However, the challenges are persistent to contain the spread of coronavirus disease. In May, the World Bank Group and UITP, an International Association of public transport, have conducted a survey among the private and
Fig. 10.6  

a Trend of Foreign Tourist Arrival (FTAs) (Data source Ministry of Tourism, Govt. of India 2020) and b Foreign Exchange Earnings (FEE) from tourists (Data source Bureau of Immigration, Govt. of India 2020)

| Table 10.3 | Foreign tourist arrival and number of domestic tourist (2018–2019) |
|-------------|---------------------------------------------------------------|
|             | 2018 (R) | 2019 (P) | Growth rate |
| Domestic    | Foreign  | Domestic | Foreign       | DTV 2018–19 | FTV 2018–19 |
| 1853787719  | 28851130 | 2321982663 | 31408666 | 25.3% | 8.9% |

P: Provisional, R: Revised: Data for 2017 is repeated for 2018, and 2019 data is estimated by applying all India growth rate for 2019/18 on 2018 data (Data source State/Union Territory Tourism Departments, Govt. of India)

| Table 10.4 | FTAs on e-Tourist Visa during March 2020 |
|-------------|-----------------------------------------|
|             | 2019 | 2020 | Growth rate |
| January to March | 3179792 | January to March | 2462244 | −22.6% |
| March | 978236 | March | 328462 | −66.4 |

Data source Ministry of Tourism, Govt. of India, 2020
Table 10.5  Foreign Exchange Earnings (FEEs) from tourism in rupees terms

|                          | 2019 (in crore rupees) | 2020 (in crore rupees) | Growth rate (%) |
|--------------------------|-------------------------|-------------------------|-----------------|
| January to March         | 52378                   | January to March        | 44203           | −15.6           |
| March                    | 16214                   | March                   | 5833            | −64.0           |

Data source Ministry of Tourism, Govt. of India, 2020

public bus service operators from India. Their report shows that over 60% of PTS operators believe that the service and demand will not be more than 50% of the pre-lockdown period. While 12% believe that the service levels will resume to 75–100%, keeping only four percent as very optimistic to believe that the demand will return to what it was before. Seventy-eight percent expect that it will take more than six months from the end of lockdown for the demand levels for buses to reach pre-COVID levels (UITP2020).

Various research works have stated that work from home will be an integral part of work culture after the lockdown. There is a 377% jump in web search regarding remote work in India during February to May amid the COVID-19 crisis.10 In the post lockdown period, people will switch to prefer personal vehicles as the mode of commutation to workplaces in case of restarting work from the office space. People have been cycling miles, driving their four-wheelers, and commuting with their two-wheelers instead of getting into crowded public transport vehicles. The number of public vehicles plying on the roads during this post lockdown phase are so inadequate in number as well as the frequency that people who have no other means and are in a desperate need to go to the workplace are boarding on the public vehicles. It exposes the passengers to susceptible to acquiring the virus for not being able to maintain proper physical distance in a crowded riding space. In India, most of the state-run buses have started plying out in small numbers, whereas the railways and metros within the city have started operation in very few states of India.

We conducted a survey to examine the respondents’ changing lifestyles and preferences to portray the impact of lockdown on the public transportation system. The participants considered in the study have been categorized with their age, and gender characteristics, educational qualification, occupational structure, and their place of residence. 82.08% of participants belong to the age group 15–30 years, and 50.94% of male participants have responded to the survey. People mostly engaged in Higher Education and academics have responded as can be seen that 46.23% have a postgraduate degree or above, and 23.58% are graduates. 43.40% of respondents are students, and 16.98% are teachers by profession. Most of the respondents are from the urban area (Table 10.6).

This survey has mirrored that almost every aspect of human life has taken a shift from the real space of being physically present to a virtual space. We find that only 15.09% of the respondents use public transportation in order to commute to their workplaces (Table 10.7). An almost identical result is observed in the case of

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10See the website of edex live: https://www.edexlive.com/news/2020/may/24/work-from-home-job-searches-see-a-377-per-cent-spike-from-feb-to-may-says-report-12211.html.
Table 10.6  Characteristics of the respondents \((n = 212)\)

| Characteristics         | Numbers (f) | Percentage |
|-------------------------|-------------|------------|
| **Age composition**     |             |            |
| <15                     | 14          | 6.60       |
| 15–30                   | 174         | 82.08      |
| 30–45                   | 20          | 9.43       |
| >45                     | 4           | 1.89       |
| **Sex composition**     |             |            |
| Male                    | 108         | 50.94      |
| Female                  | 102         | 48.11      |
| Preferred not to say    | 2           | 0.94       |
| **Educational qualification** |     |            |
| Primary                 | 8           | 3.77       |
| Secondary               | 44          | 20.75      |
| Higher Secondary        | 12          | 5.66       |
| Graduate                | 50          | 23.58      |
| Post-Graduate & Above   | 98          | 46.23      |
| **Occupational structure** |     |            |
| Unemployed              | 26          | 12.26      |
| Students                | 92          | 43.40      |
| Researchers             | 20          | 9.43       |
| Teachers                | 36          | 16.98      |
| Homemaker               | 12          | 5.66       |
| Business                | 8           | 3.77       |
| Others (Army, Geologist, Agricultural supervisor, Accountant, and IT Officer) | 18 | 8.49 |
| **Place of residence**  |             |            |
| Rural                   | 102         | 48.11      |
| Urban                   | 110         | 51.89      |

*Data source* Primary survey, 2020

Table 10.7  Mode of transportation used to commute workplaces and market

| Workplaces                          | Market and shopping centers |
|-------------------------------------|-----------------------------|
| Alternatives                        | Alternatives                |
| Alternatives                        | f   | %    | f   | %    |
| Work from home                      | 80  | 37.74| 72  | 33.96|
| Personal vehicle                    | 100 | 47.17| 124 | 58.49|
| Public transport                    | 32  | 15.09| 16  | 7.55 |

*Data source* Primary survey, 2020
marketing and shopping. Maximum respondents desire to commute to the market place by walking or by personal vehicle to avoid the chance of transmission of the virus in public transportation or shared mobility services. The same tendency is found for the transit preferences in commuting to the place of work. The Energy and Resources Institute (TERI) opines that the share of Delhi metro services has decreased by 13% due to the outbreak of COVID-19. There is a need to promote alternate low emission modes of travel in Delhi NCR. In Bengaluru city, 50% of the users of public transportation services will switch to personal vehicles, 25% will opt work from home approach, and the remaining 25% will use carpool during the pandemic situation. In the city of Kolkata, the share of personal cars has increased by 10% during the COVID-19 outbreak (TERI 2020).

The survey report shows that 55% of respondents prefer to attend the meeting and conferences in virtual mode during the lockdown. In the post lockdown period, the preference remains the same as any specific medical treatment and vaccination is yet to be operational. With the opening of several workplaces, many have stopped working from home; 15% of respondents are reported to have shifted to the offline mode during post lockdown (Table 10.8, Fig. 10.7).

Similar is the case regarding online classes and education. During the lockdown period, only 5.66% of the respondents did not avail of any online classes. Whereas, the use of online learning platforms had increased for 75.47% respondents as compared to the pre-lockdown period. The proportion decreased by 2.83% of the respondents. 16.04% had availed online classes as same as the pre-lockdown period. In the post lockdown scenario, only 4.72% had stopped using this online mode of education either because their private coaching classes have started in physical mode, or they have a lack of resources. The majority of the respondents (i.e., 84.91%) continue learning through online mode (Table 10.9).

Coronavirus disease 2019 has also triggered the “virtual tourism”11 in the form of a virtual walk and video-based virtual tour. In West Bengal, the Heritage Walk

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11Virtual tourism has become a trendy and popular term in tourism industry, also known as virtual reality tourism or VRT. It is essentially a hybrid concept combining both the notions of virtual reality (VR) and tourism. Virtual tourism facilitates a tourism experience, without actually having to travel anywhere. In its simplest form, virtual tourism may comprise of a video of a tourism destination. The “tourist” watches the video, utilizing their hearing and sight senses. For more detail, see: https://tourismteacher.com/virtual-tourism/#0-what-is-virtual-tourism. This is also termed as smart tourism and remote tourism.
The choice of people regarding the transit for a work trip in post lockdown period and commuting marketplaces in post lockdown period (Source: Authors)

Table 10.9 Use of online education platforms during and post lockdown period

| Alternatives                | During lockdown | Post lockdown |
|-----------------------------|-----------------|---------------|
| Does not use                | 12              | 10            |
| Using prior to lockdown     | 34              | 180           |
| Increased                   | 160             | 22            |
| Decreased                   | 6               |               |

Data source: Primary survey, 2020

Calcutta team have arranged such a virtual tour to experience different historical and architectural sites using modern technologies.\(^\text{12}\) Despite the existing digital divide in India, the whole education system has shifted to a digital platform, and people prefer personal vehicles instead of public transport, which will result in a huge ebb in demand for a very long period.

Besides the impacts mentioned above of COVID-19 on the public transportation sector, passenger and freight activities are affected. Per day road accidents during the lockdown period have decreased many times compared to pre-lockdown (Kumar and Sankar 2020). COVID-19 outbreak and lockdown have resulted in a significant reduction in the average emission level, contributed by the transportation sector. The

\(^{12}\)See details in their official website: https://www.heritagewalkcalcutta.com/.
air pollution level has dropped to levels last seen in 2006. Particulate matter pollution in the major cities of India exhibits a similar declining trend during the lockdown period. However, the recent relaxation during the unlock period is causing the level to become re-rising significantly (Radhakrishnan et al. 2020) (Fig. 10.8).

10.4 Coping with the Crisis

We should also look into the world’s strategies and planning for public transportation during the ongoing pandemic situation. It will help in giving a critical insight to understand the Indian situation in transportation planning during COVID-19.

In the USA, many of the bus transport agencies have temporarily waived their fares to promote the norm of social distancing and to keep safe the riders and operators. This practice may also be a financial cushion to the riders during the difficult situation of pandemic (WSP 2020a). The Australian government has identified three scenarios based on varying levels of physical distancing to understand the impact of the transition stage of coronavirus outbreak on public transportation capacity—Scenario 1, i.e., strict distancing (1.5 m between people, no standing); Scenario 2, i.e., moderate distancing (no person sitting directly next to, behind, or diagonally across from another); and Scenario 3, i.e., relaxed distancing (allows for a gap between people on each seat and 1 m distance between the people facing each other). The public transportation system of Australia is following the three phases depending upon the situation and mode of transport (WSP 2020b).

In Seoul city of South Korea, the authority has introduced live updates of the congestion level show up on every bus top of the city. Passengers can also check out the level of congestion by the mobile application, which is allowing the analysis of bus passenger trends. The city authority is plying extra buses to balance the crowd level and maintain physical distancing. The city authority has also established a
detailed guideline depending on different levels of congestion in the metro rails for managing the norm of social distancing (Lee 2020).

In the city of Mexico, the government is planning to quadruple its cycle lanes to cut down the pressure on its metros, maintaining the norm of social distancing. The same is the case of Bogota, the capital city of Colombia. The city authority has converted 100 km of city streets into cycle lanes to cut down the load on their bus services. Budapest (Capital of Hungary), is also creating cycle lanes as a safe alternative for commuting work and market places (Bhatt 2020).

To mobilize the public transport system in India, the Ministry of Health and Family Welfare (Govt. of India) has released detailed guidelines for domestic travel on 24 May 2020. The nutshell of the said guidelines is as follows

- **Dos and Don’ts** shall be provided along with tickets to the travelers by the agencies concerned.
- All passengers shall be advised to download the Arogya Setu App\(^{13}\) on their mobile devices.
- Suitable announcements about COVID-19, including precautionary measures to be followed, shall be made displayed at airports/railway station/bus terminals and in flights, trains, and buses.
- The States/UTs shall ensure that all passengers shall undergo thermal screening at the point of departure, and only asymptomatic passengers are allowed to board the flight/train/bus.
- During boarding and travel, all passengers shall use face covers/mask. They will also follow hand hygiene, respiratory hygiene, and maintain environmental hygiene.
- At airports, railway stations, and bus terminals, required measures to be taken, ensuring social distancing protocols to follow.
- Airports/railway stations/bus terminals should be regularly sanitized/disinfected, and the availability of soaps and sanitizers shall be ensured.
- Thermal screening at the exit point shall be arranged.

Institute for Transportation and Development Policy (ITDP-India Program) has also provided comprehensive and detailed guidelines for the public bus services in India. The guidelines include a list of recommendations to ensure the smooth and safe functioning of the bus services in the post lockdown period. Some of the highlights of the guidelines are\(^{14}\):

- Only those commuters must be allowed to board the bus who are wearing masks.
- Conductors must ensure that the buses do not get overcrowded.

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\(^{13}\) A mobile application developed by Government of India, for helping augment the efforts of limiting the spread of COVID-19, with an objective of enabling Bluetooth based contact tracing, mapping of likely hotspots and dissemination of relevant information about COVID-19 to the general public. It was released on April 2, 2020. See: [https://static.mygov.in/rest/s3fs-public/mygov_159050700051307401.pdf](https://static.mygov.in/rest/s3fs-public/mygov_159050700051307401.pdf).

\(^{14}\) For detailed guideline, see: [https://www.itdp.in/tag/public-transport/](https://www.itdp.in/tag/public-transport/).
Contactless ticketing systems and digital payments must be developed and promoted by the authorities and bus operators.

Agencies must communicate relevant and updated passenger information to avoid overcrowding at the bus terminals. Terminals, bus stops, and buses must be sanitized regularly.

The Council of Scientific and Industrial Research (CSIR) and the Central Road Research Institute (CRRI) have prepared few guidelines based on the multidimensional approach to managing the public transportation system of India by maintaining social distancing norms.\(^{15}\)

**Approach A: Redesigning the facilities suiting to social distancing**

**Approach B: Reducing the demand and Capacity Enhancement**

It is important to acknowledge that pandemic planning is not a standalone project, but should be integrated with existing crisis management structures and procedures in order to be effective. Along with the guideline provided by the government, the following steps could be helpful to manage the situation:

- Maximize contactless payment for shared mobility services to avoid any physical interaction during the journey and to establish best practices to keep riders safe.
- Online booking of tickets to travel which will ensure the minimization of money and ticket transfer by hand;
- Video instruction of *Dos* and *Don’ts* can be shown during the journey;
- Cleaning and sanitizing the vehicle after every trip or at layovers during the route;
- Incentive-cum-awareness programs may be helpful to gain and rebuild ridership in the public transportation system;
- An integrated plan for public transport and financial help from the state and central government to the transport operators;
- Engagement of the government and stakeholders to determine the requirements of the transportation system in the country;
- Adaptation of changing demand. (Conversion of passenger vehicles into carrying goods.)
- Riders should avoid unnecessary conversation and interaction with the fellow riders during the journey.

### 10.5 The Gap Between the “Cup and the Lip”

The mammoth volume of passengers that the Indian transport carries is the critical concern of worries whether the system could run adopting the protocols of social distancing. There are constant efforts by the government to prepare safe spaces of travel for the people with guidelines issued. Sanitizing the vehicles, seating arrangement, the number of passengers to be carried, ticketing system, distancing, passenger, passenger,
and employee hygiene: are the few measures that have been repeatedly mentioned. Despite all measures, the major concern is whether it can be executed in reality and how. Huffpost India’s interview with a Senior Associate of Urban Planning and Design at Urban Works Institute (a network partner in India for the New York-based Institute for Transportation and Development Policy, or ITDP) brings forth the real scenario. It is a big question whether the country could reorganize the transport system that would be well equipped to deal with the overwhelming demand as it enforces physical distancing, and how the changes should be implemented (Jain 2020). The gap between ambition and execution of strategies and planning is vast. There are various reasons behind that; one of those is an enormous gap between the required number of vehicles and operational vehicles. A study of Climate Trends, a body of strategic communication of Delhi, says that during this COVID-19 pandemic, the country faces a massive shortage of bus services. As per the report, India would need nearly 6.6 lakh buses16 for 25 million daily commuters, and currently, the country has only 25 thousand operational bus services. Thus, we have twenty-four times fewer buses in its public transport fleet than it needs for people to follow social distancing (Yadav 2020; Gandhiok 2020; Intelligent Transport 2020; Sachdev 2020). Due to this inadequacy, maintaining social distancing would be very difficult, and could increase the risk of infection.

The government-owned public transports can still have checks and balances to maintain the rules in order to assure the safe carriage of passengers utilizing regular audits by the officials. On the other hand, privately owned vehicles, especially city buses, autos, and e-rickshaws can be the real problem creators. With no formal announcements regarding the timings, there are chances of crowding in the pickup stands of the local modes of transport. A contactless journey is somehow not a very practical choice to travel short distances. Passengers traveling short distances within the city may be reluctant to go cashless for a journey costing between Rs. 5–50. Introducing e-ticketing is the solution that may be the solution; however, it may raise travel costs for short hauls. While the government-owned transport sector can still afford to go digital, the private short distance transport sectors may not intend to shift digital (Fig. 10.9).

The regular sanitization of the vehicles is another big issue. There is a need to ensure that the products used are not harmful and are enlisted by the government in the list of chemicals allowed to be used. The operators may be more prone to using pesticides, due to their cost-effectiveness, instead of enlisted alcohol-based sanitizer. Using toxic chemicals as disinfectants can adversely affect the health of the people on board.

As distancing has been made necessary, the public may have to opt for alternate commuting. The Kolkata Metro has laid guidelines where children and older people cannot avail of the service. So in case, a passenger has to be accompanied by a child or an older person may have to think of availing some other means that might require

16 As per Mumbai’s BEST (Brihanmumbai Electricity Supply and Transport) guidelines, i.e., 30 passengers per bus (25 seated and five standing).
a higher cost of travel. The public, despite the resume in transport services, is pushed to forced alternative choices.

In the previous discussion, it was seen that the daily commuters are shifting to personal vehicles to avoid the risk of virus transmission (Table 10.7). However, it is also the fact that buying a car or availing personal mobility is not the option for many Indians, and there must be a ramping up of public transportation infrastructure (Yadav 2020).

In most of the Indian megacities, footpaths are occupied by vendors and shopkeepers. After the unlock period has started, most of the footpaths are getting back to the pre-lockdown situation. Thus re-imagination of our city streets design where there will be a separate lane for cycling and walking would be very difficult.

While the government is trying to make sure that the least number of people are affected by sharing the transportation space, the public availing services are equally responsible for practicing the rules and regulations while traveling. While the government has to ensure spreading awareness among the masses continually, it is on the masses to acquire awareness and maintain the system during the pandemic.

10.6 Conclusion

Public transport is one of the essential services to be maintained as long as reasonable and viable. It is also a very high-risk environment for transmissible diseases, including novel coronavirus disease. Therefore, it is necessary to follow and adopt the guidelines given by national health organizations and authorities. It also can be
mentioned that the imagination of modern society without any mobility and transport was impossible just a few months back, but the outbreak of coronavirus disease in 2019 brings a complete halt in the public transportation system. The whole world is rethinking mobility alternatives and trying to abstain from community transmission. A massive shift has been noticed from transportation base activities to virtual communication.

On the one hand, the increase in the use of bicycles will be beneficial for both the natural environment and individuals’ health, but the sudden increase of personal cars and motorcycles will cause an adverse effect on the environmental and human health by increasing noise and emission gases. Public transport services also provide a sustainable alternative to private vehicles. The suspension of the public/rental services and reduction in demand can put a big question on the practice of sustainability in times to come. For the time being, the consumption of fossil fuels has decreased, but in the near future, the consumption rate will go up.

Where we could build better, we are gearing up for much chaos with no one to blame. The policy interventions should be more concrete. The post-pandemic public transportation system may not be the same as it always has been in connecting cities, towns, and villages but to sustain the future environment and reduce the risk of degradation. Strict policy measures are to be thought of by the government to bring back the limping transport sector to normal.

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