Trans. Inst. Indian Geographers
ISSN 0970-9851
Indexed in Scopus

COVID-19 pandemic, Indian public transportation systems and the shift in mobility paradigm

Bhaswati Mondal, West Bengal

Abstract

The COVID-19 pandemic-hit Indian public transport system witnessed unprecedented challenges including a shift in passengers' overall mobility. This research, on the strength of available secondary data from a number of official sources, throws light on the devastating heterogeneous impacts of the pandemic on the Indian public transport system. The study focuses on reduced travel and the decline in demand for different categories of public transport systems. The research also reveals the shifting urban commute pyramid with greater dependence on private transport. As this shift in mobility paradigm poses question to sustainability, this research also discusses policy implications

Keywords: *Pandemic COVID-19, Public Transportation System (PTS), mobility paradigm, commute pyramid, travel demand*

Introduction

COVID-19 is undoubtedly the most disastrous global event in a century caused by a highly contagious novel coronavirus. It has had unforeseen impacts on nearly every aspect of society including human psychology, social life, economy, politics, etc. Human mobility is no exception. Transport is an integral part of human mobility. The COVID-19 pandemic posed a supreme challenge to transportation worldwide. Urban travel frequency experienced a sharp decline all over the world but not uniformly for all types of modes. The effects were severe on the public transport system (Mukundan *et al.*, 2020).

The public transport system (PTS) helps to provide improved mobility and to overcome poverty and social exclusion in developing countries. It has historically played an important role for the elderly, women and physically challenged people (OECD, 2001). The contagion effects of the pandemic along with the government-imposed restrictions affected passenger ridership. The social and economic costs of the pandemic had catastrophic effects on PTS, especially in developing countries.

This research brings out the problems that a developing country like India faced with respect to its public transport during and after the pandemic including the post-pandemic mobility challenges caused by restricted travel options including the shifting mobility behavior of the people under the circumstances. This research focuses on the reduced demand for passenger travel for different purposes while examining the declined passenger ridership in different types of available public transport. The

research also specifically addresses urban commuting due to the effects of corona as it dramatically reduced peoples' reliance on public transport with a corresponding rise in dependence on private transport as well as working from home. The research compares the post-pandemic commute pyramid with the pre-pandemic situation. The pandemic was not only a medical disaster but also a socio-economic devastation. The research focuses on a few resilience mechanisms which are desirable to meet the challenges of the pandemic-affected people.

Database and methodology

This research solely relies on secondary data collected from a number of official sources. Relevant data were collected from an array of sources. Data related to COVID-19 positive cases in India was collected from the World Health Organization (WHO) and the COVID-19 dashboard of India showing cumulative graph in different waves of the pandemic. The Google Community Mobility reports were also consulted to analyze people's mobility behavior for different purposes during and after the pandemic. Census of India, 2011 data from B-28 tables was used to represent Indian's commutation modes. The period of lockdown and unlock are known from the public notices published by the Ministry of Home Affairs (MoHA).

The devastating impacts of corona virus on different sectors of public transport are collected from a number of official sources such as the Indian Railways Annual Report and Accounts under the Ministry of Railways to assess the reduced ridership, passenger-kilometre and vehicle kilometre of Indian Railways during the post-pandemic period. Directorate General of Civil Aviation (DGCA) records helped to understand the impact of pandemic on airways. Ministry of Road Transport and Highways of India (MoRTH) publishes data related to road transport which was used to analyze the nature of shifting vehicular dependence of Indian citizens, especially during the post-pandemic period. Road Transport Year Book (RTYB) data was profitably used to calculate the share of different categories of registered motor vehicles before and after the pandemic.

The post-pandemic commute data at national level being unavailable, this research depended on related literature to understand the effects of the pandemic on commuters' modal pattern. It included research report published by The Energy and Resources Institute (TERI). Data related to urban commute modes before and after the pandemic were obtained from TERI. Domestic sales of different categories of motorized transport are published by the Society of Indian Automobile Manufacturers (SIAM). These data were used to determine people's shifting modal choices with greater reliance on personalized cars.

Indian public transportation systems

The Indian landmass extending over 3.32 million km^2 supports around 1210 million people connected through different transport networks. In India, around 63 percent commuters depend on road transport to meet their daily livelihoods (Fig. 1). More than 90 percent of road traffic movement is used for passenger transportation and the rest is used to carry freight. Bus is the most common road vehicle in India. Besides bus service, India's 377 million urban people residing in 7935 urban areas depend on informal public transits (Census of India, 2011). It provides frequent, convenient, affordable and flexible journeys.

Table 1: Nation-wide lockdown and unlock phases

Phases	Period
Lockdown Phases	
Lockdown-1	March 25 – April 14, 2020
Lockdown-2	April 15 – May 3, 2020
Lockdown-3	May 4 – May 17, 2020
Lockdown-4	May 18 – May 31, 2020
Unlock Phases	
Unlock-1	June 1 – June 30, 2020
Unlock-2	July 1 – July 31, 2020
Unlock-3	August 1 – August 31, 2020
Unlock-4	September 1 – September 30, 2020

Source: Ministry of Home Affairs, GoI, 2020

Indian railways, the 'lifeline of India', have the largest network in Asia and second largest in the world. Spanning over a network of around 108,706 route kilometr, it connects almost every corner of the country operating some 11,000 trains every day of which 7000 trains are only for transporting passengers and the remaining for carrying goods. Indian railways carry around 5 billion passengers and about 350 million tonnes of freight annually. It runs both suburban and non-suburban passengers (Ministry of Railways, 2021). Everyday around 7 million commuters use railway to meet their travel needs (Census of India, 2011, B-28 Table).

Besides road and rail, India's air transport also plays significant role in passenger transportation. Airports Authority of India (AAI) manages a total of 137 Airports, which includes 103 domestic airports, 24 international airports, and 10 customs airports (DGCA, 2021). There are both nationalized as well as private cargoes.

Impact on public transport system

India faced three phases of corona virus outbreak (Fig. 2). The first wave took place in March, 2020 with its peak in October, 2020. The second was more devastating with delta plus variant. Number of COVID-positive patients increased by a stunning rise in mortality. Within a month, around 5 million Indians tested COVID-positive. The last week of December, 2021 again experienced surging effect of corona-positive cases propelled by deadlier effects of transmissible variant Omicron. The daily caseload in India climbed to 3,17,532 on January 20, 2022 (The Hindu, 2022).

PTS always faces higher risks and stiff challenges during any kind of medical-disaster, especially in developing countries for a number of reasons. First of all, the passenger demand on Indian PTS is always much higher than supply. The public vehicles are generally overcrowded. It carries higher risks of infection due to the closer proximity among passengers. Secondly, existence of many high-touch surfaces, such as doors, seat, window, ticket window, basin, bathrooms etc. make the PTS as potential risk in transmission of the deadly virus. Thirdly, limited ventilation in crowded vehicles makes the situation more complicated. Thus, PTS

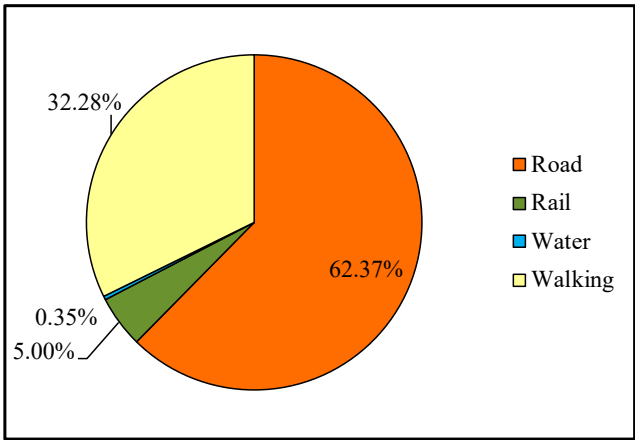

Fig. 1: Commuters' transport modes in India

Source: Census of India, 2011, B-28 Table

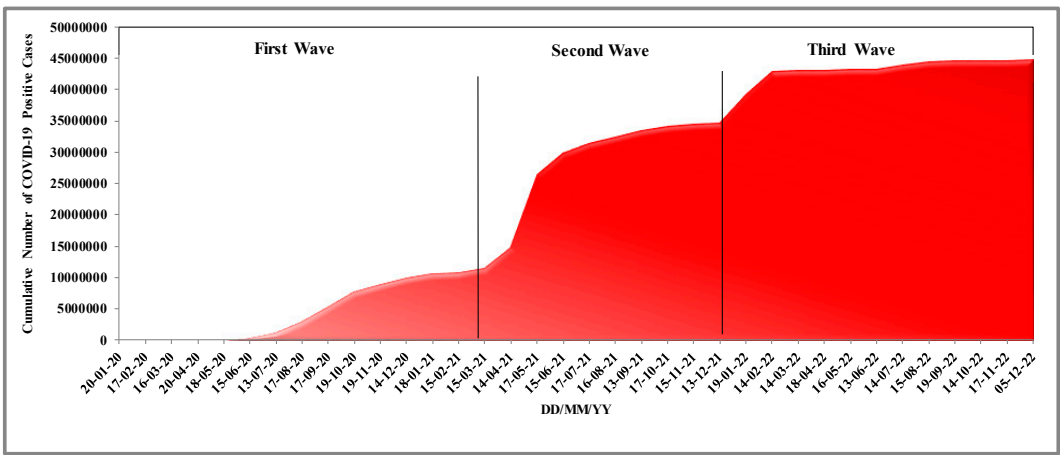

Fig. 2: Cumulative COVID-19 cases of India from January 20, 2020 to December 5, 2022

Source: Prepared by the author from WHO COVID-19 Dashboard of India

were included in super-spreader category of pandemic COVID-19. A number of restrictive measures, including maintenance of hygiene, capping on seating capacity, regular sanitization etc. were observed during the un-lock period. This left a great challenge for the PTS operators for its high maintenance cost.

Reduced mobility

Primarily having no pharmaceutical measures, strict restriction in the form of lockdown was imposed to increase physical distancing from the infected persons. Following the increasing graph of COVID-19 infection and death, complete lockdown was imposed in India from March 25, 2020 that continued till May 31, 2020 in four phases (Table 1).

All types of human mobility were drastically restricted except for some emergency outings. Figure 3 shows the most significant negative change (-86 percentage point) that took place for retail and recreation

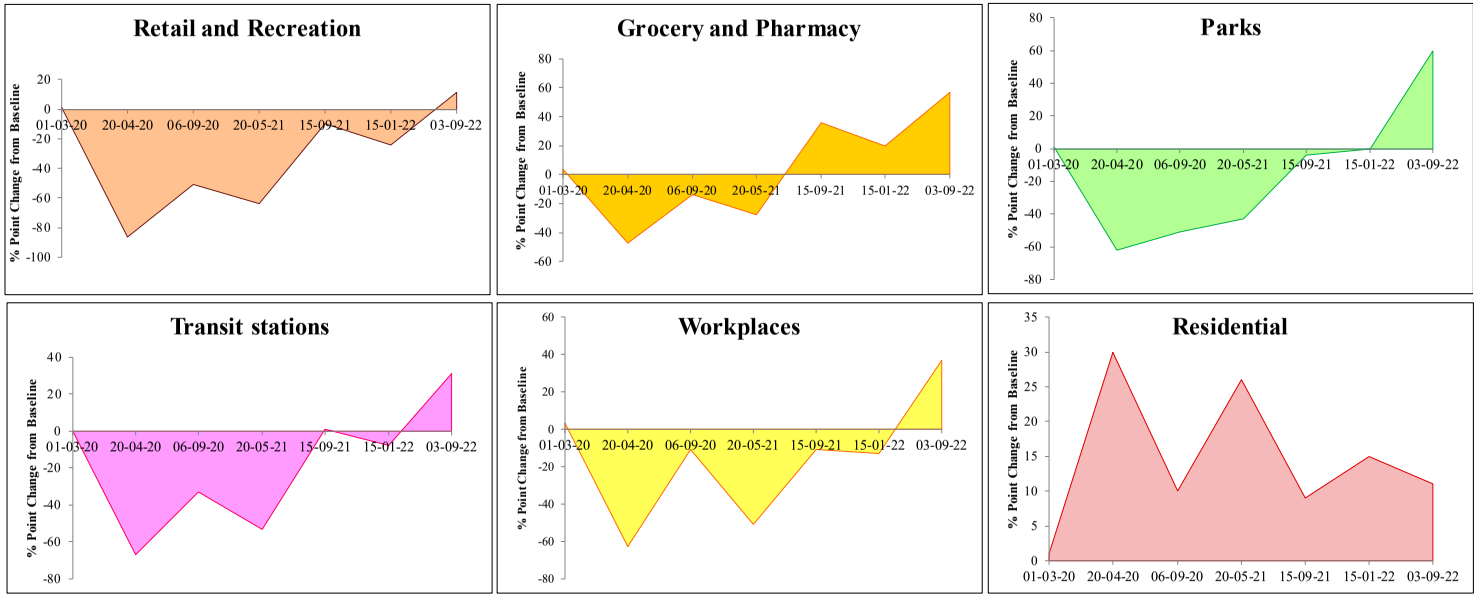

Fig. 3: Mobility trends in India, March, 2020 to September, 2022

Source: Prepared from Google Community Mobility Reports

purposes, such as in cinema hall, restaurants, parlours, shopping malls etc. Attending workplaces also declined by more than half necessitating work-from-home as a strategy. It increased residential staying (+30%). Different transit station such as railway stations, bus stands, taxi stands recorded negative impacts (as much as -70% points). As the un-lock period started, restriction on groceries and pharmacy were gradually withdrawn.

Decline in ridership

Indian Railways (IR) recorded about 1300 million originating passengers in 1950-1951 (Fig. 4) doubling within the next two decades. Since then, there is a steady growth in IR's originating passengers' volume. In 2019-2020, it reached around 8100 million, but fell to a meager 1250 millions only with the sudden outbreak of the pandemic - the least in the last 75 years' record registering an annual fall of 85 percent (Fig. 4.).

Vehicle-kilometres and passenger-kilometres too fell sharply. Vehicle-kilometre refers to the total distance a vehicle runs within a given period of time. The pandemic-hit 2020-21 experienced a sharp 70 percent reduction in vehicle-kilometre from its previous year (26398 in 2019-20 to 8114 in 2020-21). Similarly, passenger-kilometre (PKM) refers to the transport of one passenger by one vehicle over one kilometer calculated by multiplying kilometres travelled with number of passengers. In 2019-20, IR had 1050738 million PKM which reduced to 231126 million in 2020-21 registering about 80 percent fall compared to its previous year (IR Annual Report and Accounts, 2020-2021).

Indian airways, comprising all scheduled Indian and private airlines, had a steady growth since the beginning of the decade (Fig. 5). It had a record of about 2.2 million aircraft departures in 2019-2020. This figure fell to 1.01 million in the next year due to the effect of the pandemic registering the least in the last 10 years.

After two months of complete suspension, domestic flights resumed operation from May 25, 2020 with a number of restrictive measures. International flights resumed on March 27, 2022 after two years of suspension (The Times of India, 2022). This suspension had its effect on aircraft hours flown. In 2019-20, India recorded 3.87 million flying hours, which dropped to 2.6 million hours in the next year, thus making a shortfall of about 48 percent (Fig. 5).

Since road transport data at national level is unavailable for the reference period, the effects of COVID-19 on regional road transport are considered for the purpose. Thomas *et al.* (2022) have reported of rapid reduction in PTS demand, especially of the buses in Mumbai city. Raunak *et al.* (2020) found that 65 percent of those surveyed in Delhi wanted to switch to private transport. In Chennai, people's dependency on private transport increased during the post-pandemic phase (Narayanan, 2022). The Union Internationale des Transports Publics (UITP, 2020), which is an international association of public transport, works worldwide to bring together all public transport stakeholders and all sustainable transport modes. In its research, it found 81 percent reduction in passenger ridership in the post-pandemic period in major Indian cities.

Changing urban commute pyramid

The Census of India 2011 shows that nearly 88 million urban people depended on different types of PTS for commuting. The hierarchal arrangement of the modal share of commuters from the base to the apex gives it a pyramidal shape. It is referred as commute pyramid. In

this pyramid, walking forms the base (Fig. 6). It is followed by private transport which consists mostly of cycle, motor cycle and personal car. The next shows public transport comprising mostly local train, metro and bus. Intermediate transport includes auto-rickshaw, taxi, shared cab, carpooling, company vehicle and shared bike. The apex forms no travel or walk from home (Fig. 6)

In an online study, the Energy and Resource Institute found that the urban commute landscape has rapidly changed in the post-pandemic period (TERI, 2020). Around 35 percent of the respondents shifted to private modes of transport. This research shows that public transport usage dropped from 41 percent in pre-pandemic period to 26 percent in the post-pandemic period (Fig. 6).

Dependency on private vehicles increased from 31 percent to 40 percent (TERI, 2020). Short distance walking became popular. The proportion of 'work-from-home' also increased. The Ministry of housing and urban affairs has observed a steep drop in ridership in PTS by 90 percent (MoHUA, 2020).

Shift in modal choices

India's mobility choices are rapidly expanding since the Independence. It experiences a greater reliance on automobile independencies. Number of registered motor vehicles has increased from 0.3 million in 1951 to 296 million in 2019 (MORTH, 2021). Whereas Indian population doubles in 55 years, the doubling period of motorized vehicles is only 5 to 6 years. More than four-fifth of the total motor vehicles are personalized motor vehicles. About 75 percent of these motor vehicles are two-wheelers (MORTH, 2021). Since two-wheeler is a convenient and affordable means of travel, it has a consistent demand through years. Number of registered two-wheelers has increased from 92 million in 2010 to 244 million in 2020. In fact, India is the first ranking country in terms of strength of motor cycles and mopeds among the 192 countries reported in the World Road Statistics 2020 followed by Indonesia and China (RTYB, 2019-20). Two-wheelers comprised around 82 percent of all registered passenger transport vehicles in 2020. Car holds around 13 percent share of all passenger transport vehicles. Together they comprised around 95 percent of all passenger transport vehicles. The rest is occupied by public transport modes including buses, taxis, jeeps etc. (Table 2).

Pandemic-hit India witnessed remarkable changes in people's mobility behaviour. Domestic sale of all sorts of automobiles went down during these two years (SIAM, 2023). Two wheelers, which is the largest automobile sector in India, experienced declined demand. Its domestic sale fell from 21.18 million in 2018-19 to 17.42 million in 2019-20 (SIAM, 2023). Three wheelers, including a wide range of vehicles from auto-rickshaw, baby taxi etc., serve as important transit modes for end-trip transportation. Their domestic sale decreased from 0.70 million in 2018-19 to 0.49 million in 2022-23 (SIAM, 2023). Sales of passenger vehicles[1] decreased from 2.77 million in 2019-2020 to 2.71 million making a shortfall of -2.24 percentages in 2020-2021. Commercial vehicles recorded a fall of about -20.77 percent during this decade. Although all sorts of automobiles found declined demand, the demand for utility vehicles which is a sub-category of passenger vehicle continued steadily, even during the pandemic

[1] Passenger vehicles offer a seating capacity of less than 10 persons including the driver. These are personally owned and are not used for commercial purposes (SIAM, 2023).

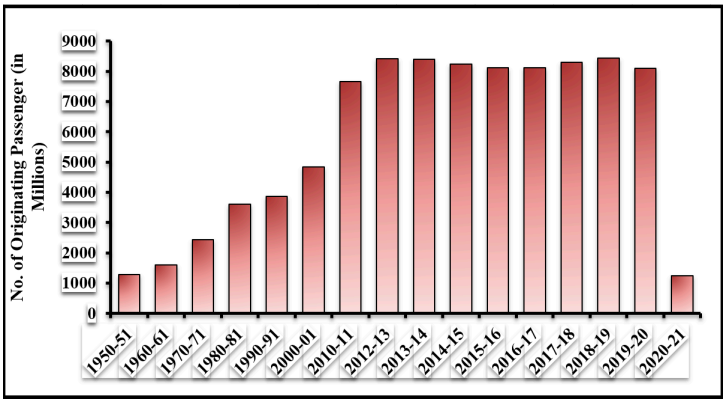

Fig. 4: Impact of COVID-19 on originating passenger volumes of Indian Railways

Source: Indian Railway annual report and accounts, 2020-2021, GoI

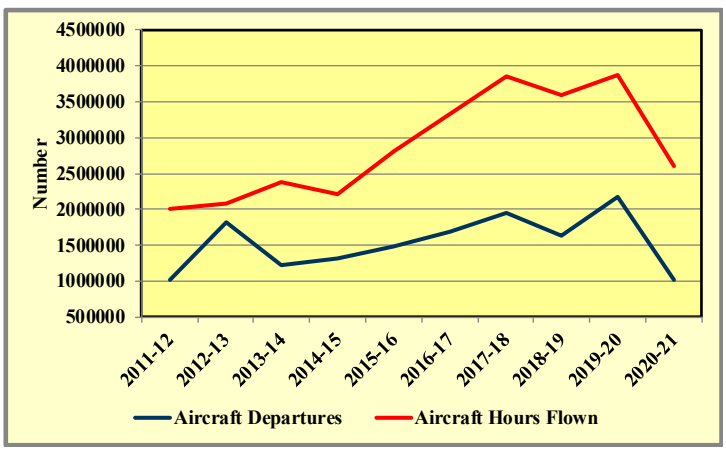

Fig. 5: Impact of COVID-19 on Indian Airways

Source: Computed from DGCA, GOI, 2020-2021

period. Its sale grew by 12.13 percent between 2019-2020 and 2020-2021 (SIAM, 2023).

The automobile sector started its gradual recovery in the post-pandemic phase. Domestic sale of each category of motorized vehicle increased. This period experienced high demand for passenger vehicles (Table 3). Sales of passenger vehicles increased from 2.7 million in 2020-2021 to 3.1 million in 2021-2022 to 3.9 million in 2022-2023 (SIAM, 2023). Passenger vehicles are of three types – passenger cars, utility vehicles and vans. Of the three types of passenger vehicles, sales of utility vehicles had sparkling growth during the post-pandemic period (SIAM, 2023). The year witnessed a milestone in the Indian automobile industry. The retail sale of passenger vehicles surpassed all the previous records, even before that of the pre-pandemic period. It reached 3.89 million mark in 2022-2023 FY (SIAM, 2023). This record is flooded by sales of sports utility vehicles (SUVs) which are mainly used for

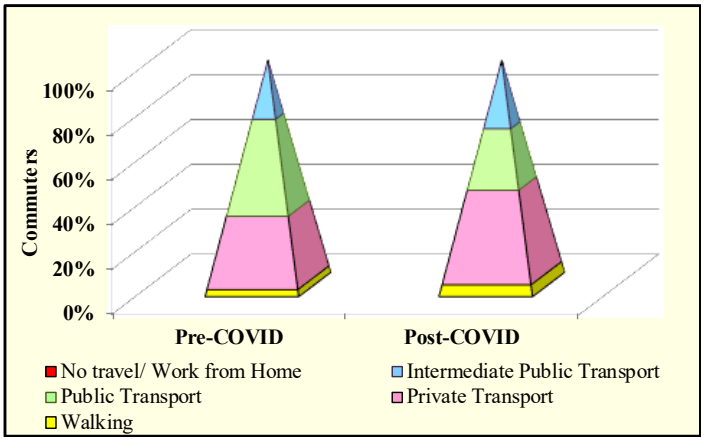

Fig. 6: Changing urban commute pyramids in the pre- and post-pandemic periods
Source: Prepared from TERI, 2020

Table 2: Percentage share of passenger transport vehicles in India in 2019-2020

Types of Vehicles	Newly registered during 2019-20	Total registered as on 31st March, 2020
Buses	0.43	0.58
Taxis	0.95	1.16
Light Motor Vehicles (Passengers)	3.30	2.75
Motor cycles on hire	0.05	0.02
Two wheelers	83.38	81.83
Cars	11.15	12.67
Jeeps	0.70	0.83
Omni buses	0.05	0.16

Source: Calculated from RTYB, 2019-2020

family travels on all-weather road types (The Business Standard, 2024). These demands basically came from large cities (SIAM, 2023).

Commercial vehicles are used both for freight and for passenger transportation with commercial purposes. There are two categories of commercial vehicles – light commercial vehicle (LCV), and medium and high commercial vehicle (M&HCV). SIAM publishes these two categories of data (SIAM, 2023). The post-COVID period observed a sluggish growth of commercial vehicles. However, sales of three-wheelers revived during this period. Experts think that this revival may be due to the availability of compressed natural gas fuel and battery-run facility in three wheeler vehicles (The Business Standard, 2024). Although sales of two wheelers increased slightly, its percentage share fell considerably in the total domestic sales of automobiles. Thus, it shows that the people's modal choice is shifting during the post-pandemic period. Sales of passenger vehicles and basically of utility vehicles accelerated during this period.

Table 3: Domestic sales of different categories of automobiles in India (%)

Category	2016-2017	2017-2018	2018-2019	2019-2020	2020-2021	2021-2022	2022-2023
Sales (number)	21863281	24981312	26266179	21545551	18620233	17617606	21204162
Passenger vehicles	13.94	13.16	12.86	12.87	14.56	17.42	18.35
Commercial vehicles	3.27	3.43	3.84	3.33	3.05	4.07	4.54
Three Wheelers	2.34	2.54	2.67	2.96	1.18	1.48	2.31
Two Wheelers	80.45	80.86	80.64	80.84	81.21	77.03	74.81

Source: SIAM, Annual Report 2020-21 & 2022-23

Questioning sustainable mobility

Current mobility structure in India shows a predominance of personalized transport. Among all the newly registered motorized passenger transport, two-wheelers and car together comprised around 95 percent in 2019-2020 (Table 2). The post-pandemic period has seen significant increase in number of passenger vehicles which are personally owned and run for personal mobility (Table 3). This growing share of passenger vehicles and basically of cars on narrow Indian roads poses supreme challenge to sustainable mobility. It may exaggerate the problem of peak hour urban traffic congestion and traffic fatalities (Mondal, 2023). Growing number of personalized vehicles are responsible for increasing atmospheric and noise pollution. Vehicular emission is supposed to contribute over 90 percent of air-pollution in urban areas of the developing countries (Shrivastava *et al*, 2019).

Public transport is thought to be more energy-efficient and less polluting in the sense that per-capita emission rate of a public transport mode is much lower compared to the aggregate emission rates of a number of private transits. The Vasconcellos Rule suggests that 'a standard 45 seat diesel bus with six passengers, occupies per person less road space than a car with an occupancy of 1.5 people; the same bus with four passengers uses less energy per person than a car with an occupancy of 1.5 people; and the same bus with two passengers emits less CO, CO2 and hydrocarbons, per person than a car with an occupancy of 1.5 people' (UNESCAP, 2012). The key pillars of sustainable mobility require a shared, clean and people-centric mobility paradigm. In a number of reports published by the government and non-government policy makers (see MoHUA, 2021; NITI Aayog, 2018), public transport has been prioritized for the sake of livable cities and smart solution of mobility challenges. The post-pandemic period requires better appraisal of public transport to solve the growing environmental problems.

Policy implications

This pandemic reminds us of implementing a radical infrastructural change to promote non-motorized transport and walking as safe and desirable modes of commute. This research also proposes of rethinking of urban archaic planning to stifle overcrowding and restrictions on spreading of epidemics. It prioritizes the decentralised policies with empowered local governments proposed by NITI Aayog (NITI Aayog, 2018). This research supports multiple nuclei model to reduce commute length, dependence on car and peak-hour congestion problems. It gives

impetus to the growth of intelligent transport system and green mobility plans, thus making the cities pollution-free and sustainable. It emphasizes on the development of climate-friendly urban transport such as rejuvenating waterways, provision of floating pontoons, jetties, e-buses in the Indian metro cities, development of footpaths for pedestrian movers, cycling lanes etc. (MoHUA, 2021). Lastly, it can be said that COVID-19 presents an opportunity which the country may utilize for a move towards sustainable mobility.

Summary and conclusion

The pandemic has put enormous strain on PTS worldwide (Tirachini and Cars, 2020; Suman *et al*, 2020; Ma *et al*., 2023). Indian PTS is no exception. Present research shows that the contagion effects of corona virus and the government-ordered restrictions prevented mass scale users from using it. As a result, the contemporary urban commute pyramid had a radical shift within these two years of pandemic. The increasing sales of passenger vehicles i.e. basically of cars in domestic automobile market focus on the people's shifting modal choices. This growth within a short period may bear long term implications on urban and regional environment.

Every blank space leaves the opportunity to be filled in. 'The COVID-19 pandemic has been devastating for cities, but it presents an opportunity to rethink and make them healthier, more inclusive and more resilient' (World Economic Forum, 2021, p. 4). This research provides an outlook to the transport engineers, social scientists and urban planners to prepare the state-of-affairs and to take necessary measures at right time.

Competing interest

The author declares that she has no conflict of interest.

References

Census of India (2011). *Commuting in India and States, B-28 Series*. Government of India.

Directorate General of Civil Aviation (2021). *Annual Reports, 2020-2021*. Government of India.

Indian Railways (2021). *Environment Conservation – A Way of Life for Indian Railways*. Government of India.

IRCTC (2021). *22nd Annual Report, 2020—2021*.

Ma, W., Hoen, F. S., & Tørset, T. (2023). No way back? A survey on changes in travel demand post-pandemic in Norway. *Case Studies on Transport Policy, 11*, 100942.

Ministry of Home Affairs (2021). *Annual Report 2020-2021*. Government of India.

Ministry of Railways https://indianrailways.gov.in/railwayboard/view_section.jsp?lang=0&id=0,1

Ministry of Railways (2020). *Reports and Accounts, 2020-2021*. Government of India.

Ministry of Railways (2021). *Reports and Accounts, 2020-2021*. Government of India.

MoHUA (2020). *Advisory on the measures to be taken by States/ UTs/ Cities/Metro Rail companies in view of Covid-19 for providing Urban Transport Services*. Government of India: Ministry of Housing and Urban Affairs.

MoHUA (2021). *The Green Urban Mobility Partnership Newsletter*, 1(1), November. Government of India: Ministry of Housing and Urban Affairs.

Mondal, B. (2023). Pandemic COVID-19, Reduced Usage of Public Transportation Systems and Urban Environmental Challenges: Few Evidences from India and West Bengal. In Sahu, A. S. & Das Chatterjee, N. (eds.), *Environmental Management and Sustainability in India*, (pp. 341-368). Cham: Springer, doi: https://doi.org/10.1007/978-3-031-31399-8_16.

Mondal, B. & Samanta, G. (2021). *Mobilities in India - The Experience of Suburban Rail Commuting*. Cham: Springer, doi: https://doi.org/10.1007/978-3-030-78350-1.

MoRTH (2019). *Road Transport Year Book, 2018-2019*. Government of India: Ministry of Road Transport and Highways.

MoRTH (2021). *Annual Report, 2020-2021*. Government of India: Ministry of Road Transport and Highways.

MoRTH (2023). *Annual Report, 2022-2023*. Government of India: Ministry of Road Transport and Highways.

Mukundan, P., Cherian, J.J. & Nair, M. (2020). *Effects of COVID-19 on Transportation: What the Experts Say*. Kochi: Centre for Public Policy Research.

NITI Aayog (2018). *Transforming India's Mobility: A Perspective*. Government of India.

OECD (2001). *Ageing and Transport – Mobility Needs and Safety Issues*. Paris: Organisation for Economic Co-Operation and Development.

Raunak, R., Sawant, N., & Sinha, S. (2020). Impact of Covid-19 on Urban Mobility in Indian Cities. *Transport and Communications Bulletin for Asia and the Pacific*, No. 90, pp. 71 - 85.

RBI (2023). *Handbook of Statistics on Indian Economy*. Government of India.

Shrivastava, M., Ghosh, A., Bhattacharyya, R. & Singh, S. D. (2019). Urban Pollution in India. In S. M. Charlesworth and C. A. Booth (eds.), *Urban Pollution: Science and Management*, (pp. 341-356). Wiley-Blackwell.

Society of Indian Automobile Manufacturers (2021). *Annual Report, 2020–21.*

Society of Indian Automobile Manufacturers (2023). *Annual Report, 2022–23.*

Suman, H. K., Agarwal, A. & Bolia, N. B. (2020). Public Transport Operations After Lockdown: How to Make It Happen? *Transactions of the Indian National Academy of Engineering*, 5, 149–156, doi: https://doi.org/10.1007/s41403-020-00121-x.

TERI (2020). *Impact of COVID-19 on Urban Mobility in India: Evidence from a Perception Study*. New Delhi: The Energy and Resources Institute.

The Business Standard (2024). High on SUVs: India records all-time high passenger vehicle sales in FY24, July 13.

The Hindu (2022). Omicron surge: Understanding the third wave of the COVID-19 pandemic in India, January 23.

The New Indian Express (2021). COVID impact: With 'Work from Home' still on, cab drivers in Hyderabad feel the pinch, November 15.

Thomas, N., Jana, A. & Bandyopadhyay, S. (2022). Physical distancing on public transport in Mumbai, India: Policy and planning implications for unlock and post-pandemic period. *Transport Policy (Oxford)*, 116, 217-236.

Tirachini, A. & Cats, O. (2020). COVID-19 and Public Transportation: Current Assessment, Prospects, and Research Needs. *Journal of Public Transportation*, 22(1), p. 1-21.

UITP (2020). *Impact of COVID-19 on Indian Bus Operators*. Statistics Brief, May.

UNESCAP (2012). *Sustainable Urban Transportation Systems - An Overview*. Bangkok: United Nations Economic and Social Commission for Asia and the Pacific.

World Economic Forum (2021). *Indian Cities in the Post-Pandemic World*. January.

Bhaswati Mondal
Assistant Professor,
Department of Geography,
Rampurhat College, Birbhum,
West Bengal

Email: bhaswatimondal11@gmail.com