COVID -19 PANDEMIC OUTBREAK PROMPTED A SHIFT IN PUBLIC TRANSPORTATION PLANS

by

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COVID -19 PANDEMIC OUTBREAK PROMPTED A SHIFT IN PUBLIC TRANSPORTATION PLANS

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Dedication

This work is heartily and proudly dedicated to never fading memories my beloved mother late Smt. Rathnamma, who lived and served as an inspiration and created ever growing interest towards mysteries of living world in my mind. From parents and guardians to classmates and circle of friends who extended their help in the midst of problems while doing this work. Above all, to my God almighty who showered me his blessings, especially for the strength, courage, patience, wisdom, time, and guidance in realization of this work.

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ABSTRACT

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A means of transportation for individuals without accessibility to a motor vehicle and an alternate mode of transportation for commuters is also crucial in reducing the strain on existing infrastructure. Overall, there is compelling evidence in favor of public transportation options. A coronavirus outbreak that started in Wuhan, China in late 2019 spread to entire World. The transportation planning system is complicated and involves many moving parts. Everything from regulating pollution emissions to arranging the construction of major transportation networks, including busways, highways, freeways, and light and heavy rail systems, falls under this category. The aim of the study is to determine the impact of COVID-19 pandemic on public transport usage in India and to find out reasons behind the change in the attitude of the public towards the usage of public transport. In this study, 500 persons were studied from five Indian cities: Kolkata, Mumbai, Indore, Bengaluru, and Delhi. These are the cities with the highest utilization of public transportation. General people are the targeted sample population in this study. The sample size is 500 people from five Indian cities: Kolkata, Mumbai, Indore, Bengaluru, and Delhi. A random sampling Technique was used in this study. The study used both primary data and secondary data. Micro Soft Word, Excel, and SPSS are used in the study. Arithmetic means standard deviation, regression analysis, and correlation are only a few of the statistical methods employed in the study.

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INTRODUCTION

1.1 Overview

Reliable and accessible transportation options are crucial to the success of rapidly developing large metropolitan areas. Businesses, schools, workplaces, and public spaces are all necessitiesfor a growing metropolitan population. The basis of urban planning is determining where amenities like shops, restaurants, and schools should be located and then building or expandingthe necessary transportation system, such as roads, subways, and parking garages. Economic viability, regional patterns of development, sustaining socially desirable levels of quality of life, and environmental consequences, are all heavily influenced and affected by the transportation system.

It is no surprise that the government continues to invest heavily in the research, development, and implementation of new and improved transportation options. Although the road from policy formulation to system implementation is not always straight or planned out, it is vital to set up and use procedures for measuring and monitoring progress toward objectives. Planning for future development and growth requires considering social, environmental,and economic factors, and providing transportation services is crucial. The viability of social activities and networking and the delivery of commodities are important factors to consider in this developing and increasing region. The transportation system faces tremendous problems due to population increase and changing urban forms. In addition, transportation planners want to set up methods for assessing and tracking the transportation network to guarantee that both immediate and long-term goals are feasible.

It is essential to remember that the transportation planning system is complicated and involves many moving parts. Everything from regulating pollution emissions to arranging the construction of major transportation networks, including busways, highways, freeways, and lightand heavy rail systems, falls under this category. Guaranteeing the accessibility of specific forms of public transportation is a crucial part of any transportation strategy. Public transportation services are crucial to any functional transportation network (Nash, 1982; May and Roberts, 1995). Among these is the assurance of resources and environmental sustainability into the near future, arguably the most important factor (Banister et al. 1997).

Providing a way to get around for people who don't have access to a personal vehicle and an alternative way for commuters to get to work is also important for easing the stress on current infrastructure. In general, there is strong evidence in favor of public transportation.

Access and accessibility are two sides of the same coin regarding improvingpublic transit. The term “access” refers to the availability of a service, which is determined byfactors such as how close a user is to the service and how much it costs. A form of transportationis less likely to be used if the traveler cannot easily access it at either the journey's starting or ending point.

Similarly, if the fare is too high (i.e., if expensive alternatives are available), then the service is not likely to be used. Regarding public transportation, accessibility refers to how quickly and easily one gets from one end of the system to the other. Because of this, the availability of a regional travel system includes its ability to perform as intended. Accessibility is crucial to the system of public transportation and works in tandem with other forms of accessibility to improve both. There is a huge distinction between having the availabilityof public transportation and the public transport network being accessible. Furthermore, the effectiveness and efficient use of the public transportation system depends on both access andaccessibility. The research examines the challenges and policy consequences that arise using proximity as a criterion for providing access to public transit.

Beginning with some context on transportation planning in general, the next part will focus on access. People then consider thepossibility of evaluating access and how that may work. Through this, they can answer questions about how to make public transportation more accessible. Freight logistics were severely affected by COVID-19. Although many individuals are employed in the freight transportation industry, the number of personnel needed to manage the many distribution linesassociated with this sector can be reduced using Intelligent Transportation Systems (ITS). Thisconforms to the limitations imposed by COVID-19 legislation, which seeks to reduce the incidence of disease and mortality by controlling the number of people present in any given location.

Notably, ITS only encourages drivers to avoid transportation, in contrast to COVID-19 law, which promotes both drivers and passengers to do so. Therefore, the same group of peopleis urged by COVID-19 and ITS to stay away from moving vehicles while empty. Multiple considerations mean that during COVID-19, fewer people will need to use public transit. Passengers on public transit are not enclosed in metal cages, as is the case with private cars. The passengers' resistance to the COVID-19 virus will plummet as a result. Those riding

in thepartitioned vehicles will be protected from germs in ways beyond the capabilities of a basic cloth mask. Additionally, the COVID-19 rules are at odds with the concept of HOV (High Occupancy Vehicle) lanes, which give preference to more occupied cars. The COVID-19 guidelines reduce traffic congestion by decreasing the number of passengers per vehicle, whereas the HOV lanes aim to raise the number of passengers per vehicle.

The research analyzes the major issues that arise while taking public conveyance during the COVID-19 outbreak, some of which shed light on the various solutions for public transit in different countries. The disaster that the COVID-19 virus caused was worst and there is currently short of reliable scientific data on key issues, including the nature of "thevirus, the effectiveness of current preventative measures," and the potential spread of the disease. The public's access to information by discussing various issues associated with public transportation amid the COVID-19 epidemic. Create a research plan based on this information.

1.2 Public Transport

The high concentration of people in a small area with poor air circulation makes public transportation a potentially dangerous setting. When those who could be sick are impossible toidentify, there is no way to keep them from spreading. Many things people interact with daily-from ticket machines to doorknobs-have smooth surfaces that they touch. In the event of a pandemic, like in any other period, public transportation is crucial for ensuring the mobility of the population, not the least of which is ensuring their access to medical care.

More than a quarter of all journeys in urban India occur on buses; therefore,it makes sense that bus networks should get a disproportionate share of the transportation expenditure. The fact, however, "...is stranger than fiction," as Mark Twain once put it. Travelers in most cities can attest that bus services have not expanded at the same rate as their cities' populations, meaning that they often have to squeeze past fellow passengers to reach theaisles. There has been a dramatic growth in the number of privately owned automobiles in recent years, and with that increase comes a whole host of problems related to the environment, accessibility, and quality of life. The BRT (Bus Rapid Transit) system is an example of a contemporary, safe, and effective public transportation system that can assist in solving these issues.

Bus Rapid Transit is a type of mass rapid transit that blends the high performance and high standards of metro rails with the flexibility and low fares of buses. This can be done with far less time and money than is required to build rail-based systems. More than a third

ofIndia's 1.3 billion people reside in urban centers, making it the second most populous countryafter China. There would have been no way to go about without public transit. There was a reliance on buses for public transportation in most Indian cities, and several had implementedBus Rapid Transit to increase the efficiency and dependability of regular bus service. Several major cities have built MRT (rapid mass transit) metro systems to provide faster, less disruptiveservices for urban commuters.

Local, state, and municipal governments often owned and operated the bus and metro networks. Rural residents were more likely to take the bus than their urban counterparts. Most city dwellers in India depend upon public transportation to get to daily work, school, and government offices. This becomes more critical when access to public services requires more time and effort than can be expended by walking or bicycling.

Although there are bus networks designed to meet this demand, they frequently fall short in the areas of dependability and velocity.

Maintaining a reliable supply chain for life-saving medicines and medical equipment following the most up-to-date national regulations is paramount to road transport companies during any pandemic. Look at the many forms of public transportation available in this area.

1.3 COVID-19 and Transportation

Every person in the transport business, from passengers to service providers to government organizations tasked with coordinating transportation, has had to adapt to the new realities (Lemke et al., 2020; Tien et al., 2020; Muller et al., 2020). Self-isolation orders or Stay-at-home, and the duty of care by vital employees, put a significant strain on the availability and demand for transportation services (Nikolaou and Dimitriou, 2020). Structural rigidities in price,safety, and availability of transportation services to existing and without established routes impedecommuters' access to efficient and safe transport services (Ivanov, 2020). Foremost among transportation companies and business transport operators' motivations for transportparticipation during the time of COVID-19 is the maximum profits despite the reduction of passengers allowed to board fleets.

Commercial transport operators were more aware of how surplus income (profit) might encourage further involvement in the transport sector during COVID-19 and how projected revenue can easily balance the cost of delivering transport services. Even before the establishment of COVID-19, it was clear that passengers' goals of minimizing costs ran counterto the transport providers' goals of maximizing profits (Adom et al., 2018). With the impendingarrival of COVID-19 only exacerbating already tense dynamics, it is time for policymakers to solve this statewide conundrum and ensure that key players in the

transportation sector can effectively guide supply and demand. In COVID-19, interventions from the transport policycommunity are required to regulate transport needs and deliver to ensure accountable transport delivery of services (Budd and Ison, 2020).

Numerous reports have examined how the pandemic has affected transportation because of the prevalence of covid. As a Brit, Vickerman (2021) wondered if coronavirus disease restored faith in public transportation. As the author pointed out, there are problems with "the current delivery methods of public transport services, and the amount of public financial support needed to sustain public transportation has decreased due to lower ridership and the adjustment to the requirement for social distancing, suggesting that the dominant tradition of apoorly regulated competitive public transport should be revisited. Dai et al. (2021) looked at the financial implications of the fare-free public transport policy in 3 Chinese cities, Xiamen, Hangzhou, and Ingbo, adopted to entice people back to public transportation." Despite efforts to get riders into public transit, Eisenmann et al. (2021) found that automobile use increased inGermany during the epidemic. Dai et al. (2021) verified this by observing a dramatic transitionfrom public to private transportation in India.

Mogaji (2020) and Mogaji et al. (2021) in "Lagos, Nigeria," whereas Abdullah et al. (2021)looked at the same question in Pakistan. Identification of the "transport industry, commuters' travel behavior, and perception of various techniques" for sustaining public transportation is crucial for developing a strategy in the wake of the COVID crisis. In order to better understandthe similarities and variations among the numerous African contexts in which this virus has been seen, Porter et al. (2021) shed light on how the spread of COVID-19 throughout Africa has affected the migration of women. To learn more about how COVID-19 would affect transportation, the author traveled to "Abuja, Tunis, and Cape Town." The study's findings reaffirmed the significance of women's involvement in transportation as transport and commuter operators, particularly in light of the potential for their advancement to regulatory positions to help lessen the impact of "COVID-19 in Africa."

According to Elbany and Elhenawy (2021), the most noticeable effect of COVID-19 in Africa was a shift in tourists' habits and routines. COVID-19 has greatly affected people's ability to go about by changing how products and services are transported. The spread of COVID-19 was mitigated somewhat with the implementation of many measures, including thelockdown, the cancellation of work and school, and stringent limitations on travel from one location to another. When considering the future of the airline and tourist industries beyond COVID-19, Ania and Joseph (2021) investigated the importance of modifications to the governance structure.

Rothengatter et al. (2021).'s submission looked at the effects of coronavirus on the transportation sector and concluded that it hurt the air, train, and subway systems. After researching the effects of the "COVID-19" epidemic on transportation in Nigeria's commercialhub of Lagos, Mogaji (2020b) discovered that economic, religious, and social activities all impacted the city's transportation network while the pandemic was at its height. The avoid- shift-improve paradigm was used for this research, and "the analysis of variance" was performedto estimate data from a field survey that was conducted to explain the effects of "COVID-19 ontransportation" in Lagos. The consequences of COVID-19 or the risks of several transportationpaths in 10 nations were examined by Barbieri et al. (2021). The authors found that travelers relied less and less on transit rules to fulfill their journey requirements. Traveling by bus or airline during COVID-19 was also the most dangerous means of transportation.

1.3.1 Changes in the Transportation Behavior

There have been several observable changes between the pandemic and post-epidemic periods "as a result of the COVID-19 pandemic" on the Indian transportation infrastructure. Here are some key differences:

a. **Travel Restrictions:** Travel restrictions were put in place during the epidemic to pause the virus's spread. With rigorous lockdowns and the suspension of local and international flights, movement between states and abroad was severely restricted. As the situation has improved, however, travel restrictions have been loosened and internal and international travel has gradually resumed, albeit with some safeguards and standards in later stages and resumed normal operations.

b. **Public Transport:** During the epidemic, there were significant interruptions to public transportation, including buses, trains, and metros. To preserve social distance, services were either stopped completely or provided only in certain circumstances. Currently, public transportation services have largely returned, but with capacity limits and rigorous cleanliness guidelines. To minimize physical interaction, several cities have developed contactless tickets and digital payment methods.

c. **Private Vehicles and Ridesharing:** Private vehicles were increasingly popular during the pandemic as individuals sought to travel in a more sterile setting to lower the chance of contamination. Vehicle sales increased as a result of the rise in demand for personal vehicles and two-wheelers. The use of ride-sharing services has decreased as a result of security worries. The use of private vehicles is still on the rise today, and people still

favor using their own vehicles for transportation.

d. **Emphasis on Sanitation and Hygiene:** The epidemic has made sanitation and hygiene standards in transportation more important than ever. Transport companies, both public and commercial, now follow rigorous sanitization and cleaning procedures. Mask use, hand sanitizer use, and maintaining social distance standards are suggested for passengers. Even after the epidemic, these sanitary precautions are still necessary to maintain passenger safety.

e. **Work from Home and Remote Work:** The epidemic made work-from-home and remote employment common place, which decreased the need for daily commute. Numerous businesses are still adopting flexible work schedules, which has reduced rush hour traffic and changed travel habits. This shift in commuter behavior has affected peak-hour transit needs and traffic congestion.

f. **Digital Transformation:** The epidemic hastened the transportation system's transition to digital technology. To reduce physical interaction and increase convenience, online ticket booking, e-payment methods, and contactless services have become more popular. In the post-pandemic period, these digital solutions are expected to endure and develop further, providing a more efficient and cutting-edge transit experience.

Given that the reaction to the epidemic and the rate of recovery may fluctuate depending on regional conditions and governmental directives, it is crucial to keep in mind that precise adjustments to the Indian transportation system differed between states and cities.

1.4 Transportation Planning

The goal of transportation planning is to achieve this. The first step is to make a plan that considers the full scope of your mobility needs throughout time. The next step is programming,which involves outlining a short-term strategy for implementing the initiatives. During transportation planning, stakeholders assess the system's existing condition, anticipate future demands, and integrate relevant data with financial and policy considerations. It is a useful toolfor guiding urban development by assessing transportation infrastructure, including roads, bridges, cargo ships, and bike lanes. Its effects on commerce, leisure, and quality of life are far-reaching. Regarding the early stages of planning, policies and legislative activity, finance, and project development, transportation planning is the convergence of many distinct disciplines.

Transportation planning is discussed in detail in the book “Designing Walkable Urban Thoroughfares: A Context Sensitive Approach,” an all-inclusive examination of national,

state, regional, and local needs achieved through a group effort involving government agencies, non-profits, and the general public. It looks at the area's demographics and travel habits, forecasts how they'll develop over time, and assesses potential upgrades to the transportation infrastructure. People worldwide are more hesitant about social contact and are less likely to go on “unnecessary” vacations because of the coronavirus. With serious repercussions for both human well-being and the global economy, social isolation first became necessary and then desirable.

The transportation system (freight and passenger) was affected by this (e.g., reduced capacity for public services; aversion to congested transport services), with medium- and long-term repercussions that are yet unclear. Furthermore, sustainable development, this crisis may also be seen as a chance to reintroduce social and welfare measures. In this light, the creation of novel technology (such as driverless vehicles and smart highways) may serve as an impetusfor reviving towns from a sustainable point of view, provided that the associated ethical and acceptable issues are resolved (Carten, 2020).

1.5 Transportation Planning Goals

Planning for efficient transportation systems involves several vital objectives. The trick is striking a balance between them while developing a strategy to achieve the Planning Goals forTransportation.

Figure 1.1: Transportation Planning Goals

1.5.1 **Access to Employment:** Link neighborhoods with high unemployment rates to jobhubs and other important centers of activity via public transit.

1.5.2 **Freight Mobility:** The transportation of commodities into, within, and out of the areacan be facilitated by improving freight routes and intermodal links.

1.5.3 **Safety and Security:** Facilitate enhancements to the transportation system that will make it easier for passengers to feel protected.

1.5.4 **System Reliability:** Reduce travel times and enhance regional accessibility by implementing the necessary technological and programmatic measures.

1.5.5 **Congestion Mitigation:** Encourage transportation system enhancements that addresscurrent and anticipated future traffic issues.

1.5.6 **Environment and Air Quality:** Offer alternate project designs that will help preserveand improve the natural environment.

1.5.7 **Multimodal Connectivity:** Make all the transit options more easily accessible andlinked.

1.5.8 **Preservation and Maintenance:** Maintain a high level of serviceability for all of thetransportation infrastructure people already have.

1.6 Public Transport Development Strategies

Add Public Transportation (e.g., Commuter rail, Light rail, BRTS-Bus Rapid Transit System)to meet the present and future demands; it is necessary to provide high-quality mass transit integrated with the larger sustainable public transport system. Plan Transportation and Development Together (Transit Orientated Development) The public transportation system, in addition to the environment and society, would gain greatly from a more thorough integration of land use planning and latest transport. For this purpose, Transit Oriented Development (TOD) a concept whose basic principles and extensively discussed in Technical Report should be implemented to bolster the public transportation system. Improve public transportation to meet its users' needs in terms of time, money, comfort, cleanliness, and safety.

Public transportation should be accessible to all, including those who may be less able to utilize it, such as the disabled, children, and the elderly. Upgrade Existing Public Transportation Systems Invest in better public transportation terminals, intermodal hubs, bus stations in convenient locations, bus priority lanes, and maintenance garages. Also, ensure saferoutes for pedestrians and cyclists to and from public transit stops and stations, reliable

taxi service and information, and streamlined public transportation marketing and ticketing. VerifyThat Only Specified Vehicles Are Used Make sure that the proper vehicles are used for each service and do everything people can to increase the accessibility of the Transports Pblicos deMaputo (TPM) collection so that it can help implement the Urban Transport Master Plan's vision of better public transportation. Formalize the public transportation sector's organizational framework and implement necessary regulations.

Regulate the public transportation sector and make it more formalized. The present, highly limited, inefficient informal public transport industry should be turned into a formalized public transport business, and their functions should be progressively altered to feeder mode to the planned mass transit networks. Adjust your pricing to a level that will not break the bank. Carefully analyze the tariff structure, fare levels, fare scale, and consequences for collection and ticketing to implement a financially sustainable fare system.

Strengthening the Capacity of Institutions Assuring that the public and commercial organizations responsible for providing public transportation services have sufficient means requires better institutional capability. To guarantee the supply of a public transportation system that will fulfill the future demands, it is necessary to have sufficient staff with the right skillsets, efficient processes and procedures, adequate equipment, and sufficient finance.

1.7 Transport Planning Objectives changes during the Covid-19 Lockdowns

The epidemic has presented new difficulties and altered travel patterns that were not anticipated. Because of the urban planning policies, the transportation industry must function tofurther guard the public's health even as minimizing its negative effects on the economy ("decreased mobility to limit the spread of the virus, increased road space for active modes"). Due to restrictions on our ability to travel together, people often have little choice but to make our journeys alone or with fewer passengers than people would want. Authorities and providers of transportation services must react to the pandemic crisis by enhancing the availability of safe mobility systems and services. Many publications have been published since the coronavirus's beginning that focus on the pandemic's consequences on transportation performance and passenger conduct (Budd and Ison, 2020; Awad-Nunez et al., 2021; Bian et al., 2021; Andreoni, 2021).

1.8 The Transportation Impact of COVID-19

The primary focus of transportation and logistics companies is the efficient transit, warehousing,and distribution of commodities (Umar M et al., 2021). However, it has been said that the present businesses have been badly and permanently damaged by the COVID-

19 pandemic (Haque et al., 2021). It's important to remember that the outbreak has made things harder for businesses in new ways and shown how weak old problems and ways of doing things are. It is very hard for officials to help with unemployment and health care while also stepping in to keep the government from shutting down (Gao et al., 2022; Su, Dai, et al., 2022; Yarovaya et al., 2021). Also, companies have been trying to adjust to the changing needs of customers and suppliers while avoiding any problems that might come up with their work and finances (Mirza, Hasnaoui et al., 2020; Su et al., 2020; Su, Huang, et al., 2021; Umar, Su et al., 2021).

Similarly, companies have had trouble with cross-border supply chain management and easing trade and other commercial activities (Dimakou et al., 2021). According to Apfalter et al., the epidemic has brought about supply disruptions and altered the balance of supply and demand across nations (2020). According to a report published by "the International Development Association," weak logistics and transport have stunted economic expansion and prevented thedevelopment of new jobs. "In addition, Singh et al. (2021) have pointed out that the transportation firms also engaged in freight forwarding, storage, inventory management, and other multi-model transit to lessen the impact of any potential economic hazards." Likewise, worldwide producers have used their transit channels, which are essential to getting their waresto customers (Haque et al., 2021).

Because of the myriad of tasks and procedures carried out by businesses in the name of the trade, logistics has been shown to significantly impact economic growth and productivity (Umar et al., 2020; Queiroz et al., 2020). This is specifically true in poor nations, where keeping track of items and ensuring they are delivered on schedule increases the price of logistics to around 25 percent of Gross domestic product, as noted by Loske (2020). However, "the present COVID-19 pandemic scenario has grown incredibly and extremely complex for economies tohandle the challenges and manage their remedies. Grida et al. (2020) argue that this unique virus has posed several problems for various countries." This epidemic is now hampering growth prospects, but it has been recognized that a healthy transport and logistics industry recognized may provide these chances. According to Wuest et al. (2020), it may be used to build a foothold in emerging areas.

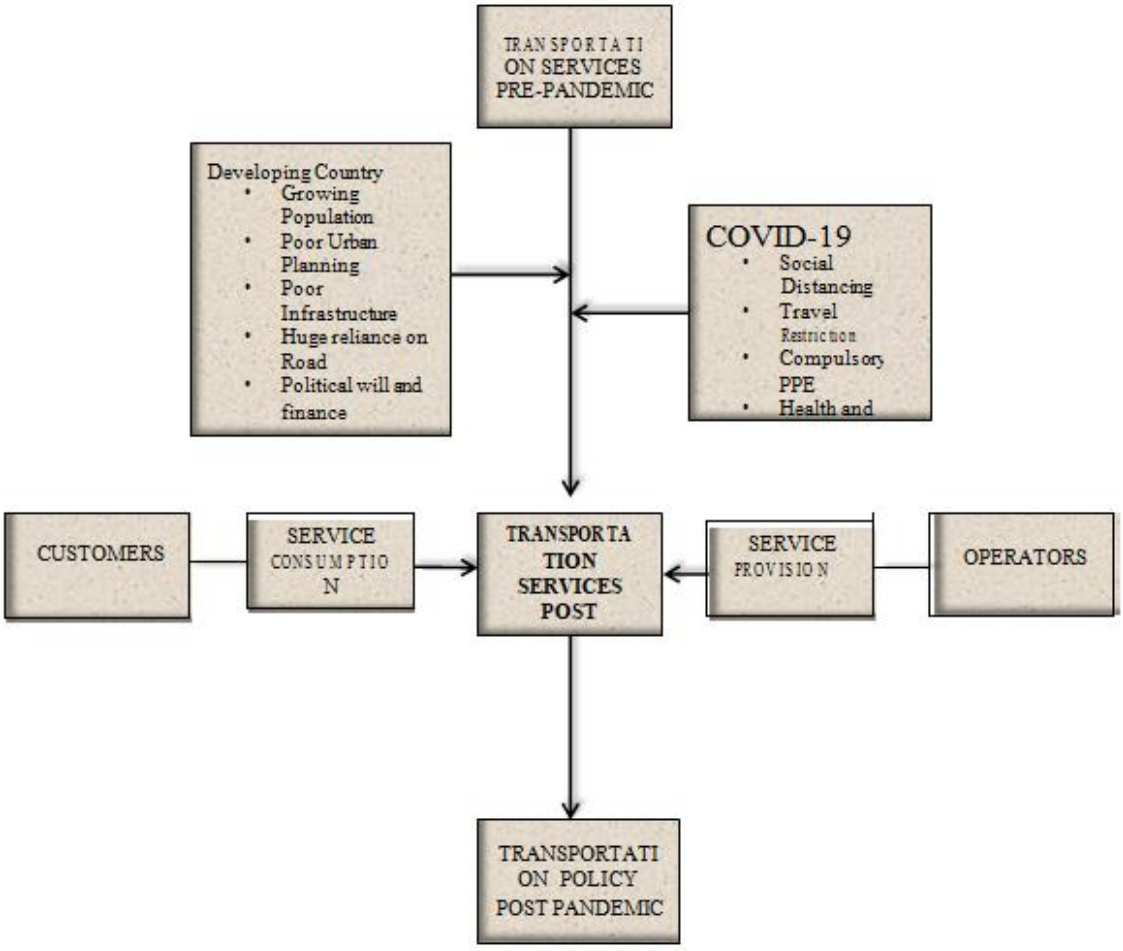


Figure 1.2: Transportation Services

Source: https://www.sciencedirect.com/science/article/pii/S0967070X21003553

However, it has been noted that manufacturing enterprises, along with all other small andbig organizations, have been impacted by the present problem of the COVID-19 epidemic (Xuet al., 2020). This is normally due to the inability to deliver produced goods to their respective locations and to provide raw materials to enterprises in a timely way so they can develop the very last product (Amankwah-Amoah, 2020). Dimakou et al. (2020) report that numerous transportable limitations are also appropriate to truck drivers and containers, which has created a substantial factor of dangerous limitations for transporters and slowed down operations in the business. Similar difficulties have arisen for several companies in the car, pharma, and medical equipment industries during the COVID- 19 outbreak due to inadequate transportation. Poor logistics andtransportation have caused them significant losses (Gkiotsalitis and Cats, 2020).

1.9 Socio-Economic Effects of the COVID-19 Outbreak on Public Transportation

1.9.1 Financial Adversity

The COVID-19 epidemic induced the worst financial catastrophe for public transportation systems in decades in only a few short weeks. People who use public transportation have dropped by a huge amount since COVID-19 spread. This drop coincided with increased associated expenditures due to stricter hygiene and cleaning regulations. Numerous publictransportation systems are experiencing financial difficulties due to the current economic climate, putting similar strain on governments worldwide. New York's "Metropolitan Transportation Authority" (MTA), the largest public transit organization in the United States, is asking for a $4 bn bailout because of the coronavirus outbreak (Goldblum, 2020). The government of other nations, such as Chile, has decided to give bus operators a reduction in demand in Santiago (DF, 2020).

Because of this, groups that run public transportation have to fight with other causes for money. When it comes to collecting fares, implementing new public transit regulations might have unintended consequences. If drivers are not separated from passengers by a physical barrier, it may be advisable to require passengers to enter the vehicle through the back doors. Since March 2020, cities including Santiago and Montreal, and the Netherlands have adopted this strategy. However, financial risks, such as persuading or forcing free trips, are incurred with systems that depend on front-door boarding for on-board fee payment. In addition to this problem, the heightened danger of spreading disease may prevent inspectors from conducting typical ticket inspections, in which they approach passengers to verify that they possess valid tickets or travel permits (UITP, 2020).

As a result, fare evasion might rise if there is no other way to pay the fee. The biggest issue is that public transportation companies might go bankrupt if they are not saved from thefinancial strain brought on by the decline in demand. While some nations may be able to fundpublic transportation, others may not. Public transportation in low-income and growing nations is often unregulated, without adequate safety or hygienic standards, and without publicsubsidies; the income of drivers is, therefore, directly tied to the number of passengers they transport each day (Tirachini, 2019; Gwilliam, 1999). It is expected that "the financial status ofsuch systems and the staff providing this sort of public transportation service" would be significantly impacted by the eventual duration of the coronavirus disease crisis.

1.9.2 Social Equity

Remote employment throughout "the COVID-19 crisis is mostly a perk of higher-paying positions,according to data from a number of countries, including the United States (Valentino-DeVries,Lu, and Dance, 2020), Canada (Tanguay and Lachapelle, 2020), and Chile (Astroza et al., 2020; COVID-19 2020)." The consequences of the pandemic on the job

market are felt most acutely by individuals with lower levels of education and women, “according to an analysis of data from20,000 persons in Germany, the United Kingdom, and the United States conducted by AdamsPrassl et al. (2020).” Because of the different times it takes for countries to recover from the epidemic, long-term effects are likely to make inequality within and between countries worse (The Economist, 2020). With this in mind, the idea that public transportation can bring people together instead of dividing them is more unrealistic than ever. People have stopped using public transit in huge numbers due to the COVID-19 epidemic. However, this trend is not consistent across socioeconomic categories.

Individuals from higher-income residents were the most likely to stop using public transportation, according to a new survey that compared trips taken in the final week before the coronavirus conflict in Santiago to those taken in the first week after nationwide indicators involving the virus were implemented in March 2020. People from low-income families used public transportation 30% to 40% less, while people from high-income groups used it 70% or more less (estimate based on Tirachini et al. 2020). These numbers support the idea that people with higher incomes are more likely to give up public transportation in favor of more private options, like working from home, paying for private transportation, or shopping online. On the other hand, people with lower incomes are more likely to stick with public transportation. The post-crisis period is expected to continue this disparity “inthe rate of adaptation in travel behavior between various social groupings.” As a result,increasing access to public transit is more important than ever for promoting social justice in the modern world.

1.9.3 Sustainable Mobility

Numerous concerns were raised about the long-term viability of city mobility in light of the substantial drop in demand for public transit caused by new physical distance habits and the danger of coronavirus spread. It will need concerted efforts by politicians, public transportation agencies, employees, and users to design a strategy to make “Public Transportation” secure fora time frame (post-crisis) that is likely to be protracted. The goal should be to make public transportation as secure as possible so that more people use it than only the ones who have noother choice. In the post-Covid-19 world, if buses/trains are almost always empty, the case forpromoting public transportation on the grounds of environmental and economic efficiency would be severely weakened, leaving only the argument that public transportation is necessary for the mobility of those who lack other options.

The demand threshold (also known as the BEP, or "break-even point") in PTV ("Public Transportation Vehicle") capabilities, which puts buses ahead of vehicles in terms of

transportation regarding pollution, energy consumption, and congestion, is a credible research. One example is the use of road space. Earlier to the coronavirus pandemic, the average number of passengers per bus in Santiago was between 28 and 65 (during both peak and off-peak times), whereas the average number of passengers per automobile was between 1.4 and 1.5. (SECTRA, 2013). Vehicle drivers are believed to require between 10 and 15 times as much road space as bus drivers, based on a "passenger car equivalence" (PCE) of 2 to 3 cars/bus.

This means that bus travel can have significantly lower average occupancy than vehicle travel while still making better use of road space. A lot of people are worried about the long-term viability of urban transport because of the drop in demand for public transit due to new habits of walking farther and the risk of the coronavirus spreading. It will need concerted efforts by politicians, public transportation agencies, employees, and users to design a strategy to make "public transportation" secure for a time frame (post-pandemic) that is probable to be protracted. The goal should be to make public transportation as secure as possible so that more people use it than only the ones who have no other choice. Currently, in-service commercial airplanes typically reuse fifty percent of cabin air.

1.10 Influence of coronavirus disease on passenger preventative actions and demand in public transport

- **Effect on Passenger Demand and Ridership Levels**

Changes in public transportation may be seen depending on how far the coronavirus has spread in the study area. During the COVID-19 epidemic, preliminary data suggests that ridership has dropped by as much as 80%-90% during shutdown times in key cities in China, the United States, and Iran, and by as much as 70% for some carriers in "the United Kingdom" (Union Internationale des Transports Publics, 2020b). "In Philadelphia and Detroit, ridership shortfalls are between 60% and 67% (Hughes, 2020); in Singapore, they are 80% (Chong, 2020); in Toronto, they are between 85% and 95% (Jeffords, 2020) in the New York City Subway (Teixeira and Lopes, 2020); in the Netherlands (de Haas, Faber, and Hamersma, 2020); in Lyon and Nice (Chivers, 2020); in San Francisco" (Hughes, 2020).

This data reflects variations in public behavior due to government directives, with demand lowered to solely needed travel. Changes in work patterns, especially in home offices, have also led to a decrease in ridership and have impacted all modes of transportation. So, how people think about risk may have a big impact on not only their immediate travel choices and the trade-offs they make between time and too much noise (Shelat, Cats, and van Cranenburgh, 2020), but also on how many people use public transportation after the

lockdown and maybe even the effects of the pandemic.

A few public transportation companies ceased operations completely e.g., in “Wuhan, China (Jiang et al. 2020) and India (Gettleman, and Schultz, 2020) or permitted the use of public transportation for only essential travel (e.g., California and a number of other states in the UnitedStates, Asia, and Europe)” to reduce operational costs in response to low travel demand. As was discovered in the context of India's transition to a statewide curfew (Pawar, Yadav, Akolekar, and Velaga, 2020), the extent to which traveling patterns change is determined not only by travelers' current insights of own security but also by their access to alternative modes of transportation. In order to adjust their actions in response to a significant decline in public health concerns, ridership, and legislative regulations, “public transportation service providers around the world have begun limiting service hours, discontinuing certain services, and closing specific stations.” For example, Transport for London (TfL) has stopped running the tube at night and taken down forty metro stations that aren't linked to any other routes (TfL, 2020).

1.11 Issues of Community Health in Transportation Planning

- **Taking Public Health into Account When Designing Services**

Without the right precautions, passenger transportation is a prime breeding ground for the transmission of infectious diseases because of the proximity of passengers. This is especially true on overcrowded public transportation modes when people from many walks of life headed in different directions must squeeze together. The question, therefore, becomes how much of afinancial hit, if any, should be taken by “the public transportation system in the form of preventive measures and increased travel times” to lessen the potential impact of an outbreak on public health. It is unsettling, but there are only so many people in society who would give upsaving lives.

Chorus notes that this calls for moral decisions, which are nothing new in transportation policy, regardless of the risk taken (2020). Consider the trade-offs in funding a link that would save travelers' time vs. a safety feature predicted to lower the likelihood of fatal accidents. There are trade-offs to be made while deciding how to respond to COVID-19, including those between hypothetical but potentially catastrophic hazards and the experience and inconveniencesfaced by many. Therefore, tools to aid in evidence-based decision-making are required, as aretechniques for experts to communicate with decision-makers and the public about the challenges faced and the outcomes chosen.

- **Physical Distancing in Public Transportation**

It was decided that only necessary or necessary travel should be permitted during the COVID-19 shutdown. When life returns to normal after a lockdown, it raises the issue of how far apartpeople should stand in taking the bus or train. Not many studies have looked at the influence of physical distance in enclosed settings, such as public transit cars and stations. Physical separation may not be as necessary on public transportation if other non-pharma precautions are required, like the right "use of face masks," improved cleanliness, or even a restriction on chatting. On the one hand, Shen et al. (2020) found that people can still spread the virus if they don't wear a face mask. This is being looked into further in current epidemiological efforts (Prather, Wang, and Schooley, 2020; Morawska and Cao 2020; Setti et al., 2020). If others are not wearing masks and there is an infected passenger on board, keeping a safe distance can cutdown on the spread of the virus but will not eliminate it.

But new epidemiological studies reveal that wearing a mask can greatly reduce the transmission of the coronavirus disease (Leung et al. 2020; Chu et al. 2020; Prather, Wang, andSchooley 2020). Recent reports from Japan indicate that when everyone is required to wear protective gear, public transit systems may safely operate with high passenger loads and passenger spacings "below the two-meter physical distance" requirement. Gyms, bars, live musicvenues, and karaoke rooms were recently identified as "the most common clusters of COVID-19 transmission in that nation." Commuter trains have not been connected to any cluster. One possible reason for these findings is the rarity of close-quarters interaction between strangers on public transit, as proposed by virologist Hitoshi Oshitani (Normile, 2020).

As a result, Singapore decided against strictly enforcing physical separation restrictions on public transit and instead mandated those passengers wear face masks and refrain from conversing with one another. The potential benefits of extensive "use of face masks to escape the spread of disease" are substantial; nevertheless, it is unclear how secure a public transit station or vehicle would be if all passengers wore masks (surgical, cloth, or N95) at various points in the pandemic. Since an "acceptable" occupancy level for public transportation has important social, economic, and operational repercussions, this is an issue of the highest importance. To rephrase the question: what should the max. Seat capacity of cars be if all passengers use masks correctly when riding public transportation, given that "a physical distanceof two meters" does not adequately operate when individuals do not use masks?

Public transportation experiences in major Asian cities like Tokyo and Seoul have shown"that a physical distance of less than one meter seems to operate effectively under

universal mask" wear and strong cleanliness standards; nevertheless, the present incidence of the virus isunclear in those locations. Without establishing strict physical separation requirements, the development of this method of utilizing public transit should be attentively monitored in the future to comprehend the circumstances that would permit its imitation in other placesthroughout the world. It is important to note that there is a shortage of hard data on the dangerof coronavirus transmission on public transportation under various use and operating rules (involving the implementation of preventative techniques), but more information is expected in the coming months.

Implementing face masks, ventilation, and sanitization are only a few potential solutions to the complex issue of increased maximum occupancy limits brought on by additional physicaldistance requirements. But things are not going to be as cut and dried as they seem, what withsome people not (properly) wearing masks. So, people are going to proceed on the assumptionthat there could be a need for physical separation, as is the case in many nations.

- **Examining the Potential for Virus Transmission in Mass Transit**

When weighing "the public health implications of different scenarios and solutions," it is crucial to have a firm grasp on "quantifying the transmission of the virus in public transit networks." Asa result, "there is an immediate need to link transportation models with epidemiological modelsto examine the ensuing contact graphs and their geographical effects" (Colizza et al. 2007; Barabási 2014). As one travels across a city on public transit, one's contact network will represent the group of people one may meet. "The transportation model will allocate trip demandto the service network," and the epidemiological model will utilize that output to revise the statesof subsets of the population based on their viral carriage status.

For any given day, a passenger may fall into one of four categories: infected (traveling), susceptible (not infected), "quarantined (infected but not traveling), or immune (andtraveling again)." "Key performance measures, such as the percentage of the passenger community that has been affected or the number of days required to negate the number of newcases," may be obtained by reassigning passenger demand to the network and analyzing the spread of the virus over time. "Passenger trajectories and the consequent crowding levels" must be analyzed since the propagation of a virus needs close contact with an infected passenger. Using precise smart card trajectories, Krishnakumari and Cats (2020) showed how this is possible.

Using the expected starting infected "passengers' trajectories, they evaluated the crowding circumstances that each passenger encounters on each segment of the route and the likelihood that a person is close to someone infected." Exit plans and post-pandemic reality may be better planned with such modeling skills, which allow for evaluating the possible effects of different "demand levels, service provision, and presumed viral spreading characteristics."

1.12 The Art of Doing without the Crowds: Making do with Mandatory Physical Separation

- **The Effects of Physical Distance on Service Capacity**

In order to comply with regulatory directives and lessen potential health concerns, the public transportation industry is actively altering services to meet distance standards and improve vehicle and station hygiene. However, as was previously said, there is still inconclusive information on the applicability of rigorous "physical distance" limits ("as two meters is likely not enough in closed environments if passengers do not wear masks, and there are public transport systems with a large no. of seats in which everyone wears masks that have good results"). "The service capacity supplied and, by extension, the system's ability to meet demand" must be drastically reduced in order to meet physical distance criteria. For the Washington, DC Metro, this would imply a capacity of just 312 people, a decrease of more than 80%, if passengers were spread out among stations and trains to provide a min. length of 1.5m (about 5 feet) from every fellow rider (Krishnakumar and Cats 2020).

Similarly, in order to maintain the status quo, it is advised that a normal 12-meter-long bus have a full capacity of 18 to 20 people (GIZ, 2020). However, as the pandemic progresses and more reliable epidemiological research becomes available, any new Coronavirus-induced capacity requirements should be evaluated and appraised. Because of existing high demand at peak times or a lack of available resources, expanding capacity by adding more cars per day or hour is sometimes not an option in many systems in order to compensate for the drop in capacity per vehicle (lack of more operators, vehicles, and drivers).

- **Redesigning services to fit current patterns of demand and limited capacity**

With "the new, more stringent capacity limits, public transportation systems" may be rethought to better meet the needs of their customers. Gkiotsalitis and Cats (2020) show how this may be done on the Washington, DC Metro system by resetting service frequencies to optimize the proportion of passenger requests that can be met. "To better adjust supply to unequal geographical patterns of demand," service redesign may go beyond reallocating to current services and instead incorporate modifications in the service configuration, such as

halting patterns and short-turnings (Tirachini, Cortés, and Jara-Daz, 2011).

This requires the incorporation of potential physical distance limits into operational, strategic, and tactical choices and considering their outcomes. Considering the equity implications of decisions that leave certain travellers unsatisfied is important. There isa possibility that on-demand transportation services will be employed to meet the needs of passengers who cannot be met by traditional bus or train routes. Using on-demand public services while traveling may lead to a smaller social circle (Kucharski and Cats, 2020). Furthermore, "on-demand services provide door-to-door transportation for customers in risk categories, including the aged and healthcare professionals, who could otherwise be left behind.Nations like Mexico (Jetty, 2020) and Germany have already developed arrangements for shared-mobility businesses to offer exclusive operations to healthcare personnel (Carey, 2020)."

- **Managing Crowding Effectively to Reduce Public Health Risks**

Management of crowding is crucial in fighting the spread of viruses since close contact is considered necessary for viral transmission. This includes not just the cars themselves but alsothe platforms and station walkways to keep passengers comfortable while they walk, wait, ride,and switch lines. One-way doors, corridors, and stairways are all examples of crowd control strategies used in stations to assist in segregating flows and decrease passengers' directconnection with one another. For the same reason, passengers may be required to enter and exitthe vehicle through certain doors (Jara-Daz and Tirachini, 2013; West and Cats, 2017), even ifthis change is expected to long wait times at stations where boarding was previously permitted from any door. Priority and control mechanisms for public transportation can also play an important role in reducing passenger congestion.

Congestion after a lockdown may worsen if it is not managed well, as some people may switch from public transit to their vehicles. It will become increasingly important to take operational steps to assist public transit as congestion rises. Dedicated bus lanes will help ease congestion on buses and at bus stops, saving money and time for public transit passengers. With the same number of buses operating more often, fewer passengers will need to squeeze into each ride, even if journey times are cut in half. Even if the system's total capacity is adequate to meet the requirement for "public transportation journeys, indicators to control bus headway to reduce bunching" will become increasingly important during the coronavirus pandemic because irregular headways between buses stimulate unneeded congestions (a half-empty bus guided by a full bus). Holding, speed regulation, and station skipping are all methods for reducing bus clustering (Muoz et al. 2013; Hickman 2001).

- **Possibilities for Diversifying Passenger Demand**

Most of the demand for public transportation is derived from demand, meaning that individualsgo because they have tasks they need to complete once they arrive. As a result, demand controlmeasures must also be implemented in addition to supply-oriented measures if people see significant drops in station and vehicle occupancy. Ultimately, these policies aim to limit "the number of people in and the number of relationships" within the networks formed by people using public transit. Some crucial steps are promoting remote work and discouraging unnecessary travel.

Due to the considerably decreased capacity of public transit services due to physical distance regulations, demand would probably exceed supply during peak hours on the high-demand routes when they gradually reopen following the lockdown period. So, it is important to spread out the delivery of services as feasible in terms of time and location. Here, various sectors of society and the economy must work together to coordinate their departure strategies, scheduling work, school, and shopping to spread out demand over a larger time frame. Involvement from several parties is necessary, but the benefits should last long after the COVID-19 pandemic is over.

- **Passengers' Behavioral Responses and Adaptations**

Passengers may respond differently to coronavirus pandemic circumstances and accompanyinglockdown and escape procedures. The primary factor driving this is the desire to keep from beinginfected. Avoiding crowded areas is a good rule of thumb to apply in this situation, especiallywhen more reliable information is unavailable. Depending on the severity of the problem, people may opt for different modes of transportation, depart at off-peak times, change their final goal to a less crowded store, or even decide not to travel at all (e.g., e-shopping). Due to all these choices, there will be major changes to traffic patterns and ridership. Personal preferences, household income and composition, working from home, logistics, the flexibility ofwork schedule, computer literacy, and vehicle access all play a role in the population's desire and capacity to exercise such adaptation. All this suggests, and preliminary research backs thisup, that people's opportunities to avoid crowds are unequally distributed.

1.13 Virus Transmission Risk and Related Preventative Measures in Transport

Governments, as a component of their escape plans, establish regulations for the public transportation system. Improved ventilation in buildings and vehicles, as well as more regularand strict cleaning of surfaces, are all part of the new regulations. The necessity of

cleanliness,sanitation, and ventilation seems to be widely agreed upon, and these topics are discussed by Tirachini and Cats (2020). For COVID management, Shen et al. (2020a) present an overview of approaches ranging from personnel management and material sanitation to communication campaigns for public transportation. Evidence of possible viral spread by public transportation is few. However, it is expanding quickly. Statistically speaking, there was a link between using the bus/tram in the 5 days before the beginning of symptoms and contracting anacute respiratory illness such as COVID, as described by Troko et al. (2011).

Public transportation was crucial in the dispersion of coronavirus from Wuhan to many cities in China, according to research by Zheng, Bi, Xu, Wang, and Ning (2020). This result, however, was derived exclusively from correlations between coronavirus instances and service regularity between city pairings; no causality can be inferred. Demand movements between the two cities are likely at the root of this correlation. In 2020, Yang et al. reported that a passenger on a coach bus infected with COVID-19 was just 4.5 meters away from the bus. A similar finding by Shen et al. (2020b) found that those who rode buses that used air recirculation were more likely to become infected. According to Hernandez (2020), there was no discernible pattern to the spread of infection on a bus in Ningbo, China; passengers near and distant from the sick individual contracted the disease.

To lessen the likelihood of a virus transmitting in public transportation, Zheng et al. (2020) stress the significance of better ventilation. Vuorinen et al. (2020) also stress how important it is to reduce crowding, improve airflow, keep people from getting too close, and limit time spent indoors in places where a high spray formation is likely to happen. Based on an empirical study oftrolley bus surface and air samples in Italy, Di Carlo et al. (2020) determined that thecleanliness, ventilation, and interpersonal safeguards implemented on the bus were successful.Jones et al. (2020) synthesized the available evidence to summarize how the level of risk transfer is jointly determined by environmental factors such as “group activity (occupancy level, contact time, and whether one remains silent) and face covering”.

As long as there is sufficient ventilation, individuals cover their mouths and noses and maintain a low volume level during brief contact periods; the transmission rate may be kept low even in a highly populated area. When in touch for a while, the transmission rates rise to a medium level. However, countries have widely varying policies on the use of facemasks, whichcan range from mandatory use at all times when leaving the home to mandatory use solely onpublic transportation vehicles or hospitals. In contrast, although some nations have made it lawful to use face masks in specific situations, others have only recommended them.

Since governments worldwide have restricted people's freedom of movement, public transportation companies have decreased the amount of space they make available.

Using data from 149 nations and locations from 1 January to 30 May 2020, Islam et al. (2020) conducted a fascinating time sequence analysis of coronavirus instances, seeing the physical distance treatments as a field experiment. Once they accounted for other treatments, they found no indication that the suspension of public transportation had a protective impact on the incidence of disease (i.e., closing down of workplaces and schools, lockdown, restrictions on large and public events restrictions). Worldwide, authorities advise citizens to keep their distance from one another to prevent the spreading of infectious diseases.These reforms may have the greatest impact on public transportation services. Varyinggovernments and health organizations give different distancing guidelines to maintain public safety, which is a strongly debated subject. Most governments and the WHO advocate for a 2-meter social distance between individuals.

A thorough examination of the literature by Bahl et al. (2020) revealed that the 1- to 2-meter restriction is dependent on "limited epidemiologic and model-based studies" of a group of disorders. Public transportation service providers in many nations are under pressure to change their business practices to comply with physical distancing regulations, despite the conflicting and inconclusive evidence regarding the effectiveness of such measures in dropping the threat ofan epidemic when people are wearing face masks (Javid, Weekes, and Matheson, 2020; Greenhalgh, Schmid, Czypionka, Bassler, and Gruer, 2020). In response, service providers everywhere are rolling out new policies that will drastically cut available resources. Many public transportation companies have started or will start running because of national rules that require 1-2 meters of physical separation. This has caused a big drop in capacity, between 60% and 90%.

Planning approaches and technologies that help keep public transportation systems running smoothly while reducing potential dangers to public health in mass transit and crowd control are urgently required. To prevent infractions of distance rules, several service providers have set restricted capacity limits; nevertheless, these have been imposed ad hoc. The RegionalTransportation District in Denver mandated a 15-passenger cap on city buses and a 30-passenger cap on rail cars (Hughes, 2020). With a 2-meter safety zone (Guardian, 2020), the United Kingdom's public transit system will reopen. Because of this, just "10% of the usual number of passengers" will be allowed on board. Despite some evidence suggesting coronavirusmight transmit further than two meters, most governments and health organizations hold that this distance is sufficient to ensure public safety.

This is probably the result of a compromise between maintaining social order and lowering the likelihood of spreading. However, it is generally agreed that the danger of transmission does not rise in direct proportion to the inverse of the physical distance between the two parties. The danger may grow exponentially below 1 m, and physical separation standards of 1, 1.5, or 2 m aim to guarantee a minimal risk of transmission (Jarvis et al., 2020). With fewer people using public transportation when COVID-19 and associated lockout strategies are at their height, it was easier to keep people physically separated during the initial phase. With passengers spread out uniformly across stations, each train in the Washington, DCmetro system can only transport 18% of its complete capacity with a 1.5-meter distancing and 10% with a 2-meter distancing, according to recent research by Krishnakumari and Cats (2020).

After introducing 1-meter, 1.5-meter, and 2-m social distancing regulations, "Gkiotsalitis and Cats (2020)" found "that the average train capacity in the Washington metro" could be lowered to 11.6 percent, 8.7 percent, and 6.5 percent, respectively. Furthermore, they demonstrated that 23 percent of the total traveler's trips might stay dissatisfied during the peakhour when applying a 1.5-meter distance policy and 43 percent when using a 2-m distancing policy. The public transportation industry faces unprecedented problems due to the drastic changes in ridership numbers and patterns and the deployment of measures to limit the virus increase.

There is a lot of uncertainty around these shifts, and the dynamics of a pandemic rarely adhere to a regular route to recovery. Providers of public transportation services had to adapt to these drastic shifts using just the information they had at hand and some ad hoc measures. In what follows, researchers survey the literature on public transportation in search of insights on how existing planning practices may be modified to meet these emerging needs.

1.14 Handling with the Impact of COVID-19 on Transportation in a Developing Country

The fast spread of COVID-19 has had far-reaching social and economic effects, the full extentof which are still being calculated. It is hardly an exaggeration to claim that COVID-19 has caused the most significant socioeconomic disruption since WWII (Adekunle et al., 2020). The seriousness of its repercussions is conditional on "regional development" and the efficiency of "policyresponses." The reaction of impoverished nations to the development of coronavirus illness varies greatly, while wealthy countries have "well-established policy frameworks" for coping with varied macroeconomic shocks (Mogaji, 2020a). It was hard to deal with the COVID-19 pandemic and its aftermath because of institutional bottlenecks (Wadoum and Clarke, 2020), a lack of transportation facilities that are deep enough to handle

an upcoming public health recession (Mogaji, 2020b), different "public transport management procedures," and different societal responses and a willingness to adapt to a new normal (Budd and Ison, 2020). Examining the ripple impacts of the corona epidemic on the transportation industry is important for advancing realistic and evidence-based transport policy lessons.

Putting regional and national limits on the free movement of goods and services and stressing the need for personal hygiene are the best ways to stop the spread of contagious diseases from one person to another (Chinazzi et al., 2020; Wells et al., 2020; Kraemer et al., 2020). Many people worldwide are subject to some kind of limitation, not counting those on the necessary duty of care. All parties involved in the transportation business were subjected to “new normal” processes due to these strict measures (self-isolation for infected patients, remain-at-home directives, and directing important duties and care) (Mogaji et al., 2021).

Transformational changes in the way we organize and build our transportation systems and our cities. Policy suggestions are needed to provide additional information on how to achieve a “responsible transport delivery post-pandemic.” People made theoretical improvementsto the management and delivery of transportation services during a pandemic, particularly in low-income regions, and the results of our research provide practical, actionable advice for thissector.

To those with a stake in the transportation sector, it will shed light on the most effective means of resolving the uncomfortable tension between the behavior of commuters and operators with regards to cost minimization and profit maximization goals, as well as on the best ways to make sure safety compliance and navigating urban as well as “infrastructural changes in the event of a public health crisis.” Research waves can be sparked by the results of this study, which is crucial since improvements in transportation technology are needed to alleviate pressure on overburdened public transportation systems.

1.15 Planning for Public Transit with Social Distance

1.15.1 Strategic planning

Planning public transportation involves deciding where and how many stops will be situated and what routes will link them (Bagloee and Ceder, 2011; Shrivastava and O'Mahony, 2009; Yu,Yang, Jin, Wu, and Yao, 2012) much though well-designed networks may be able to tolerate moderate fluctuations in passenger demand (Cats, 2016; Jenelius and Cats, 2015), the drastic shifts in demand brought on by COVID-19 may require much more extensive adjustments. The needs of the pandemic need adjustments to the public

transportation network, yet long-term decisions like station location or the tracks/roads that a train/bus route should follow may be easily adjusted. Strategic choices for public transportation providers are limited by the currentnetwork's limitations.

Despite this, as was previously indicated, several operators have either discontinued all line services or modified others, closing stations in response to fluctuating user demand (UITP, 2020b). While transit companies' choices to close stations depend on their knowledge of the area, there is a lot written on choosing which stops to skip to maximize service efficiency in light of current demand. Several books and articles indicate which stations should be ignored based on riders' demand patterns (Liu, Yan, Qu, and Zhang, 2013; Wang, De Schutter, van den Boom, Ning, and Tang, 2014), although this literature mostly disregards the influence of isolation on riders. While the drawbacks of stop-skipping have been taken into account, to figure out which stops a bus or train line should skip, it has been used a lot for real-time operations (Altazin, Dauzère-Pérès, Ramond, and Tréfond, 2017; Wang et al., 2014; Muoz et al., 2013; Sun and Hickman, 2005; Fu, Liu, and Calamai, 2003).

Companies providing public transportation services are prepared, at an "offline" strategic level, to choose which stations should be shut down to lower operating costs or transmission hazards. Methods for developing stop-skipping tactics consider various importantperformance factors to provide a strategy schedule of missed stops for all daily travel. Time spent waiting, and passenger traveling (passenger-related expenditures) are two aspects that should be measured for these KPIs (operational costs). They should also consider issues of equality in marginalized communities.

Stop-skipping choices should also be made with critical employees in mind. A review ofsome strategic stop-skipping strategies may be utilized to make an informed choice about which stations should be shut down because of COVID-19. Finally, it is important to rememberthat tactical stop-skipping cannot be utilized in isolation to decide which stations should be shut down. The following substantial changes are needed for them to function properly:

- To start, additional key performance indicators relating to the outcomes of coronavirusdisease should be incorporated into the objective activities. One such key performanceindicator is the likelihood of transmission due to insufficient distance.
- Second, adjustments need to be made to the vehicle capacities that are taken into account to align with "national social distancing" requirements.
- Ultimately, limitations may be introduced to guarantee that the chosen locations are

skipped continuously during the day instead of setting them per trip, i.e., to permit thetemporary shutdown of the appropriate locations.

1.16 Strategies in the context of COVID-19

People use the growing cluster dynamics and a lot of literature to come up with a complete plan to stop a pandemic and a public transportation system that is driven by passengers. First, describe three programs developed to counter the threat posed by COVID-19. Second, they synchronize the three programs with different traveler clusters todevelop tailored pandemic response plans. In the third place, they create a system for transporting various passengers. The three-tiered plan to curb epidemics is laid forth. Insights from previous empirical investigations suggest that the coronavirus pandemic measures have affected the vast majority of the parameters.

A better knowledge of how to prepare for the right services may be gained by analyzing passenger data based on aspects related to service quality. In addition, the results ofthe literature study conducted during the COVID and post-COVID periods assisted in developing suitable solutions for customizing public transportation services and avoiding epidemics. The next parts give service providers a thorough public transportation framework and an epidemicprevention strategy.

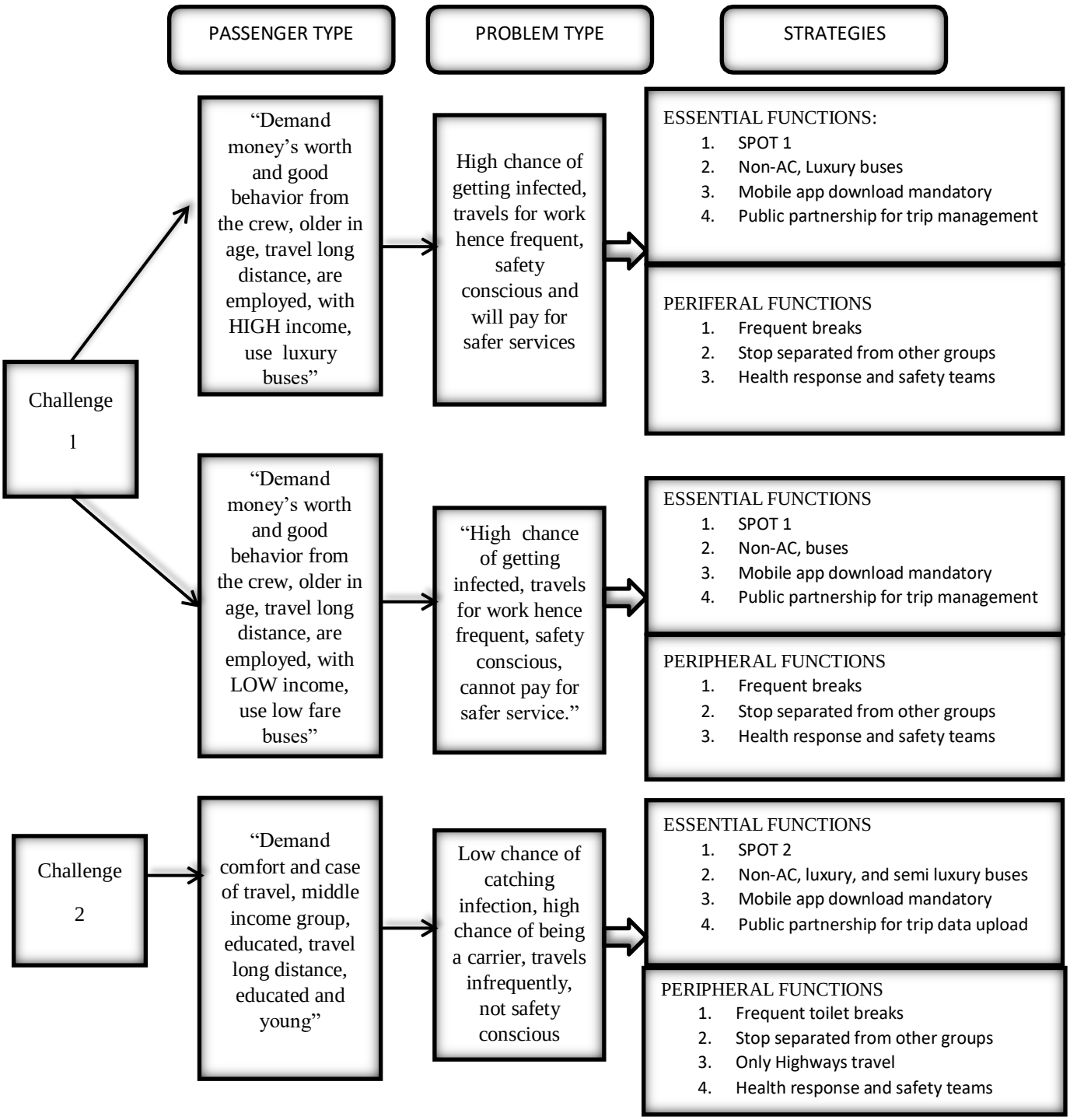
1.17 Public Perception of COVID-19 Outbreak

To encourage and inform the public about the pandemic circumstances and to encourage and inform the traveling public to practice caution and safety, it is crucial to have a firm grasp on how the public perceives these issues. If the government issues warnings about potential healthrisks, Public Transport users would likely accept them for their good in this scenario. There isa high risk of spreading an infection from an infected person on public transportation or throughcasual public contact. Anxiety over learning the outbreak's status swiftly changes public behavior, which might affect public transportation. This was proven by Rubin et al. during the spread of swine flu.

The danger, emotion, and behavior reaction of the public during the coronavirus epidemic were evaluated by Hou et al.,(n.d.) who found that announcements and rumors would have asignificant influence on public image and may lead to a panic scenario. The public's reaction to pandemics is well understood because of previous outbreaks like “severe acute respiratory syndrome” in 2003 and “Middle East Respiratory Syndrome” in 2012. The public's regular behavior (ignoring safeguards) and other specific behavior essential in pandemic scenarios make it exceedingly difficult to gauge the risk, and this fear has

increased as coronavirus severity has increased. Thus, encouraging people to change their behavior in certain ways regarding cleanliness and social distance has proven effective, and new hygiene measures implemented during disease outbreaks aid in the Public Transport system's speedy recovery.

The epidemic has resulted in a considerable drop in leisure and out-of-home activities. Researchers discovered that the risk perspective had a substantial impact on the decline in leisure and recreational trips' outdoor activities. A lot of studies have shown that the pandemic has had a big impact on transportation. There is a rise in the usage of Information technology during pandemics, as identified by studies of the perceived danger, subjective norms, and function of Information technology. The general population has observed the following threats to using public transportation.


PASSENGER TYPE
PROBLEM TYPE
STRATEGIES
Challenge 1
"Demand money's worth and good behavior from the crew, older in age, travel long distance, are employed, with HIGH income, use luxury buses"
High chance of getting infected, travels for work hence frequent, safety conscious and will pay for safer services
ESSENTIAL FUNCTIONS:
1. SPOT 1
2. Non-AC, Luxury buses
3. Mobile app download mandatory
4. Public partnership for trip management
PERIFERAL FUNCTIONS
1. Frequent breaks
2. Stop separated from other groups
3. Health response and safety teams
"Demand money's worth and good behavior from the crew, older in age, travel long distance, are employed, with LOW income, use low fare buses"
"High chance of getting infected, travels for work hence frequent, safety conscious, cannot pay for safer service."
ESSENTIAL FUNCTIONS
1. SPOT 1
2. Non-AC, buses
3. Mobile app download mandatory
4. Public partnership for trip management
PERIPHERAL FUNCTIONS
1. Frequent breaks
2. Stop separated from other groups
3. Health response and safety teams
Challenge 2
"Demand comfort and case of travel, middle income group, educated, travel long distance, educated and young"
Low chance of catching infection, high chance of being a carrier, travels infrequently, not safety conscious
ESSENTIAL FUNCTIONS
1. SPOT 2
2. Non-AC, luxury, and semi luxury buses
3. Mobile app download mandatory
4. Public partnership for trip data upload
PERIPHERAL FUNCTIONS
1. Frequent toilet breaks
2. Stop separated from other groups
3. Only Highways travel
4. Health response and safety teams

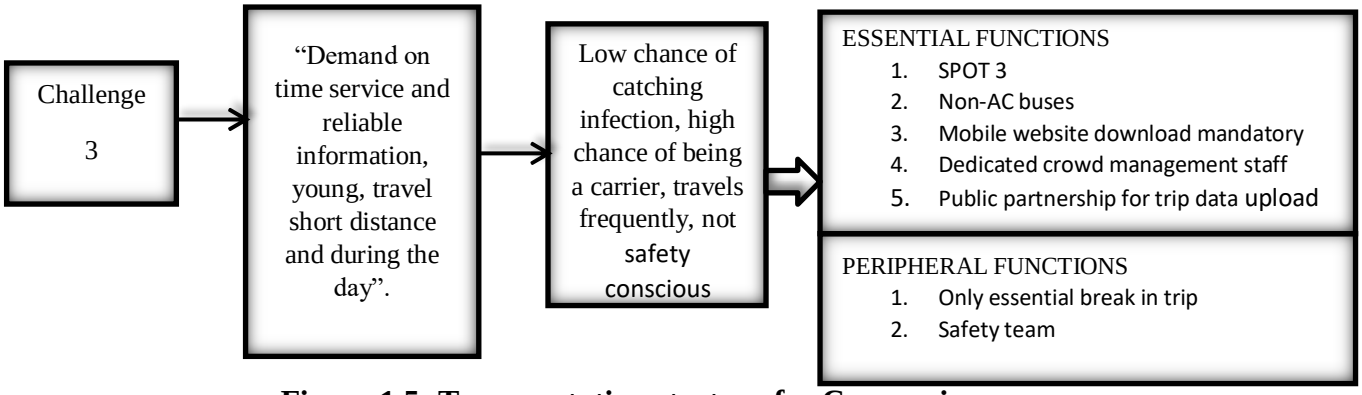


Figure 1.5: Transportation strategy for Companies
Source: https://www.researchgate.net/figure/Strategy-map-for-the-transport-company-authors-study_fig2_35296698

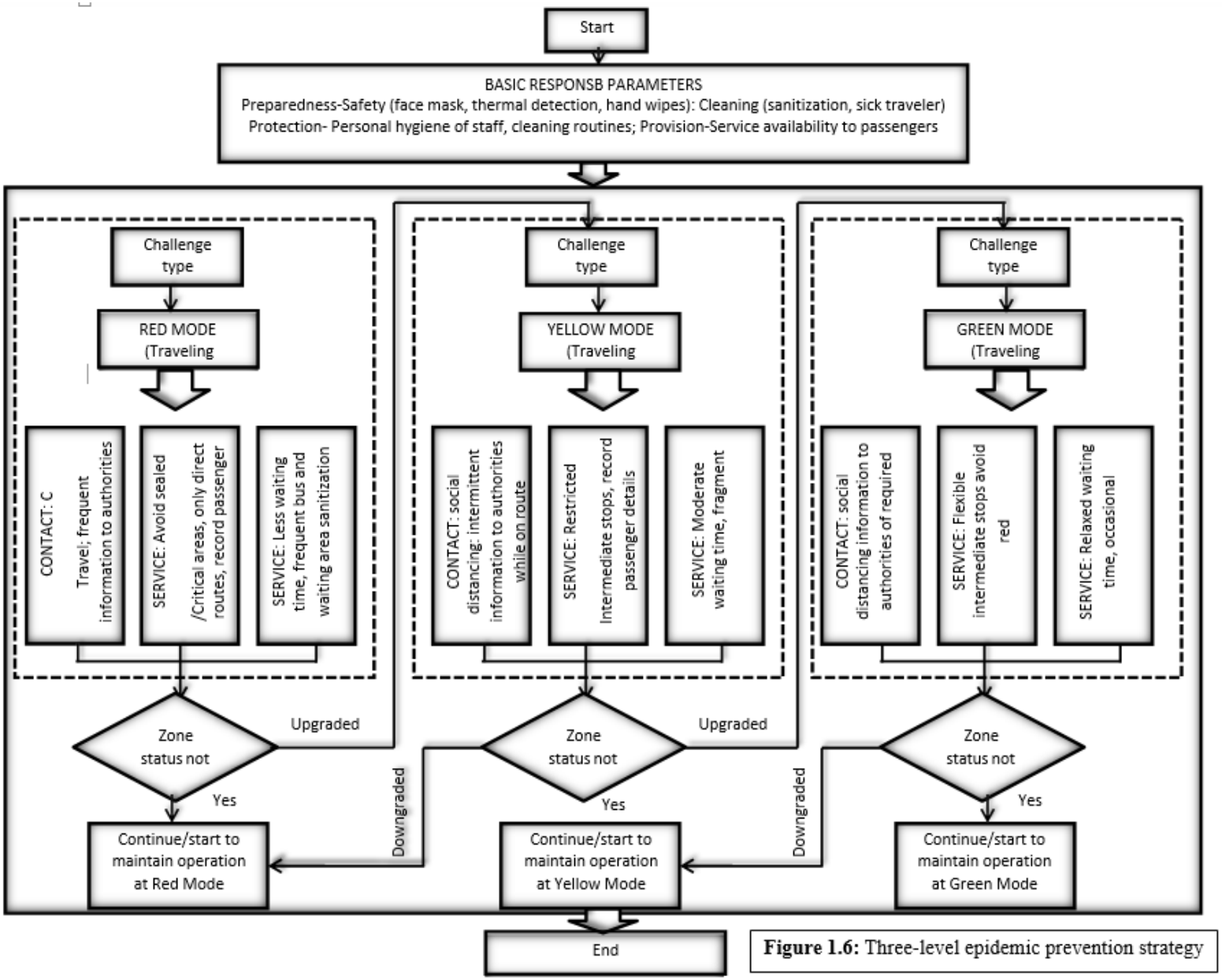


Figure 1.6: Three-level epidemic prevention strategy

1.18 COVID-19's Effect on Women in Transportation

While the coronavirus epidemic significantly impacts all vehicle employees, the effects on women vehicle workers will be unique and extra because of the industry's strong gender bias. The "International Labor Organization" (ILO) has noted that the difficulties caused by this situation can deepen preexisting divisions. In order to prevent this from happening, all actors in the transportation sector (governments, unions, employers, and investors) must take a gender-approachable strategy. Women in transportation are an integral element of the workforce that drives the global economy by transporting goods across borders and connecting markets. As the world mobilizes to combat the epidemic, these people are on the front lines, responding to urgent needs as drivers, ticket sellers, pilots, conductors, seafarers, cabin crew, and dockworkers. The unsung heroes keep transportation networks ticking over with essential tasks, including maintenance, cleaning, security, and administrative support.

Because the transportation sector is gender-segregated, women are disproportionately represented in high-risk customer service and cleaning positions. Women in the transportation industry are disproportionately vulnerable to the effects of the current coronavirus epidemic due to their higher risk of coverage, a lack of suitable and proper "personal protective equipment" (PPE), and the fact that women make up the proportion of precarious employees. Guideline 205 from the International Labor Organization calls for gender equality and women empowerment, and girls as part of any crisis response. Returning to "normal" after coronavirus implies, for many women in the transportation industry, continued exposure to abuse at home and work, a lack of leadership and decision-making opportunities, a lack of access to safe sanitation, and so on. This is not acceptable and has to change. Instead, people have the chance to create a "gender equal new normal" in which all workers have access to stable employment while people recover from the current economic downturn.

1.19 The Objective of the Study

1. **To determine the impact of the COVID-19 pandemic on public transport utilization in India.**
2. **To find out the reasons behind the change in the attitude of the general public towardsthe usage of public transport.**
3. **To analyze the difference in the functioning of public transit and the COVID-19pandemic.**
4. **To study the views and suggestions of the general public regarding public transport**.

1.20 The Hypothesis of the Study

H1: There is a significant impact of the COVID-19 pandemic on public transport usage in India.

H2: There is a significant relationship between the change in the attitude of the general public and COVID-19 towards the usage of public transport.

H3: There is a significant difference between the functioning of public transit and the COVID-19 pandemic.

1.21 Scope of the Study

Since the emergence of "COVID-19" in India, there has been a significant adjustment to public transportation planning. The most recent study looks into how COVID-19 has changed the plans for public transportation in light of what has happened. To achieve this objective, the research will also investigate how people's perspectives have shifted with regard to their willingness to make use of public transportation. Only mostly urban areas across the country are included in the study's geographical reach. The empirical investigation for this research is limited to the perspectives of five hundred persons who are residents of the cities of Kolkata, Mumbai, Indore, and Bengaluru, respectively. They will be solicited for their point of view on the use and change in plans for public transit.

1.22 Statement of the Problem

The public transportation and transit system has been severely disrupted by COVID-19. People are abandoning public transportation in favor of alternative options, such as purchasing a personal automobile or walking. As a result, public transportation is in decline. The challenge is to determine the factors that led to the decrease in usage of public transportation and the migration of people towards different modes of transportation. The study will determine what caused the public's attitude to shift andwhat caused the transportation plan to shift. It also figures out the positive and negative consequences of changing public transportation planning in an economy.

CHAPTER II:

REVIEW OF LITERATURE

2.1 Overview

In 2020, the socioeconomic and cultural sector was significantly impacted by the fast spread of infectious illnesses worldwide, and COVID-19 is responsible for thousands of daily fatalities. Since the effect of “COVID-19 on Public Transportation (PT)” is greater than that of other transport means, this phenomenon has a particularly worrying influence on the transportation industry (Tirachini and Cats, 2020). In order to reduce the danger of infectious diseases, the “World Health Organization (WHO)” has promoted physical separation between individuals (WHO, 2020). The PT makes it possible to carry many passengers efficiently at a minimal cost, but because of the vehicle's cramped conditions during the COVID-19 epidemic, the PT's crowding is unavoidably a fatal flaw.

The study looks at earlier studies with similar research goals to this chapter. A literature review's objective is to locate, evaluate, and comprehend the body of current written material produced by scholars and practitioners. The pertinent literature discloses the roots of important ideas, concepts, and hypotheses, useful information on problems, evaluations of current procedures, and empirical research. It is helpful to review earlier research on a subject to discover what sorts of concerns have been raised and what lines of investigation have been taken. Reading up on the appropriate literature and research is essential since they spell out the guidelines that must be followed.

This chapter talks about the systematic review of different types of literature from the past by different writers that looked at different aspects of the COVID-19 pandemic outbreak that caused plans for public transportation to change. In this chapter, things that are looked at are plans for public transportation before COVID, how the COVID-19 outbreak affected public transportation, and new rules for using public transportation. This part also talks about the research gap, gives a summary, and then ends the study.

2.2 Theory of Reasoned Action

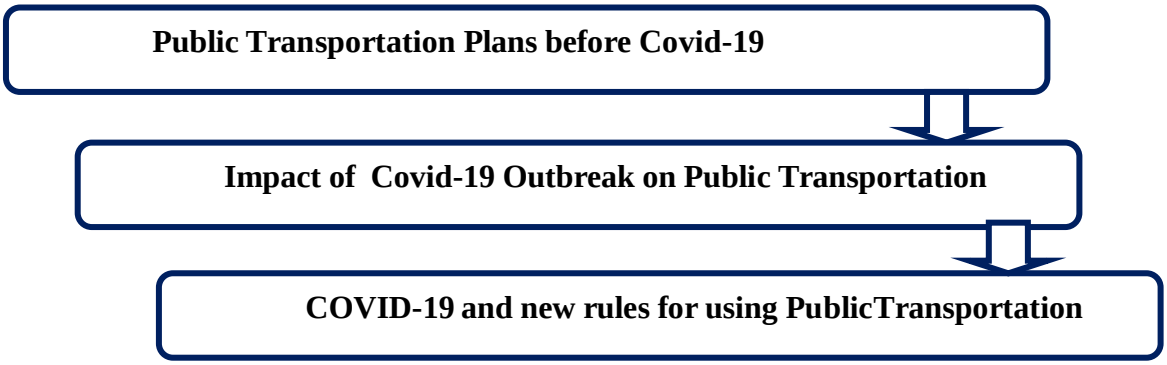


Figure 2.1: Variables of the study

2.1.1 Public Transportation Plans before Covid-19

Mekoth, N. (1997) showed that factors such as “safety, punctuality, regularity and frequency,comfort and convenience, the caliber of the crew, and social orientation” influence how customers perceive the quality of service. The study also demonstrated the viability and methodology for operationalizing various aspects of service quality by utilizing functional manifestations of those aspects. Measurement of perceived quality also highlighted the areas where public sector organizations require improvement. While Singh, S. K. (2000) stated that on the grounds of a “sample of medium- and the large-sized Indian States,” it was endeavored to present the latest data about the technological attributes of “state road transport undertakings (STUs).” It also determined the effectiveness of those establishments depending on the evaluation of a trans-log cost function employing the “fixed effects model of panel data method.” The study discovered that “smaller STUs” generally seem more effective than their bigger ones. The study also discovered that the “STU,” which runs longer routes per bus, is more likely to enjoy better production levels and that greater bus employment and capability would result in higher production levels. On the same note, Singh, S. K. (2001) projected the increase and the comparative levels of production evaluated in respect of “Total Factor Productivity (TFP)” in their analysis of the performance of “21 STUs.” Regression analysis was used to examine the causes of growth and variations in productivity levels. A comparison between the predicted TFP and other established measures of transportation product, such as revenue “passenger kilometers per employee” and “available passenger kilometers per employee,” was also recommended. Further, Singh, S. K. (2002) assessed the financial viability of “India's major municipal transport undertakings (MTUs)” by analyzing the changes in their productivity as well as their capacity to set prices higher than their costs. This was doneby doing

the analysis using a cost-plus pricing model. Because of the many ancillary issues, the study concluded that the several MTUs could not increase their traffic income sufficiently to meet their own individual running costs.

While Nandgopal, R., and Chinnaiyan, P. (2003) discovered that rural residents responded favorably to the use of minibuses and were content with the frequency, timetable, and policy regarding carrying bags in their investigation on theviability of the minibus plan in Tamil Nadu. The minibuses were seen to be operating at full capacity in order to break even. The bus fares bothered the proprietors, notwithstanding their satisfaction with the timetables. In their study, Geurs, K. T., and Van Wee, B. (2004) undertooka review to determine the applicability of metrics used in assessments of development,transportation, and land-use plans. Many pertinent factors evaluate accessibility measures, including their theoretical foundation, interpretability, communicability, and information needs. The ease of access effects of "land-use" and transportation plans are frequently assessedutilizing the ease of access metrics, such as trip speed, which are simple for academics and policymakers to operationalize and comprehend. Modern location-based and utility-based accessibility metrics, calculated with state-of-the-art data and land use and transportation models, may be operationalized to greatly enhance the existing practice while being reasonablyeasy to comprehend for academics and policy makers. Research directions for conceptually more sophisticated accessibility measurements included incorporating people's "spatial- temporal" restrictions and response processes among ease of access, "land-use," and tourism behavior. The relationships between ease of access, option values, and non-user benefits mustbe studied theoretically and empirically, and different ease of access elements must beevaluated.

According to Pucher J. et al. (2004), tremendous demands on all modes of transportation in India could be attributed to the country's rapidly expanding urban population. Growing demand for transportation services outstripped supply by a significant margin. Particularly, public transportation had been clogged. The majority of mass transit options, including buses and trains, were congested, unreliable, inconvenient, poorly coordinated, and often deadly. The fact that the government is responsible for and runs most public transportation systems also leads to lower productivity and higher prices. Improvements and expansions to public transportation were sorely needed in India's urban areas. Inadequate public funding and the absence of rules that might aid public transportation, such as giving buses precedence in traffic, make the situation untenable for the sector. While Chorus, C. G.,and Timmermans, H. J. (2009) developed and demonstrated methods for the "ex-ante" assessment of consumer advantages related to transportation system enhancements. In contrast to traditional assessments, they

assumed that the level of passenger awareness of changes to the transportation system is initially low and gradually increases. In particular, they posited that each day's journey affords passengers the chance to learn about recent modifications to thetransportation system. Both direct and indirect learning were part of this process, such as learning gained through social networks or information providing. Under appropriate error term assumptions, their measure of user benefits had a closed-form solution and included the traditional log sum-measure as a particular case (where complete understanding is expected). A numerical example offers the first indication of face authenticity.

Santos, G., et al. (2010) studied three major policies: “Physical policies, soft policies, and knowledge policies.” Each of the three aims to alter consumer and business behavior but in slightly different ways. Publictransportation, land use, walking and bicycling, road building, and freight transportation are among the policies in the first group that have a physical infrastructure component. Additionally, they think about the unique difficulties with mobility in developing nations and how to solve them. On the other hand, soft policies are less flexible and try to modify behaviorby educating actors about the implications of their transportation decisions and influencing them to do so. These actions include carpooling and car sharing, “teleworking” and teleshopping,and “eco-driving,” as well as public awareness campaigns and general informational materials. Ultimately, “knowledge policies” stress the crucial role spent on “research and development” in creating a sustainable mobility model for the future. In their study, Ming, H. E., et al. (2010) concentrated on the division of metropolitan train transportation modes and investigated two- stage rail transit split predictions. Using the transfer curve approach, they initially predicted the traffic composition without rail transportation. Finally, in order to systematize the standardconsiderations and anticipate the train transportation split, they used Suzhou city as an example.Their findings showed that rail had a significant diversion rate from conventional transportation and bicycles. With additional parameters influencing residents' choice of transport mode takeninto account, the model becomes more accurate and useful.

Further, Zebin, Z. H. A. O., et al.(2010) analyzed the development of the revenue redistribution strategy theory, the public support theory, and the social welfare theory as they pertain to road congestion pricing. They suggested using it for communication on metropolitan roads. According to theory, research, and actual experience with road congestion pricing profits redeployment, strategy recommendations, and appropriate tactics for implementing this approach should be made to determine the biased delinquent of welfare relocation and gain public backing grounded on the prioritization of transportation efficacy. This approach

successfully improved the viability andvalidity of the pricing method for traffic congestion, reduced traffic, and boosted transportation efficiency. In their study, Sumalee, A., et al. (2011) established a multi-modal transportation network project model that took network uncertainty into account on both the supply and demand sides. Unfavorable weather conditions, which have varying degrees of effects on various modes, cause these uncertainties. In the context of the common-line framework, they present "the derivations of the mean and variance-covariance of the stochastic passenger flows and dis-utility variables engaged in the route/mode choice model. "It was believed that the risk-averse passengers would weigh both the mean and variation of "the random perceived journeytime on every multi-modal path" when deciding which way to choose. The model uses a "Probity stochastic user equilibrium framework," which was phrased as a fixed-point issue, totake into account passengers' perception mistakes. The fixed-point problem was addressed using an algorithm, and some statistical instances were provided to highlight the uses of the suggested prototype.

Zhang, J., et al. (2011) created a general "multimodal transport networkmodel and tested it for "Automatic Terminal Information Service Procedures (ATIS)" applications." They first divided networks into public and private modes and modeled multimodal transport networks from an abstract standpoint. After that, they applied a general strategy that was modeled after the so-called super network technique to build a representation of a multimodal transport network employing transfer connections. Pedestrian networks are crucial for simulating transfer links across all modes. On the basis of a case study in the city ofEindhoven, they evaluate their model and algorithm. The outcomes show that their model andmethods serve as an appropriate foundation for ATIS applications. The time needed for data reading and compilation was now their biggest drawback. Increasing efficiency via the use of current computing techniques can resolve this. While Awasthi, A., and Chauhan, S. S. (2011) offered a hybrid method centered on "the Analytical Hierarchy Process (AHP) and Dempster Shafer theory" for assessing how sustainable transportation practices, such as mode sharing, multi-modal transportation, intelligent transportation systems, etc., affect cities. The problem-solving process involves several phases. The study identified the standards for evaluating sustainability in the first phase. The criteria are organized and graded using AHP. The secondphase involved testing "the transportation measure for sustainability" and gathering information for assessment purposes from a variety of data sources, including "human experts,questionnaires, sensors, and models." "The Dempster Shafer theory" was employed to merge data from several data sources. The final phase involves utilizing a "Transport Sustainability Index (TSI)" to gauge the city's sustainability." The transportation measure's pre- and post-test stages" are used to

generate the Transport Sustainability Index. By comparing the values at “the pre- and post-test stages,” they evaluated the effects of the “transportation measure” on the sustainability of the city in the fourth step. If a rise in TSI value was seen, the transportation measure was seen to have a good influence on municipal sustainability and was advised for adoption. Similarly, Tlig, M., and Bhouri, N. (2011) created a “multi-agent bimodal traffic control” approach for cities. This multi-agent technique controls traffic signals to manage transportation, encourage bus passage, and keep track of the gaps between buses that are drivenalong a particular bus route. In order to better control “the bimodal urban traffic between publictransportation (buses) and private vehicles,” they provided a model that had been adjusted to agenuine traffic scenario and suggested new possibilities. While Holmgren, J., et al. (2012) proposed “the Transportation And Production Agent-based Simulator (TAPAS), an agent- based model” for simulating transportation networks that may be utilized, for example, to analyze measures for infrastructure and policies connected to transportation. TAPAS is more effective than conventional methods for analyzing freight transport because it unambiguously demonstrates manufacturing and consumer need and encapsulates the interactions, heterogeneity, and decision-making processes of the many participants in the transport chain. TAPAS depends on causation, i.e., the emphasis was on the choices and conversations that runto actions, whereas traditional techniques depend on presumptive statistical connection. Two interconnected layers make up TAPAS, one of which simulates physical activity.

Behrends, S. (2012) looked at the interaction between urban mobility and “Inter Railway Request Transfer(IRRT)” to discover potential local initiatives to boost “the competitiveness and environmentaladvantages of rail freight.” A structure for environmental metropolitan freight transportation was designed and implemented grounded on a review of the literature examining the stakeholders'viewpoints on this kind of transportation. As a result of capacity issues in urban locations, theirfindings indicated that the urban setting poses a danger to the further expansion of rail freight.By including all interested parties in “the strategic land-use” and transportation planning processes, local governments may play a crucial part in fostering the needed “public-private” collaboration on a provincial level. In their study Bouhana, A., et al. (2013) suggested using‘a multi-criteria approach” to tailor itineraries for transit customers based on their requirements and preferences. The suggested method combines Choquet integral and case-based reasoning to provide a schedule that most closely matched the user's preferences. The suggested techniquealso predicted the consumer's attitude by contrasting his choices with those of other consumerswho share those interests in a certain setting. This may enable the customer to take the best course of action in a new circumstance during his journey hunt. This

assisted the consumer inchoosing the appropriate course of action in a novel circumstance. The two-additive Choquet integral was used to measure the weights of the criteria used in personalized information retrieval. In order to evaluate the efficacy of the suggested algorithm, a real-world itinerary planning issue identified in "the Tunisian metropolitan public transit network" was solved. Therewas also a comparative study done that included both qualitative and quantitative evaluation of the suggested strategy in comparison to two other methodologies. Their innovative techniqueoffers the best results for products needing customization centered on customer likings in a multi-criteria scenario, according to performance analysis and comparison research. Thinking about the environment and sustainability, Nair, R. (2013) investigated how people think aboutand feel about environmentally friendly automobiles. A questionnaire with a sample size of 157 people was prepared and distributed in the Mumbai region. The study identified how people in India think about green vehicles, how people feel about vehicles that run on alternative fuels, and the characteristics consumers look for in a vehicle that is considered environmentally friendly. Age, gender, level of schooling, annual family income, and the number of cars owned were some of the things that were looked into. The study revealed a few fascinating facts, any one of which can be of critical significance to a companythat makes environmentally friendly automobiles. Most people who participated in the survey think that conventional automobiles would eventually be replaced by environmentally friendlyalternatives, but the age group that felt this way the most was people aged 33 to 43. To a greaterextent than other people, those with higher levels of education, such as post-grads, appreciatedthe significance of environmentally friendly automobiles.

Further, Zeng, W. et al. (2014) stated autonomous vehicles could provide more public transit departures than the current ones,and the results of the study show that citizens would use them. Future study should look at how passengers feel again, and plans to use fully autonomous buses. However, full automation has not been reached yet, and there is a host on board who can control the vehicle if needed. "Parking, transportation and service (PTS)" mobility using a set of analytical tasks derived fromthe work of transportation experts. The study explored several different design directions before settling on a unified solution that consists of three simulation modules: There is an isochrone map for location data, a time flow map for easily comparing and changing time data, and an OD-pair journey view for a more in-depth look at the mobility factors along the routes of certain pairs of origin and destination. If you change a flow map into a parallel isoline representation, like in a time flow map, you may be able to show mobility data better along the horizontal time axis while still making the route people take to get from A to B look smooth and clear. In addition, the study provided many visual interactive query

techniques that allow users to probe the spatiotemporal dynamics of PTS movement quickly and intuitively. Last but not least, the study builds a PTS mobility model using millions of actual passenger paths and assesses the visualization methods using a variety of case studies with transportation experts. Stressing autonomous cars, Wu, J. et al. (2019) revealed that the proponents of autonomous cars, implementing them would have far-reaching positive effects on society, including fewer accidents, enhanced quality of life, and more efficient use of resources (including land and energy), and cleaner air and water. Self-driving vehicles cannot take off in the mainstream until people are comfortable with them. The survey results were then analyzed using structural equation modeling. Specifically, the results show that the publics perceived value of autonomous cars mediates the effect of the innovation diffusion traits' relative advantage, trialability, complexity, compatibility, and observability on public adoption. The public's trust in autonomous vehicles also mediates the relationship between perceived value and acceptance. The study stands out from others in the field because it uses theory to explain why people were comfortable with autonomous vehicles. It uses three different theoretical frameworks based on studies of how new ideas spread. The value customers place on new products and the science of social interaction. Additionally, it synthesizes the ideas and offers a unified account of the cognitive process that leads to acceptance by individuals. In sum, the study contributed to the body of theoretical knowledge on the public acceptability of autonomous cars and shed light on the challenges of effectively managing technology-human interactions and implications for transportation policy and practice.

According to Allen, J. et al. (2019), administrators of "PT (public transport)" systemsneed tools to prioritize spending on expanding and enhancing services to retain and gain new riders. In addition to measuring how happy people were now with individual features of the PTsystem, satisfaction surveys may reveal how happy people were with the system as a whole. Data like this may be analyzed statistically to see which factors have the greatest effect on customer happiness. Despite the widespread use of econometric frameworks for this purpose, the study could only identify three pieces of research that even tangentially relied on "psychological theories" to validate the models they produced. To fill this void in the study, researchers proposed "Maslow's hierarchy of transit needs," with three levels representing public transportation's operational, protective, and pleasurable aspects. To verify the hypothesis, the study estimate "SEM (structural equation models), SEM-Multigroup, and SEMM (finite mixture)" models and compare them across four "Latin American cities with BRT-like systems." The study's findings validated a hierarchy across a variety of type system settings,

paving the way for more generalized conclusions to be drawn. Finally, the study offered concrete policy suggestions by developing goals for case studies regarding dependability, security, customer service, and ease; this framework was transferable to any environment with a PT system. In the same way, Hasselwander, M., et al. (2021) discovered that all types of transportation have seen big drops, but public transportation had the biggest drops (74.5% on average). The research revealed that lockdowns had a bigger effect on people who rely on public transportation, that public transportation did not do its job as a public service, and that this led to a shift toward active mobility. Moving forward, governments must emphasize public transportation and encourage active mobility in the short term to lessen uneven access to transportation. Longer term, authorities must take advantage of the rise in active transportation to enhance decision-making by investing in infrastructure and promoting modal shift. Further, Mouratidis, K., and Serrano, V. C. (2021) studied the feasibility of using autonomous cars for urban public transportation. Using a normal public transportation line in a residential section of Oslo, Norway, the study examined the operation of recently constructed autonomous buses (self-driving electric shuttle buses). A combination of survey and interview data from two research forms the basis for analysis. The study examined how individuals felt about taking autonomous vehicles before and after being introduced to the case area and their experiences while riding them. The majority of respondents, both before and after utilizing autonomous vehicles, expressed a desire to do so. Users reported a high level of comfort and safety when riding driverless buses. Users have recommended several changes to the autonomous buses: an increase in speed and a decrease in the vehicle's sudden stopping. If autonomous vehicles can provide more public transit departures than the current ones, the results of the study show that citizens would use them. Future study should look at how passengers feel again, and plans to use fully autonomous buses. However, full automation has not been reached yet, and there is a host on board who can control the vehicle if needed.

2.1.2 Impact of Covid-19 Outbreak on Public Transportation

Sharifi, A., and Khavarian-Garmsir, A. R. (2020) recognized the pandemic's effects on cities and highlighted the key courses employed for “post-COVID” municipal mobility are the mainobjectives. Results indicate that the initial study on “COVID-19's effects on cities” had a primarily thematic focus on four key areas: “(1) environmental quality; (2) socio-economic implications; (3) management and governance; and (4) transportation and urban design.” The first subject, which deals with problems relating to air quality, climatic factors, and water quality was prominent, even if this suggests a varied study goal. The rest are still comparatively

under studied. In addition, the study offers other suggestions for “post-COVID” municipal development and layout in “socioeconomic considerations, urban administration and governance, transportation, and urban design.” The "COVID-19" scenario offers planners and decision-makers a significant opportunity to transform cities into ones that are more equitable, resilient, and sustainable, according to the knowledge that is currently available. According to Zhang, J., and Hayashi, Y. (2020), it was vital and crucial to hear the thoughts and recommendations of specialists in the transportation and associated sectors due to the unknowns surrounding and numerous uncertainties about this virus and its effects (particularly long-term repercussions).Between theend of April and the end of May 2020, a global poll was undertaken, taking into account the requirement for balance among geographic areas, employment types, working hours, and otherfactors. In particular, professionals were asked to answer questions with free replies, including their thoughts, recommendations, and concerns. Research has first described the reality of lockdowns, limitations on outside-the-home activities, and other physical distance constraints,mode changes based on a detailed analysis of the survey responses. The questionnaire regarding changes in lifestyles and society is then examined, along with the agreements and disputes of the experts. Additionally, a qualitative analysis of the experts' unpaid responses wascarried out. The final steps include a thorough discussion of significant research concerns anda summary of the findings.

Further, Shamshiripour, A., et al. (2020) stated that the recent COVID-19 outbreak had upheaved the globe and drastically altered everyday routines. Telecommuting and internet purchasing are replacing long-established patterns like going to the office and doing shopping in-person. Many of these changes have been happening for a while, but the epidemic has significantly sped them up. “The study determined how and to whatdegree people's mobility-styles and regular travel habits have changed during the COVID-19 pandemic,” as well as to determine if these changes will last after the epidemic or revert to the way they were before it. A “stated preference-revealed preference (SP-RP)” survey was createdand used in the Chicago metro region to do this. The study asked a lot of different questions about how people traveled, what they did every day, how they felt and behaved before and during the outbreak, and what they wanted and expected to happen in the future. People's travel habits have changed a lot in different ways after the data was analyzed. The authors also provided policymakers with insights to help them proactively prepare for more fair, sustainable, and resilient cities.

Furthermore, Kothari, V. and Sclar, R. (2020) investigated every facet of transportation that had been impacted by COVID-19. The tax income used to purchase and maintain government vehicle fleets had been drastically reduced due to economic shutdowns. Public

transportation systemshave been affected harder than any other aspect of local government, with ridership dropping by as much as 97%. Some public transportation companies were on the verge of insolvency, and some bus routes may be eliminated. Due to customers' perception that they were better able to avoid exposure to COVID-19 in a private vehicle than they would be on public transportation, the private sector has seen an uptick in demand for vehicles. The number of individuals reaching for their keys instead of their transport tickets was growing, and even those who had never had a car before were beginning to contemplate making a purchase. These developments were worrisome because they put at risk two of the most important aspects of sustainable mobility better public transportation and less reliance on personal automobiles. Forcommunities to function more effectively and sustainably, public transportation must be prioritized above private automobile use. Nonetheless, personal automobiles were here to stayin the future, and any new purchases had to be electric models.

Stressing people's lifestyle Muley, D., et al. (2020) evaluated that people's lifestyles are greatly impacted by the spread ofinfectious illnesses because they engage in fewer outdoor activities as a preventative precautionand must abide by government restrictions restricting their mobility. In order to learn how to handle such situations, the study studied scholarly literature on transportation and contagious illnesses. The findings of the study show that the transportation industry had a dual role in controlling the expansion of infectious illnesses and deciding how the decline in outdoor actions would affect the industry. Local and international travel limitations have been proven beneficialin the initial phases of regulating the transmission of contagious illness; however, as time goeson, behavioral shifts perform a further substantial part in comprising the increase. In addition to greatly reduced mobility, the breakouts altered traffic patterns to have lower peaks and improved traffic safety. Public transit suffered a large fall in its mode share, and people favoredtheir own automobiles and active modes over them. Positive effects on water and air pollutionwere also seen as a result of these modifications. The tourist and air transportation sectors werealso acknowledged to have been the most severely affected and would recover slowly. Planners and administrators will benefit from the review's findings as they improve their ability to handleemergencies in the future.

While Gössling, S., et al. (2020) evaluated that in March 2020, Travel bans that impacted about 90% of the population of world, broad restrictions on public gatherings and community mobility, and other causes had all but ceased tourism. The consequences of cruises, air travel, and hotels have had terrible early outcomes. Early "United Nations World Tourism Organization (UNWTO)" forecasts for 2020 suggest that foreign arrivals may fall by 20 to 30% from 2019. However, these estimates are quite speculative. The tourism industry was highly

prone to pandemic protection efforts because of limited mobility and social isolation. The research work examines the effect of COVID-19 on pre epidemics, pandemics, and other sorts of worldwide calamities in order to evaluate how the pandemic may impact the economy, tourism, and society. It was addressed why the volume growth tourism paradigm pushed by "the United Nations World Tourism Organization (UNWTO), International Civil Aviation Organization (ICAO), Cruise Lines International Association (CLIA), The World Travel and Tourism Council (WTTC)," and other tourism organizations had to be questioned as it was contrasted to the current climate situation and COVID-19.Jenelius, E., and Cebecauer, M. (2020) examined how COVID-19 would affect daily public transportation usage in Sweden's three most populous regions- "Stockholm, VästraGötaland, and Skne" throughout the spring of 2020. Based on data from ticket validations, passenger counts and sales, the research divides the overall ridership by ticket kinds, youths, seniors, and transportation modes. Authors further analyzed the degree to which fewer individuals traveled, or each person traveled less, during the pandemic by using "disaggregateticket validation data with consistent card ids." The decline in public transportation usage (between 40% and 60% across areas) was significant compared to other transport modes. Service levels had minimal impact on ridership because the supply was mostly constant throughout the time. The fall in the utilization of active public transportation was mostly to blame for the drop in ridership. Short-term tickets, typically used by visitors, almost went extinct when "passengers switched from monthly period tickets to single tickets and travel money." A price increase for annual and student passes since mid-April may suggest that customers who buy these passes rely more heavily on public transportation. To place the findings in an international context, cooperation was needed.

Similarly, Mogaji, E. (2020) discussed the rising body of research on COVID-19's effects in terms of industrialized nations,revealing a knowledge gap regarding how the pandemic was affecting underdeveloped nations.This theoretical analysis focused on COVID-19's immediate and long-term effects on transportation in Nigeria's Lagos State. The study talks about the effect on transportation in emerging countries, where lockdowns and moves restrictions might not work because of a lot of people living in a small area, bad transportation systems, and a big black market. Using the "avoid-shift-improve" approach, the study gives helpful advice for public and private sector leaders as they deal with this uncertain time and chart a new path for individuals and Nigeria. While Ahangari, S., et al. (2020) examined the impact on public transportation usage in "Baltimore and nine other American cities like Baltimore in terms of population and service area in the first half of 2020 due to the coronavirus (COVID- 19) pandemic." The research uses data on ridership, revenue hours driven, and vehicle utilizationto

draw conclusions. A compliance study between 2020 and 2019 was also performed, in addition to “a monthly analysis of 2020 by mode and kind of services.” In comparison to 2019, the pandemic's beginning in March saw a decline in ridership, with April seeing the biggest drop in all 10 cities.

Further, Gajendran, N. (2020) used descriptive study methods to look at travel situations that would have happened normally before lockdown and up until the end of the COVID-19 pandemic. This was done to learn more about how the coronavirus affected Indians' travel habits. The questionnaire asked about the respondents' socio demographic traits, typical travel habits, and pre- and post-lockdown activities. In order to answer appropriately, the respondent must understand the post-lockdown circumstances. Ona five-point Likert scale, the survey also included several questions about policy. People relied more on their own means of transportation during the pre-lockdown phase since there was a large danger of virus transmission from close contact with strangers, and shared mobility use had drastically fallen (35% compared to the usual scenario). After the lockdown period is through, it was projected that individuals would make fewer non-essential journeys and that higher-income groups would make an effort to avoid utilizing public transit. This pandemic demonstrated the benefits of walking and bicycling (a 22% increase was seen during pre- lockdown), as these modes offer a fantastic means of maintaining good health and an effective means of promoting social segregation and reducing the demand for public transportation. Two-wheelers and other private vehicles would contribute significantly to traffic congestion and road air pollution due to the high percentage of private vehicle use. The study outcomes helped planners and decision-makers in the transportation industry create effective policy solutions to offer transportation services during this pandemic catastrophe. The author also suggested that public transit systems create technology advancements to decrease the connection with vehicle space (seat configurations), automated ticketing, and overcrowded warning signals.

Similarly, Konečný, V., et al. (2021) found that the COVID-19 pandemic hada significant effect on social and economic progress worldwide, particularly that of the transportation industry. Individual states have to enact drastic measures, such as shutting down schools, offices, and companies, to stop the spread of COVID-19. The COVID-19 epidemic continues to have an unprecedented impact on the Slovak Republic at this time, which continues to affect how passengers behave and make decisions while utilizing public passengertransportation. A drop in population mobility in public passenger transportation was a result ofanti-pandemic efforts in the Slovak Republic; the mobility shift showed up to varying degreesin different areas of the Slovak Republic. The regional research was concentrated on the autonomous

territory of Žilina. The number of passengers decreased more noticeably during the first wave of the pandemic in the first half of 2020 compared to the second wave in the second half of 2020.The credibility of projected future values of demand was decreased by a time series of historical demand for SBT in the autonomous territory of Žilina, which includedinformation from the pandemic era utilized for predictions of a single criterion. SBT's transportation service plans include estimated future demand values as a crucial component for maintaining a sufficient supply of transportation services to satisfy demand. While Abdullah, M., et al. (2021) intended to provide light on people's decisions about their means oftransportation during the COVID-19 epidemic. Using the data gathered, a binary logistic modelwas created to predict whether people would choose to go alone or with others during COVID-19. The findings demonstrated that respondents favored solo means over public transportationthroughout the epidemic. When compared to solo means of transportation, factors such as gender, income, education, occupation, trip frequency, automobile, and motorcycle ownership,as well as an underlying characteristic known as "safety precautions," were found to be significant predictors. Compared to men, women prefer using public transportation over traveling independently. Owners of private vehicles (such as cars or motorcycles) were less likely to utilize solo and public modes in comparison to non-owners. The findings of the studymay be crucial in helping policymakers, government officials, and transport companies understand how public transportation was used in developing nations during pandemics. In particular, in developing nations with few choices for private transportation, such information will be helpful in formulating rules and preventative measures to manage infectious illnesses linked to public transportation.

Further Munawar, H. S., et al. (2021) looked into how the tactics the Australian government used to stop COVID-19 affected the transportation system. The three main parts of the transportation business are looked into. There are three major types: moving goods, moving people, and plane travel. The latest academic papers on COVID-19 and its effects were read, along with statistics from the Australian government, Google, Apple, Moovit, and other official sources. The study looked into how COVID-19 safety measures could be used in Australia by using databases, online articles, and interviews with people who work in the transport business. The results of the study showed that taking COVID-19 precautions reduced the need for transportation. Reports also say that the transportation industry's aviation, freight, and public transportation areas are all making less money. Based on the poll, the transportation business in Australia is in terrible financial shape because of a big drop in the number of people using public transportation, an expected 31.5% drop in the income of international airlines, and

an expected 9.5% drop in the movement of freight by sea. The transportation business will only be able to get back to how it was before the pandemic if COVID-19 containment rules are eased and the government gives money. On the same note, Zhang, J., et al. (2021) looked into how the 2019 coronavirus illness (COVID-19) affected the transportation business and how lawmakers responded. Based on a detailed analysis of the poll results, the study first talked about what lockdowns, limits on outdoor activities, other physical distance limits, and mode changes really mean. Then, the structural questions that look at how society and lifestyles have changed, as well as what the experts agree and differ on, are looked into. The findings of the analysis confirmed the significance of risk communication by showing that human society was not adequately prepared for the present epidemic. Further modal shift geographic disparities are found, particularly concerning active transportation and reliance on cars. Future sustainability and resilience improvements are anticipated, but they should be backed up by efficient behavioral intervention strategies. Finally, the findings' implications for policy are examined along with crucial areas for future study.

Similarly, Zhou, H., et al. (2021) found that the transportation sector was significantly damaged by the COVID-19 pandemic, which started in the fourth quarter of 2019. To stop the epidemic from spreading, numerous limitations and laws were implemented by nations worldwide, which significantly reduced the need for transportation. China was the first nation to notice the epidemic and recover the quickest. To assess the pandemic's effects on China's urban transportation industry and suggest potential COVID-19 mitigation strategies, existing policies and their effects were examined. The study looked at how the government should respond in the event of a pandemic that disrupts urban transportation systems. The hierarchical response structure for the pandemic's recovery efforts and their effectiveness are assessed. In order to determine when traffic congestion during the repeat of COVID-19 in Beijing would be at its worst, this study employed a technique known as the "Event Study Methodology" (ESM). This was done so that the participants in the research could observe the positive effects of their efforts to recover. Significant policy implications and lessons learned were gleaned from this study for building a sustainable urban transportation system and enhancing the flexibility, reliability, and resilience of traffic governance in the wake of a pandemic.

While Thombre, A., and Agarwal, A. (2021) provided that in India's metropolitan areas, an online poll was done to find out how this rare disease affected people's travel and movement habits. The plan is to keep track of which journey mode was chosen before, during, and after scenarios. A better and more disaster-proof public transportation system that can also meet the needs of people who own their own cars was another study goal. The report looks at the current

situation and also suggests and rates a set of policies that could be put in place in the medium to long term to lessen the effects of the crisis and take advantage of the chance it gives to finally make the dream of resilient, sustainable cities come true without giving up the need for public transportation that is easy to use and accessible. The study's results show that India has become more dependent on cars since the COVID-19 crisis. It's surprising that people who regularly use public transportation and non-motorized forms of transportation (like walks) are also willing to switch to private motor cars (cars and motorized two-wheelers). How people get around will eventually change depending on (a) how long it takes for public transportation to get back to normal and (b) how much money is put into and promoted active transportation choices. Further, Tiikkaja, H., and Viri, R. (2021) discussed that Public transportation saw unforeseen repercussions from the COVID-19 epidemic in cities all over the world, including a 70% decline in ridership in Tampere during the spring of 2020. The study compared public transportation patterns in May 2020, when the epidemic was at its height, to those in January 2020, when normalcy reigns. The findings suggested that, except for some eastern Tampere neighborhoods, the ridership decline was significant in practically all locations. All locations saw a reduction in frequencies while maintaining an adequate level. When authors looked at fill rates, authors discovered that, on average, during the COVID-19 pandemic in May compared to January, the bus routes leaving from east of Tampere were more congested. Fill rates were lower in several places. The findings implied that Tampere's frequency usage was primarily controlled to provide a high quality of service. The results also showed that not all places with high fill rates on particular routes had their frequencies effectively modified. It is crucial to note that COVID-19 presented public transportation planners with an uncommon circumstance and that in the future, more information will aid decision-making.

While Habib, M. A., and Anik, M. A. H. (2021) suggested a paradigm for analyzing public dialogue on Twitter to comprehend how COVID-19 has affected different transportation options and mobility patterns. The public's discussion on reopening issues and prospective reopening tactics were also identified. First, between May 15 and June 15, 2020, 15,776 tweets with personaljudgments about transportation services were collected for the study. Then, it looks at the tweets using text mining and topic modeling to find the main ideas, phrases, and topics that come up in the arguments. This helps us learn more about how people feel about the changes COVID-19 has made to transportation systems and how they are acting in general. Results show that individuals are moving away from utilizing public transportation and instead using walking, bicycles, or private vehicles. Sales of vehicles have reduced, and sales of bicycles have increased. The COVID-19 mobility issues and the reduction of automobile use

are mentioned as potential solutions to address traffic congestion in the post-pandemic future. Telecommuting, online learning, cycling, and walking are all suggested. People advocated for the restructuring, restoration, and safe reopening of transit networks and applauded government decisions about budget allocation to public transportation. While mask-wearing, gradual reopening, and social separation are suggested as viable reopening techniques, protecting transit personnel, riders, store customers and staff, and office employees were noted as a key reopening difficulty. To create policies for a secure reopening, decision-makers can utilize this framework as a tool to enable a comprehensive knowledge of the public's thoughts on transportation services during COVID-19. According to Tarasi, D., et al. (2021), the recent epidemic has significantly altered urban mobility while drawing attention to the shortcomings of the existing forms of transportation. The crisis offered a rare chance to reinvent urban mobility strategies in a more robust and sustainable way. In two cities on the island of Crete, one with a large academic community and the other with a significant tourist industry, the study tracked how the COVID-19 outbreak and the resulting restrictive measures affected residents' commuting patterns and mode of transportation over a two-phase (four-period) period. Sixty percent of the 308 participants in the first phase and thirty percent of the 193 people in the second phase were permanent residents of Chania and Rethymno, respectively. It was shown, however, that men and women were affected by these factors in different ways. For example, women placed a higher value on personal safety and road safety than men did, while men gave the environmental impact of their transportation choice less weight.

Further, Naveen, B. R. and Gurtoo, A. (2022) analyzed the first industry to suffer due to governments all over the world modifying their travel protocols in response to the COVID-19 outbreak in the public transportation sector. Transport authorities all around the globe have described a fall in users of approximately 95% at peak COVID-19, a loss in ticket box income, and increased expenditures for sanitizing and adopting measures of physical distancing. In normal circumstances, over 85 percent of individuals traveling between cities in India utilize some form of public road transportation, which puts India's public transport providers in a precariousposition. To look at how COVID-19 changed travel, the study put travelers into groups based on how they traveled and created two frameworks: the passenger-driven transportation strategy framework and the outbreak prevention strategy framework. Both of these frameworks were designed to address the issue. The frameworks use three mobility tenets: adaptability, integrated movement, and public-based cooperation. Instead of limiting consumers' access to various options, the methods attempt to make it possible for transportation companies to offer novel travel opportunities and improved operational efficiencies. However,

maintaining a high level of security was essential to making these newly developed and creative service modifications viable. Further, Chen, C., et al. (2022) investigated how people's travel choices are impacted by COVID-19-related counter measures used in public transportation. The authors investigated how much policy counter measures affect the usage of public transportation by various types of individuals. The information gathered in the Netherlands was used to estimate an error component latent class choice model. Results indicated that the Dutch central government's decision to loosen restrictions had a major impact on people's decisions about their method of transportation during the epidemic. Contrarily, the relevant policies made by the public transportation industry have diverse consequences for various groups of individuals. Those who are older and better educated are more vulnerable to enforcement measures, whereas Dutch individuals who are younger and single are more open to non-compelling tactics. Further, the average willingness to travel declined when public transportation was perceived as a riskier alternative than other private modes. The results of the study are useful for the government in creating and promoting pandemic-related effective policies.

2.1.3 COVID-19 and New Rules for Using Public Transportation

Zhou, J. B., et al. (2020) said that "Urban Public Transportation (UPT)" systems must do two things: provide necessary transportation services and stop the spread of the country's main disease. The UPT system should not only plan effective transportation in response to the COVID-19 unique coronavirus pneumonia outbreak, but it should also take steps to make it less likely that the pandemic will spread. "Metros and regular buses" are important parts of the "UPT system" and have a big effect on it. If there is an urgent epidemic, the UPT system's plan to stop it must activate the crisis response system and follow the basic rules of the local grouping avoidance and management method. As the epidemic situation gets worse, the many collective pandemic deterrence plans for conservative cars and public train transportation must be actively changed, and the appropriate level of the public transportation emergency plan must be put into action as soon as possible. In reality, both passive and active prevention and control were needed. The UPT system was very important for emergency reaction and transportation during an epidemic. Further, Tacchini, A. and Cats, O.(2020) found that the COVID-19 disease's spread around the world had made public transportation networks very difficult to run, as shown by a sharp drop in demand and income. What was learned about "public transportation and the COVID-19" epidemic was summed up in the paper. As a result of the many responses from "governments and public transportation" groups around the world during the so-called "post-

lockdown" period of public transportation, more study needs to be done on key factors that stop the spread of an outbreak. Recent study showed that wearing face masks effectively in confined spaces like public transportation has greatly reduced the risk of infection. At the same time, efforts to maintain physical separation (which goes against the basic idea of mass public transportation) are looming large in many countries. The study filled that gap by outlining a research plan for looking into the possible future policies and practices and how they might affect public health. It focused on ways to make public transportation less crowded. The study gave a summary and point of view on the effects of the pandemic crisis on public transportation for transit officials, planners, and researchers to represent the state's needs and research requirements. The fate of many countries' "public transportation systems" were in danger. Because of this, the study had to be done right away.

According to Wilbur, M. et al. (2020), Without reliable public transportation, it would not be possible to build a fair area. At the same time, the COVID-19 coronavirus disease and the restrictions that came with it have had a huge effect on how people move around towns. The fact that low-income and historically marginalized groups were more likely to be affected by changes in the economy and relied heavily on public transportation may have been the most troubling thing about the COVID-19 epidemic. Transit companies are having a hard time keeping their services running smoothly even though they are losing money. Because of this, transit companies had to deal with two big problems. How has COVID-19 changed the number of users, and what is the new normal now that the virus is gone? What has changed about the number of traffic changes over time, and where? Researchers used statistical methods to look at how the COVID-19 pandemic affected public transportation services and how usage changed over time. Next, they use local economic data and area distributions of falling ridership to find differences in socioeconomic status. From 2019 baselines, they found that fixed-line bus traffic in Nashville, Tennessee, fell by 66.9% and 65.1%, respectively, before leveling off at a loss of 48.4% and 42.8%, respectively. In the morning and evening, when everyone is busy, the prices dropped the most. Also, in Nashville, the drop in ridership was much bigger in places with higher incomes (77% vs. 58%) after controlling for income.

Similarly, Abdullah, M. et al. (2020) Many other policies that countries suggested or put into place to stop COVID-19 were looked into. Taking these kinds of safety measures had a big effect on where and how people traveled. But people move for many reasons, such as to run errands or get to and from work. The study looked at how people's habits changed because of COVID-19. An online survey questionnaire was used to collect information before and during COVID-19. It asked about the purpose of the trip, the chosen mode of transportation, the

distance traveled, and the number of times the trip was made. One thousand and three responses came in from all over the world. Before and during the pandemic, there were big changes in the main reason people traveled, the distance they traveled, the mode of transportation they chose, and how often they traveled. Furthermore, during the epidemic, shopping made up the vast majority of trips. Public transportation lost popularity as more people used their own cars and non-motorized forms of movement. People put pandemic-specific concerns ahead of general ones when choosing a mode of transportation during the disease. A lot of factors related to the COVID-19 epidemic were found to be good drivers of mode choice. These included gender, car ownership, job position, trip distance, the main reason for travel, and other factors. The study's results put light on why people need to move around, which helped with transportation planning and policy during pandemics. Government officials could use this knowledge to plan strategic and limited lockdowns, among other things.

While Shen, J., et al. (2020) said that because the coronavirus illness 2019 (COVID-19) is still spreading around the world, long-term effective preventative and control measures should be put in place since public transportation is becoming more and more popular and many people use it as their main way to get around. Because of the length of the exposure window, the ways that the virus can spread, and the way buildings are built when people are moving or at work, there may be a very high risk of getting sick. This could make the sickness spread quickly. The authors came up with a list of comprehensive countermeasures to control and avoid COVID-19. These included better management of the workforce, personal safety, environmental sanitation and disinfection, and health education. They did this by looking at how the "Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2)" spreads and what kinds of places are used for public transportation. Public transportation can be safer by taking a number of different methods. When every country in the world starts making things, it will be even more important to stay healthy while riding public transportation. The study's goal was to help the rest of the world respond to COVID-19 by sharing China's experience with control and prevention steps. Further, Arellana, J., et al. (2020) said that because of the world COVID-19 epidemic, all governments and city governments need to do something very different to stop the virus from spreading. A lot of these rules say that people have to change the way they do things so that they interact with other people less. Because of this, these actions have different impacts on people's daily lives and transportation systems. The study looked at how the different COVID-19 containment steps taken by Colombia's national and local governments affected the transportation network in the short term. Researchers looked at how Colombia's three main transportation systems affected the country's air, freight, and urban transportation

sectors. They used government and secondary data on the country's seven most populous cities to do this. The results showed that national policies and local actions had lowered the desire for motorized trips within cities. This had reduced traffic, lowered the number of people using public transportation, and lowered the negative effects of transportation on other people. People are not allowed to fly in this country, and only flights bringing medical and essential goods are allowed. Over the first three months of COVID-19, freight delivery was the most reliable part of the whole thing. About 38% fewer freight trips have been made, which changes how non-essential things get to people. To keep the system running during the epidemic and avoid traffic jams, governments need to offer subsidies. This will also support active transportation by giving bikes and pedestrians access to less-used road space. Right away, the pandemic will put transportation service providers in a financial bind, and they will need help from the government to get back on their feet.

Wielechowski, M., et al. (2020) looked at how the COVID-19 spread had changed the way people could use Poland's public transportation system. The data showed that there was a weak but negative link between changes in how people moved around on public transportation and the number of new proven COVID-19 cases in Poland. There are big differences in how strong and statistically significant the link is between voivodeships. From the data, it looks like there is a strong, negative, and statistically significant link between the factors at the national and regional levels and how strong the Polish government's anti-COVID-19 policy is. There was a link between changes in how people could use public transportation and trends across the country. They also used analysis of variance and Tukey's "honestly significant difference (HSD)" test to show that how much public transportation access changes relies on how strict Poland's and all voivodeships' anti-COVID-19 regulations are. The results showed that government limits, not a local epidemic, led to a bigger drop in mobility. They also showed that the COVID-19 pandemic's forced shutdown had made social isolation in Poland's public transportation system much worse. According to Amekudzi-Kennedy, A., et al. (2020), Over thousands of years, many problems that have caused unimaginable pain have put the social and economic growth of humanity at risk. But these problems have also made people smarter, as they have learned to deal with them by being creative. This has led to progress in science, technology, medicine, ethics, and social and political systems. Looking at how COVID-19 changes the risks and possibilities in the built, cyber, social, and economic environments may help us learn more about resilient and sustainable infrastructure and development. From the point of view of transportation, the study looked at five things that COVID-19 taught about what it means to grow in a way that is good for the environment: For long-term sustainability,

planning and analyzing frameworks for sustainable development must be all-encompassing; multimodal transportation was a better idea than any one mode; tele activities are an important part of a good infrastructure sustainability strategy; economic capital was important for sustainable development even when it wasn't a major existential threat; and strong social capital is necessary. In the twenty-first century, changing natural and man-made dangers relies on building infrastructure that is strong and lasts.

While Cho, S. H., and Park, H. C. (2021) found that because public transportation is a form of mass transportation, there had to be a drop in trip demand after the COVID-19 pandemic. This made it more important to make new rules for transportation. The study looked at how crowded public transit was before and after the COVID-19 spread to come up with ways to improve transportation. The study uses a random parameter mixed logit model to figure out crowding impedances from the two surveys in order to see how people's behavior has changed before and after the COVID-19 pandemic. With the help of crowding factors to look at behavioral variables, it was found that crowding impedances were 1.04 to 1.23 times higher after the COVID-19 pandemic than they were before the epidemic. To deal with the problems that an infectious disease caused on public transportation, transportation plans were given to people who make policy and run transit systems. Further, Anwari, N., et al. (2021) investigated how SARS-Cov- 2 and related governmental initiatives to reduce viral transmission have impacted Bangladesh's everyday travel choices. Using a questionnaire survey, opinions of respondents from various socioeconomic backgrounds were gathered on their preferred trip frequency and manner for arange of trip objectives both “before” and “during” the COVID-19 circumstance. Through theuse of Sankey diagrams, ordinal logistic regression, and contingency tables, the study was ableto analyze the impact of these alterations on I travel frequency and (ii) mode choice. The analysis's findings demonstrated that COVID-19 caused a sizable variation in mode preferences but only a very slight change in trip frequencies. Males are still more in danger than females since they still go outside to work and shop. COVID-19 significantly reduced travel for leisure but not for business. The people in rural and suburban regions may be more vulnerable to the virus because of the lack of online penetration in those areas, according to theresults. Furthermore, due to a lack of other affordable options, most individuals continue to utilize buses at the price of their health. The findings suggest that the government must make sure that public transportation and non-motorized paratransit vehicles adhere to adequate cleanliness standards. Additionally, facilities for pedestrians, bicyclists, and information and communication technology (ICT) must be enhanced.

In their study Rahimi, E., et al. (2021) investigated how people perceive danger when

utilizing ridesharing and public transportation (the most popular types of shared mobility) throughout “the COVID-19” epidemic. In order to achieve this, the Authors created and launched “a multidimensional travel behavior survey in the Chicago metropolitan region,” which includes socio-demographic data and retroactive inquiries about attitudes and travel behavior both before and during the epidemic. In order to properly account for the possible relationship between unobserved factors, the authors investigated the perceived risk of exposure to the novel coronavirus in scenarios of riding public transportation and using ridesharing services simultaneously. The perceived danger of utilizing shared mobility services was found to be influenced by a wide variety of variables, including socio-demographic characteristics, built environment settings, and viral transmission. The findings also suggest that mitigating initiatives to boost the use of shared mobility services should consider geographical differences. In view of Das, S. et al. (2021), the unexpected shock brought on by the COVID-19 pandemic has significantly influenced travel behavior, mode choices, and the services offered by public transportation networks. It was conceivable that a rise in the risk of viral contamination in shared transportation systems may lead to a general shift away from public transit and toward car commuting. Such a shift puts more strain on the existing infrastructure and increases congestion and pollution. The study offered scenarios for a potential switch from public transit to driving caused by the coronavirus outbreak. It also discusses various contributing elements that could affect the modetransition, focusing on appropriate future promotional tactics for using public transportation. The study was carried out because there was a pressing need to re-evaluate transportation in apost-COVID society. According to the results of a logistic regression model run on informationfrom an online questionnaire survey conducted in India, commuter socio-economic variables like age, gender, and monthly income appear to have a substantial impact on preferences for switching modes of transportation. In addition, factors including trip time, crowd, and cleanliness were strongly associated with the desire to transfer from public transit to driving a car. The evaluation of commuters' opinions on various strategies for enhancing public transportation had also set the path for creating a post-COVID transport policy and may do so in the future. In conclusion, efforts should be concentrated on restoring consumers' faith and trust by giving them a safe, secure, and healthy environment when using public transit.

According to Przybylowski, A., et al. (2021), like an earthquake, the COVID-19 epidemic rocked society and continues to have a terrible impact on daily life. Due to social people's subjectivism, their variety of views, and their prior experiences, ensures an acceptable degree of safety in an epidemic was a very difficult challenge. Authorities worldwide have reacted by

releasing the required sets of recommendations and legal actions in response to the “World Health Organization (WHO)” guidelines surrounding the epidemic. This had immediate and negative effects on mobility patterns. The study sought to determine how COVID-19 affected mobility behaviors, particularly those of public transportation users, regarding their willingness to travel and their views of safety standards. 90% of respondents to a user study had quit or reduced their usage, according to the findings. When the situation with the outbreak subsided, about 75% of them intended to start utilizing public transportation again. Unfortunately, others have given up hope that public transportation would ever be risk-free. These findings made it clear that passengers' perceived comfort and safety during the epidemicwill positively impact the future of public transportation in communities and their desire to utilize it after the epidemic has passed. This indicated that transportation regulations should becentered on improving these attitudes and preventing a further fall in public transportation; otherwise, it may be nearly hard to persuade passengers to utilize sustainable forms of transportation again in the future.

In their study Gkiotsalitis, K., and Cats, O. (2021) found that Service provision and passenger traffic have been significantly impacted globally by the COVID-19 pandemic issue. As numerous nations manage their return to normality, new planning guidelines for public transportation are devised. Compared to the time before COVID-19, these acts point to a considerable reduction in service capacity. There is a fundamental lackof understanding of the possible effects of the pandemic on public transportation operations when authors create models to help in service planning in light of these extra problems. In the study, the authors comprehensively evaluated and synthesized the literature on the impacts of COVID on public transit to ascertain the necessity of modifying planning methods. On the other hand, the authors also examined existing operational, tactical, and strategic public transitplanning methods. In order to aid public transportation service providers in making plans for the post-shutdown period, the authors identified the intervention strategies and supporting modeling needs that can help them. This might help hasten the shift from impromptu strategiesto more deliberate, data-driven planning and decision-making. Further, Wang, D., et al. (2021)stated that cities are debating what measures might be useful for a gradual reopening defined by social distance in light of how the COVID-19 epidemic has changed travel habits and the functioning of transportation systems. MATSim-NYC, a standard prototype created and“calibrated for pre-COVID” circumstances. By revising the population schedule to allow for “work-from-home” and re-estimating the mode choice model for MATSim-NYC to match observed traffic and transit passenger data, a new COVID model was calibrated that more closely resembles travel behavior during the COVID-19 outbreak. Assuming that the increasein car traffic caused by the

state of New York's phased reopening plan demonstrates inertia during the reopening, the writers looked into the issue. The findings point to the necessity of combining a transit capacity restriction policy during reopening with (1) assistance for micro-mobility modes, especially in boroughs outside of Manhattan, and (2) congestion-relieving measures that focus on decreasing traffic in Manhattan, such as cordon-based pricing, for maximum effectiveness.

While Abdullah, M., et al. (2021) found that since the outbreak of the coronavirus epidemic, travel behavior has changed globally (COVID-19). The pandemic had a significant impact on several businesses, including transportation. Due to decreased outdoor travel due to the virus close contact transmission method, there was less congestion onthe roads and in public transportation than before. Investigating how the pandemic had changedtravel behavior patterns was crucial to creating transportation-related regulations for the post-COVID environment. Using a questionnaire survey, the study investigated the impact of the COVID-19 epidemic on travel choices and patterns in Pakistan. The findings indicated a dramatic shift in travelers' principal trip objectives during the epidemic, from work and schoolto shopping. Additionally, there was a considerable difference between the number of trips made for non-commuting purposes before and after the epidemic. For distances under 5 km, there was a considerable modal shift from motorcycle to non-motorized forms of transportation. People started using private cars instead of public transportation for greater distances. These results imply that in the post-COVID-19 environment, previous regulations relating to various modes might be reviewed. During the epidemic, the respondents prioritizedpandemic-related issues such as infection worry, social isolation, the availability of hand sanitizers, cleanliness, etc., according to statistical analyses of the factors influencing mode selections. According to Eisenmann, C., et al. (2021), due to the coronavirus pandemic, several preventive measures were implemented in Germany and other countries across the world in the spring of 2020. This has significantly altered both mobility and daily lives. It wasunclear if and how the pandemic and lockdown affected transportation usage, attitudes towardtransportation modes, and individual mobility choice ownership during the lockdown. The authors conducted a representative travel survey in Germany at the start of April, during the toughest time of lockdown, to shed light on this crucial transport policy issues. With an emphasis on the bicycle, the vehicle, and public transportation, the authors examined general and individual changes in the utilization of and attitudes toward various forms of transportation. Additionally, the perceptions of personal mobility alternatives have been examined with a focus on families without cars. The findings suggested that whereas private forms of transportation, notably the private vehicle, gained importance during the highly constrained lockdown time, public transportation suffered. The

findings have significant implications for developing sustainable individual transportation options and concepts for public transportationin the context of transportation policy. These factors are essential for developing a viable transport system in the medium and long term, notwithstanding the coronavirus pandemic.

Further, Combs, T. S., and Pardo, C. F. (2021) examined that a significant shift in demand forareas for physically separated walking, biking, and outdoor commerce was brought about by the COVID-19 epidemic. Cities worldwide responded by putting in place a range of laws and initiatives to address this transition, including allocating more space on the road for non-car purposes, recalling pedestrian walk signals, lowering speed limits, and supporting bike-sharing programs. The extraordinary speed and scope of these replies as well as the public's responses to them indicate that the fields of transportation planning, legislation, and engineering may be at a turning point concerning the fair consideration of modes of non-automotive transportation. The study described a project to promote prospective changes in practice by classifying and recording more than a thousand COVID-19-related mobility answers into a database that is accessible to the public. The authors included thorough instructions on using the database and preliminary descriptions of its most important variables. Additionally, the authors proposed a research agenda to advance knowledge of the procedures that resulted in these actions, their consequences for future initiatives to construct and execute pedestrian and bicycle infrastructure, and potential changes in the transport professions as a result of the lessons learned throughout and after the pandemic. While Marra, A. D., et al. (2022) looked at how the pandemic influenced users' choice of routes and frequency of travel while observing how they used public transportation. The author tracked the whereabouts of forty-eight participantsover the course of four months during the first wave of the epidemic using GPS devices. Userswere tracked again in the spring of 2019, allowing researchers to draw parallels between users' migration patterns before and after the pandemic. The authors analyzed how the epidemic changes users' typical activities, travel habits, and percentage of trips taken by car, bus, and train. The authors paid special attention to the method and route of regular travelers, including commuters and non-commuters, and compared the two time periods. In order to learn how people's route preferences shifted during the course of the epidemic, scientists developed a mixed path size logit route choice model for public transportation using data from two years. Most noticeably, users' perceptions of transfer costs and railway travel time have shifted over the pandemic, and they are less likely to stick to their previously established favored route while making repeated journeys.

Further Mogaji, E., et al. (2022) It was noticed that while developed countries have ways

to handle big changes in the economy, poor countries handle the COVID-19 influx in a lot of different ways because of different structural barriers. These average ways to get around can't be used to deal with a major public health crisis because they aren't very flexible. As the gap between how public transportation is managed, how people feel about it, and how ready they are to adapt to the "new normal" of transportation operations after COVID-19 and the pandemic grew, policy solutions based on data were needed to improve service delivery. The semi-structured interviews with passengers and operators in Lagos, Nigeria, collected qualitative data. The researchers used theme analysis to order the data to help them better understand how COVID-19 affected the city's transportation system. The study found that the pandemic had a lot of big financial, logistical, and economic effects. These included higher transportation costs, stable finances, changed travel needs, and lost income. Because of the study, people involved in transportation now have a better idea of how to plan for the future, even though the world is currently unpredictable. Figuring out these effects helps people come up with policy ideas that will help poor countries reach their development goals during and after COVID-19. It was talked about the limitations and the plans for more research.

2.2 Research Gap

The percentage of people who use public transportation is directly linked to how profitable and efficient a city is. The appearance of COVID-19 has effects on the rest of Earth and has raised worries about how public transportation systems are set up. The main point of this investigation is to look into how people's views on using public transportation to get themselves or their things have changed over time. This study does just that. It fills in a gap in the current body of research by looking at the good and bad effects on the economy of COVID-19 changes in public transportation plans. Many earlier studies that looked at the good and bad effects of COVID-19 on changes in public transportation plans forgot to look at one important factor.

2.3 Summary of Literature Review

When looking through the available research, one may find real data regarding the effects of viral pandemics and other types of public dangers that have occurred in the past. But, virtually little extensive research has been done on how the recent COVID-19 outbreak may affectplans for public transit and public transportation. These studies are helpful and show how doing different jobs and using different modes has changed, but they haven't yet looked into how people's personal risk perceptions have changed because of the COVID-19 pandemic. The study's goal is to find out how safe it is for people to use shared transportation options like public transit and taxi services

during the COVID-19 pandemic. Early study shows that shared mobility, and public transportation in particular, will be very important for getting the economy back on track after the epidemic (Sifuentes, 2020).

The occurrence of COVID-19 brought about significant changes in every facet of life for everyone and one of the most significant areas that it affected was the public transportationsystem. People all over the world who rely on public transportation on a regular basis have hadtheir perspectives fundamentally shifted as a direct result of COVID-19. Based on the study, the reason for the change in public transportation plans was the COVID-19 pandemic and people's worries about their health and safety. This goal was to be reached by splitting the subject into groups for the study. These groups include plans for public transportation that were in place before COVID-19 broke out, how the spread of COVID-19 affected public transportation, and COVID-19 and the new rules for using public transportation.

CHAPTER III:

METHODOLOGY

3.1 Overview

Research is a broad phrase that encompasses both artistic effort and scientific inquiry. Methodsused to conduct the research are detailed here. Therefore, the study's foci and the rationale behind those foci are elucidated. Details on the study's methodology, including its population, sample, and sampling techniques, as well as the data gathering techniques employed, are laid forth in these sections. Methods for collecting and analyzing data and validating instruments are also described.

The study is focused on the research and the researcher's approach and design for determining the outcome. It also outlines the conceptual framework and research method for the current study. This chapter covers the concept of research and research technique, as well as the research study's aims and hypotheses. The study in brief covers categories of data, sampling, number of participants, research area and data-gathering methods and methodologies. Another important aspect of the study is the researcher's research design and conceptual design that introduces the essential notions of research.

3.2 Operational Terms

- **Covid-19**

The 2019 coronavirus disease outbreak (COVID-19) is a viral infection caused by the severe acute respiratory illness coronavirus ("SARS-CoV-2"). Wuhan, China, reported the first incidence in December of 2019. After an initial outbreak in Asia, the disease swiftly went global, causing the so-called COVID-19 pandemic. Some people who are afflicted might not exhibit any symptoms at all. Every time a person infected with the virus opens their mouth, sings, or coughs, tiny droplets of liquid are discharged into the air and spread it to others. The effects of COVID-19 vary from person to person.

- **Pandemic**

When a disease spreads over multiple countries or continents, people call it a pandemic. Its effectsare far-reaching and lethal, dwarfing even the deadliest epidemic. As soon as it became apparentthat Covid-19 was extremely dangerous and rapidly spreading across a large area, the World Health Organization proclaimed it a pandemic. A pandemic differs from an ordinary epidemic. In an epidemic, the number of instances of a disease or illness much exceeds what would be expected

in a given community or region, but the disease or illness itself does not spread.

- **Public transport**

Public transport (also known as "public transportation, public transit, mass transit, or simply transit") is a mode of transportation for travelers by group travel systems that are accessible tothe general public in contrast to private transport, are typically managed according to a set schedule, operate along predetermined routes, and charge a set fare per ride (Schofer 2018). There is no universally accepted definition of public transportation; The Encyclopedia Britannica limits the term to metropolitan regions, and most dictionaries simply refer to "buses, railroads, etc." when discussing public transit. City buses, trams, trolley buses, passenger trains, fast transit (metro, sub, underground, etc.), and ferries are all forms of publictransportation (Public transport in British 2018).

3.3 Need of the Study

In many cases, local communities make it possible for residents to gain access to a network ofpublic transportation services. These services make it possible for big groups of people to traveltogether along established routes. Trains, trams, and buses are just examples of the common modes of public transit. The vast majority of public transit between cities is carried out by either high-speed rail, aviation, or coaches. The epidemic caused by COVID-19 had a significant effect on public transportation. As a consequence of recommendations made by several nationsstating that public transportation should only be used in extreme circumstances, the overall number of passengers and available services have both drastically reduced. The study can be used to determine the actual impact of taking public transportation on the general public after Covid-19. The authors are also interested in determining whether or not people use public transportation more after being exposed to covid. The fear of utilizing public transportation isa major deterrent for many people, and studies have been looking into the reasons behind this phenomenon and future preparedness for any such pandemic outbreaks.

3.4 Conceptual Framework

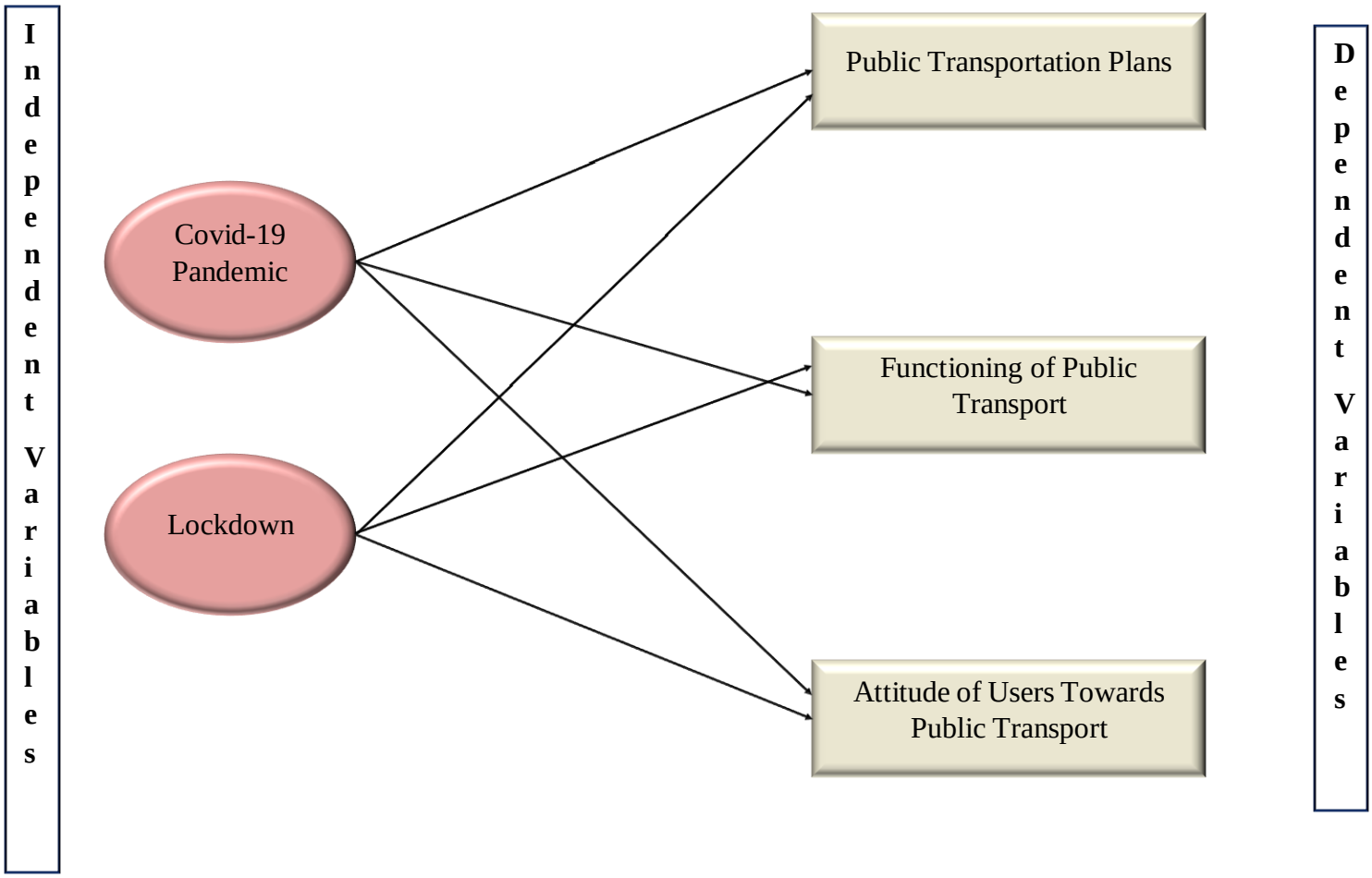


Figure 3.1: Conceptual Framework

3.5 Variables of the Study

- **Independent Variable**

In innovative research, to explore the independent parameter's effects, it would be manipulatedor modified. It is referred to as an "independent variable" because it is unaffected by the otherfactors in the study. These phrases are commonly used in statistical data to assess the extent towhich a change in an independent variable may describe or anticipate variation in the dependency variables. The independent variable in this study is Covid-19 and the pandemic.

- **Dependent Variable**

The phrase "variable that changes as a result of the changing of the independent variable" is one definition of a "dependent variable." The result is what is concerned with evaluating and will look into whether or not it "depends" on the "independent variable." "Dependent

variables" are also response and outcome variables in statistics. In this study, public transportation plans, the functioning of public transport, and the attitude of users towards public transport are dependent variables.

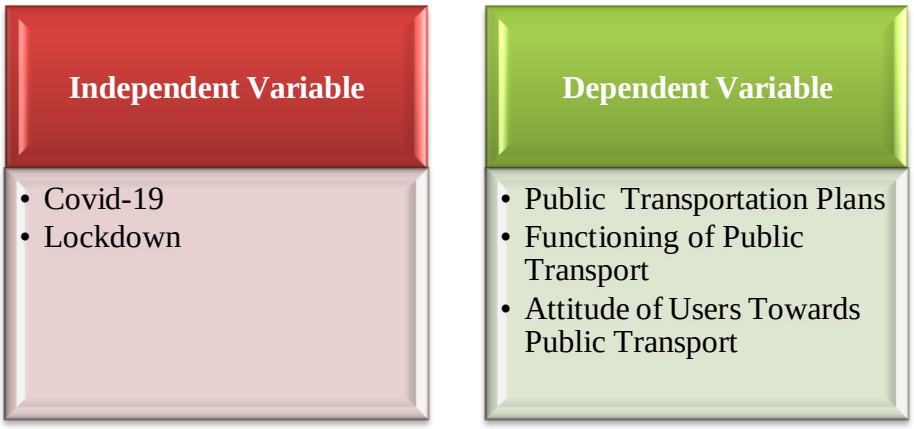


Figure 3.2: Variables of the Study

3.6 The Objective of the Study

1. To determine the impact of the COVID-19 pandemic on public transport utilization in India.
2. To find out the reasons behind the change in the attitude of the general public towards the usage of public transport.
3. To analyze the difference in the functioning of public transit and the COVID-19 pandemic.
4. To study the views and suggestions of the general public regarding public transport.

3.7 The Hypothesis of the Study

H1: There is a significant impact of the COVID-19 pandemic on public transport usage inIndia.

H2: There is a significant relationship between the change in the attitude of the general publicand COVID-19 towards the usage of public transport.

H3: There is a significant difference between the functioning of public transit and the COVID-19 pandemic.

3.8 Research Methodology

Since it is a guide for accumulating and analyzing the necessary data, the research technique isan essential component of the research methodology. This is because the study's

goals can only be accomplished by doing so. The positivist philosophy will influence the current research. Theobjective character of the cosmos, truth, or knowledge is asserted through the positivist research technique. This is a descriptive study that looks at the reasons for the change in publictransportation planning; the Covid-19 outbreak is to blame.

3.9 Area of the Study

In this research, 500 persons were studied from five Indian cities: Kolkata, Mumbai, Indore, Bengaluru, and Delhi. These are the cities with the highest utilization of public transportation.

3.10 Targeted population

A group of people with similar characteristics who are meant to be the audience for a good orservice, ad, or investigation is called the target population. The "objective audience" is a group of people chosen from the whole world. General people are the targeted population in this study.

3.11 Sample Size

Sampling is the technique of selecting a sample of a larger population to collect data about the features of the entire population. The Sampling size is determined using the entire population. The sample size was 500 people from five Indian cities: Kolkata, Mumbai, Indore, Bengaluru, and Delhi.

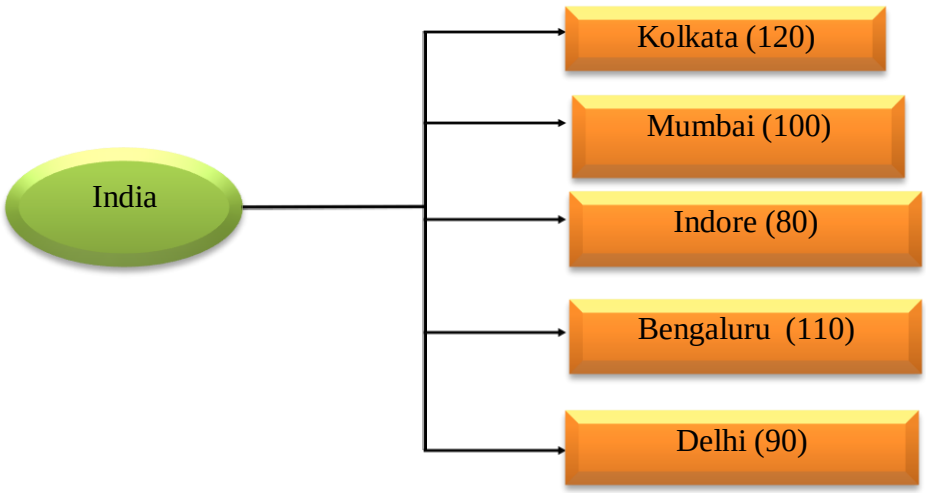


Figure 3.3: Sample size of the Study

3.12 Sampling Technique

A random sampling Technique was used in this study. When using random sampling, all possible samples have an equal chance of being selected. The goal of a randomly selected sample is to accurately reflect the whole population.

3.13 Collection of Data

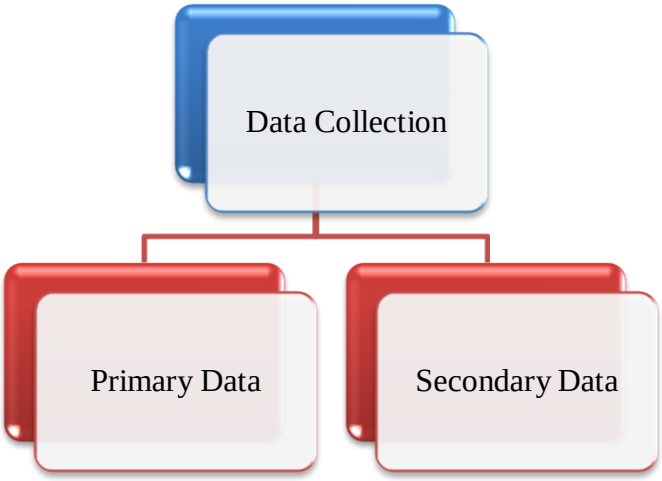


Figure 3.4: Data Collection

- **Primary Source**

A primary source of data is an original data source, which means that it was acquired directly by the researchers for a specific study goal or job. Primary data collection is both more expensive and more consuming than secondary data collection. However, for other types of inquiries, actual data collection may be the only viable option. To collect information from primary sources, surveys, questionnaires, and interviews were used. The COVID-19 pandemic outbreak caused a shift in public transportation plans, as evidenced by interviews with persons personally and contacted over the internet. In addition to the survey, observation, questionnaires, and analysis were employed.

- **Secondary Source**

Secondary data is a research technique that employs previously collected data. Secondary research comprises of previously published research material in peer-reviewed publications and other similar studies. Data that is already been collected from primary sources and made available to academics is called secondary data. This is information that was gathered in the past but is still beneficial. It is possible that one researcher collected data for one study and then made it accessible for use in another. It is possible that, like with a national census, the

information was gathered with no specific purpose in mind.

The study used both primary data and secondary data.

3.14 Statistical Tools

A sample of the target population would be used to acquire the area's replies of the representative. Statistical Technique is the approach the researcher uses to choose this sample. To do true statistical analysis, one must learn to use professional commercial statistical tools such as Micro Soft Word, Excel, and SPSS.

- **Micro Soft Word**

Microsoft Word is the company's premier word processor, although the moniker "Word" is also commonly used to refer to this product. Microsoft's take on the word processor is called Word. Microsoft Word allows you to make documents like these: papers, reports, letters, and resumes look professional. Microsoft Word is more than just a word processor; it also has built-in features like spellchecking, grammar checking, text and font formatting, picture editing in HTML, and flexible page layout possibilities.

- **Excel**

Microsoft Excel is a widely used piece of statistical software that may be used to verify the accuracy of hand-worked calculations and to gain a better grasp of statistical concepts that canbe used to the solution of practical problems. The Analysis Tool Pak is a set of data analysis methods that could be used to speed up the process of creating complex quantitative research.

- **SPSS**

"SPSS" stands for "Statistical Package for the Social Sciences" and is a statistical program thatallows the author to read and write tables in external relational databases. SPSS Data places constraints on internal file form, data categories, data assessment, or correlating files, all of which greatly simplify programming.

3.15 Statistical Technique

Statistical tools and procedures include those used to plan the study, set up the data collection,evaluate the results, make meaningful conclusions, and disseminate the findings. Arithmetic means standard deviation, regression analysis, and correlation were only a few of the statisticalmethods employed in the study. A thorough search of the relevant literature was performed aspart of the all-encompassing methodology used in the study.

- **Mean**

The arithmetic means also referred to as the actual average or arithmetic average is a mathematical term. It is calculated by adding all the quantities in a given information set and then dividing the total amount of Quantities in that set by the number of units. The arithmetic mean (AM) of uniformly distributed integers is equivalent to the middle value. Furthermore, the AM is computed using a variety of methodologies that are depending on the number of units and the dispersion of the data.

$$\mathrm{m} = \frac{\text{Sum of the terms}}{\text{Number of terms}}$$

- **Standard deviation**

The "standard error of a statistic" (like the sample mean) and the "standard deviation of a large population or sample" are not always the same, but they are related. To find the standard deviation, multiply the variances of each set of data by the square root of their variance.

$$\sigma = \sqrt{\frac{\Sigma(x_i - \mu)^2}{N}}$$

- **Correlation**

When two or more variables are correlated, it shows how much their values fluctuate about oneanother. Both variables increase and decrease in tandem if there is a positive correlation, and theopposite is true if there is a negative correlation. Statistically, the correlation coefficient indicates how well one variable predicts the change in another. One of the most widespread fallacies concerning correlation is that when one variable predicts the fluctuation of another,

correlation always indicates causality. Correlation, on the other hand, does not imply "causation."

$$r = \frac{\Sigma(x_i - \overline{x})\ (y_i - \overline{y})}{\sqrt{\Sigma(x_i - \overline{x})\ ^2 \Sigma(y_i - \overline{y})\ ^2}}$$

- **Regression**

The statistical method known as "regression" is used to characterize the nature and strengthof the relationship between a single "dependent variable" (often denoted by "Y") and a group of "independent" variables. It has found use (as a "independent variable") in the fields of finance, investing, and a number of others. Using a line of best fit, "linear regression" determines the linear connection between two variables. For linear regression, the link betweena change in one variable and another is shown by the slope of a straight line.

$$Y = a + bX + u$$

CHAPTER IV:

RESULT

4.1 Summary of Results:

Table 4.1 Gender of the Respondents

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	200	40	40	40
	Male	300	60	60	60
	Total	500	100.0	100.0	

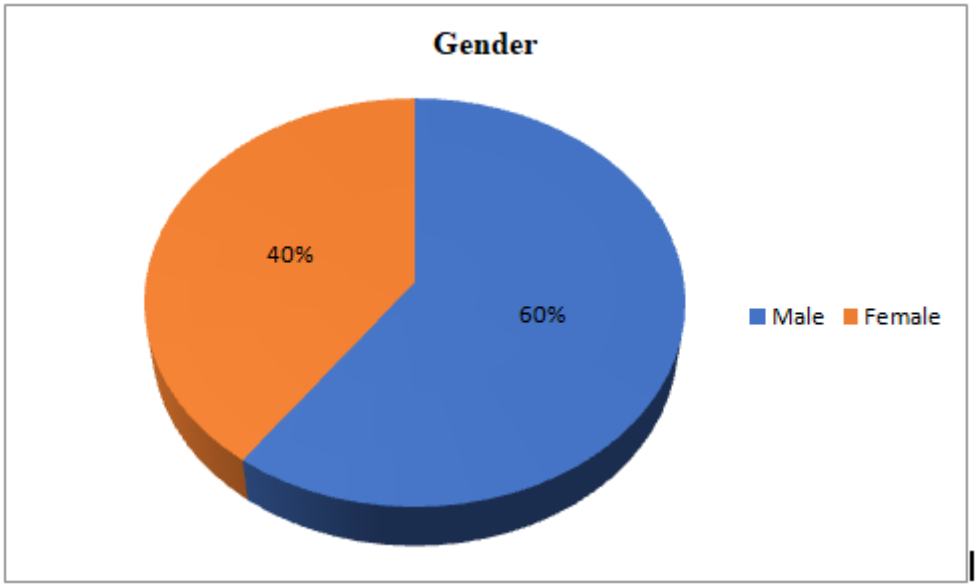


Figure 4.1 Gender of the Respondents

The above table 4.1 and pie chart (figure 4.1) define the Gender of the respondents. According to Table 4.1, it is observed that, out of 500 respondents selected for the study, 300 are males who constitute 60%, 200 are females who form 40% of the total sample respondents. This indicates male-dominated sample with a significant proportion of females.

Table 4.2 Age group of the Respondents

Age group					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	16-25 Years	70	14.0	14.0	14.0
	26-33 Years	217	43.4	43.4	57.4
	34-45 Years	161	32.2	32.2	89.6
	Above 45 years	52	10.4	10.4	100.0
	Total	500	100.0	100.0	

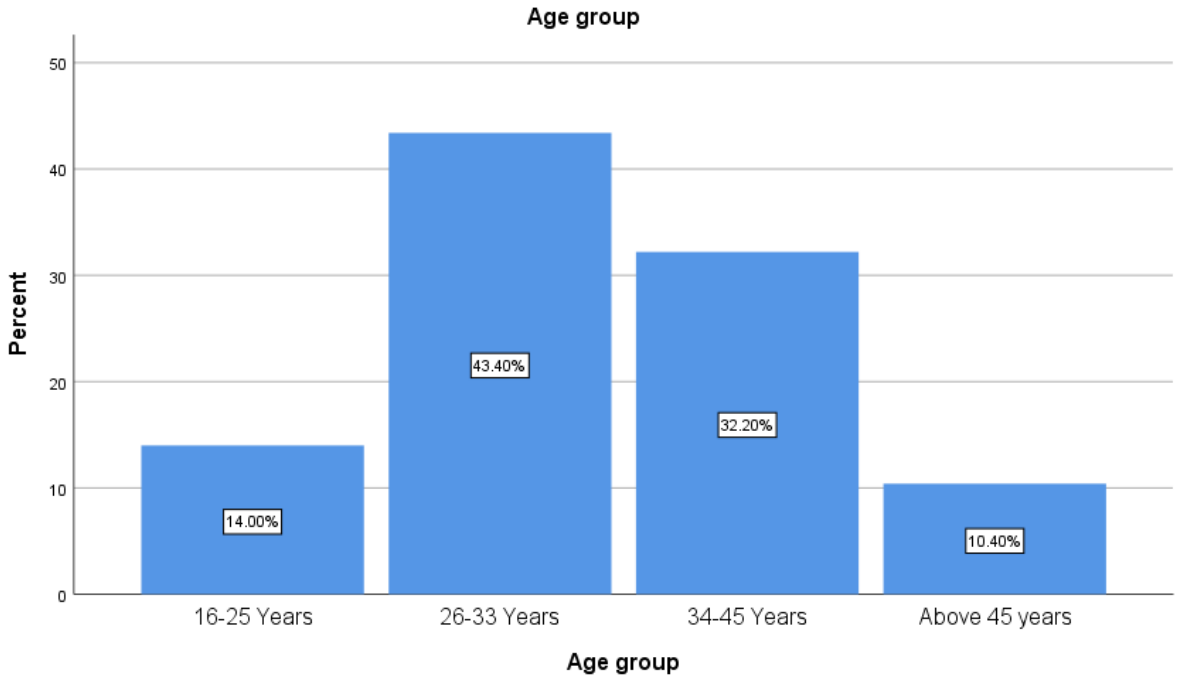


Figure 4.2 Age group of the Respondents

Table 4.2 and figure 4.2 (Bar Graph) shows the age of the respondents. According to table and graph 4.2, out of 500 respondents, 14.0% of the respondents aged between 16-25 Years, 43.4% of the respondents aged between 26-33 Years, 32.2% of the respondents aged between 34-45 Years, and 10.4% of the respondents aged Above 45 years. This indicates a relatively balanced age distribution, with a slight majority of the sample being between 26 and 45 years of age.

Table 4.3 Occupation of the Respondents

Occupation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Students	62	12.4	12.4	12.4
	Salaried	142	28.4	28.4	40.8
	Self-Employed	136	27.2	27.2	68
	Unemployed	94	18.8	18.8	86.8
	Others	66	13.2	13.2	100.0
	Total	500	100.0	100.0	

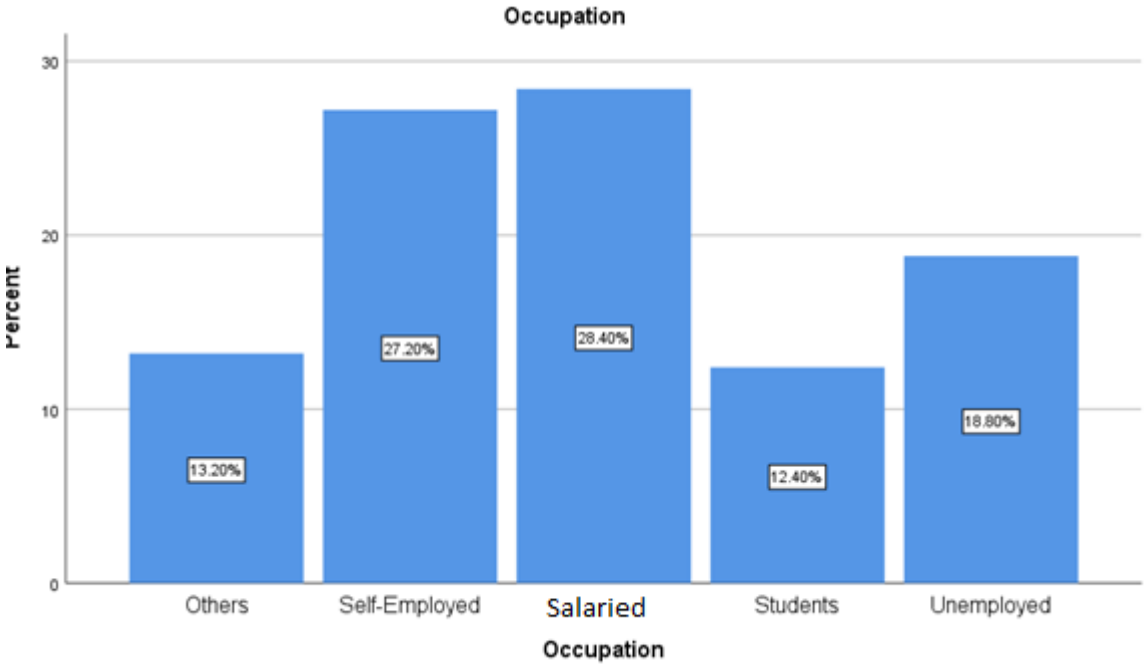


Figure 4.3 Occupation of the Respondents

In the above table 4.3 and bar graph (figure 4.3), we define the occupation of the respondents. According to table 4.3, it is observed that, out of the 500 respondents selected for the study,

12.4% of the respondents are Students, 28.4% of the respondents are Salaried, 27.2% of the respondents are Self-Employed, 18.8% of the respondents are an Unemployed, 13.2% of the respondents are Others. This indicates a fairly even split, with a majority in salaried and self employed.

Table 4.4 Education Level of the Respondents

Education Level					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Illiterate	72	14.4	14.4	14.4
	Can read and write	64	12.8	12.8	127.2
	Primary education	144	28.8	28.8	156
	Secondary education	132	26.4	26.4	82.4
	University level	88	17.6	17.6	100.0
	Total	500	100.0	100.0	

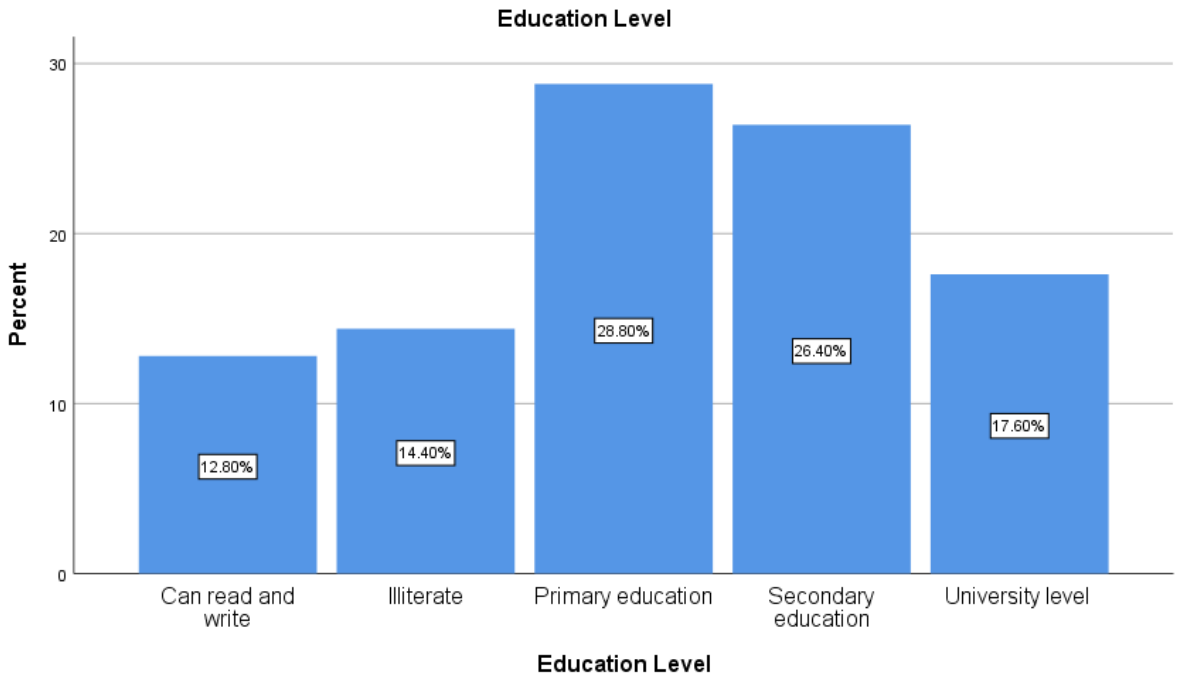


Figure 4.4 Education Level of the Respondents

Table 4.4 and figure 4.4 (Bar Graph) shows the educational qualification of the respondents. According to table and Graph 4.4, out of 500 respondents, 14.4% of the respondents are Illiterate, 12.8% of the respondents can read and write, 28.8% of the respondents are Primary education, 26.4% of the respondents are Secondary education, and 17.6% of the respondents are University level. This indicates a predominance of relatively primary and secondary education individuals in the sample.

Table 4.5 Residence of the Respondents

Residence					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Rural	50	10	10	10
	Urban	450	90	90	100.0
	Total	500	100.0	100.0	

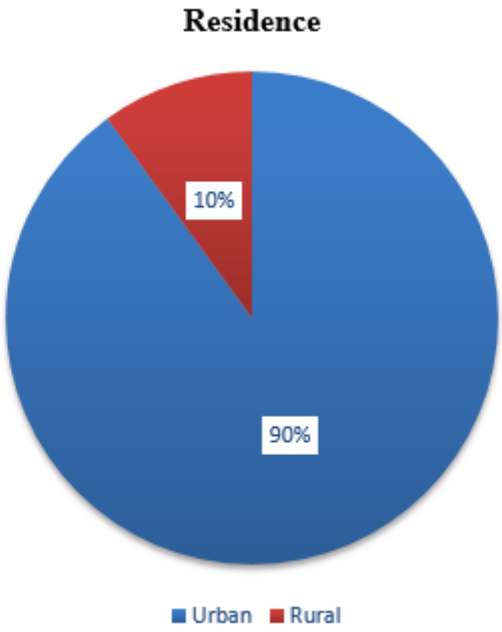


Figure 4.5 Residence of the Respondents

Table 4.5 and figure 4.5 (Pie Graph) shows the Residence of the respondents. According to table and Chart 4.5, out of 500 respondents, 10% of respondents from Rural and 90% of respondents from Urban. This indicates a predominance of urban population.

Table 4.6 Monthly Income of the Respondents

Monthly Income					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Nil	33	6.6	6.6	6.6
	Less than 10,000	53	10.6	10.6	17.2
	10,001-20,000	162	32.4	32.4	49.6
	20,001- 40,000	148	2936	29.6	79.2
	More than 40,000	104	20.8	20.8	100.0
	Total	500	100.0	100.0	

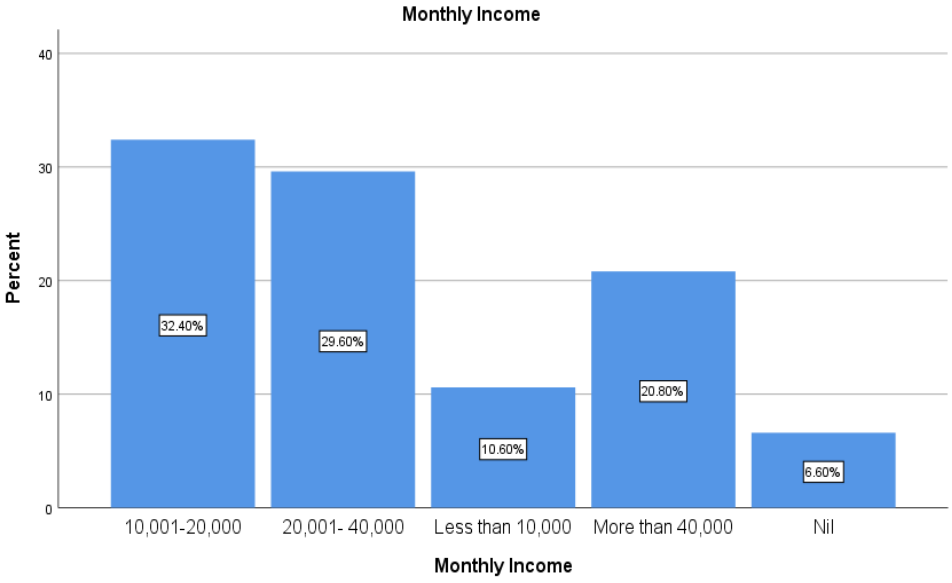


Figure 4.6 Monthly Income of the Respondents

Table 4.6 and figure 4.6 (Bar Graph) shows the Monthly Income of the respondents. According to table and Chart 4.6, out of 500 respondents, 6.6% of respondent's monthly income is Nil, 10.6% of respondent's monthly income is Less than 10,000, 32.4% of respondent's monthly income is 10,001-20,000, 2936% of respondent's monthly income is 20,001- 40,000, 20.8% of respondent's monthly income is More than 40,000. This indicates a predominance of respondents with income range between 10,000 to 40,000.

Table 4.7 Respondent of Mode of Public Transportation

Mode of Public Transportation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Buses	189	37.8	37.8	37.8
	Metro	311	62.2	62.2	100.0
	Total	500	100.0	100.0	

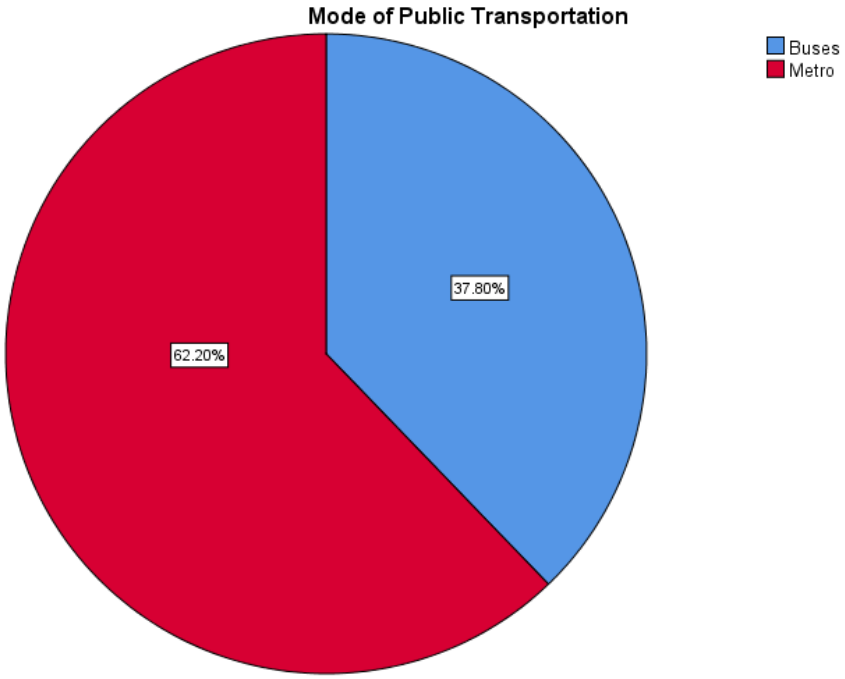


Figure 4.7 Respondent of Mode of Public Transportation

Table 4.7 and figure 4.7 (Pie Chart) shows the Respondent of Mode of Public Transportation. According to table and Chart 4.7, out of 500 respondents, 37.8% of respondents Mode of Public Transportation is Buses, 62.2% of respondents Mode of Public Transportation is Metro.

Table 4.8 Since How Long Respondent Using Public Transport

Since How Long Are You Using Public Transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	1 Year	154	30.8	30.8	30.8
	2-5 years	179	35.8	35.8	66.6
	More than 5 years	167	33.4	33.4	100.0
	Total	500	100.0	100.0	

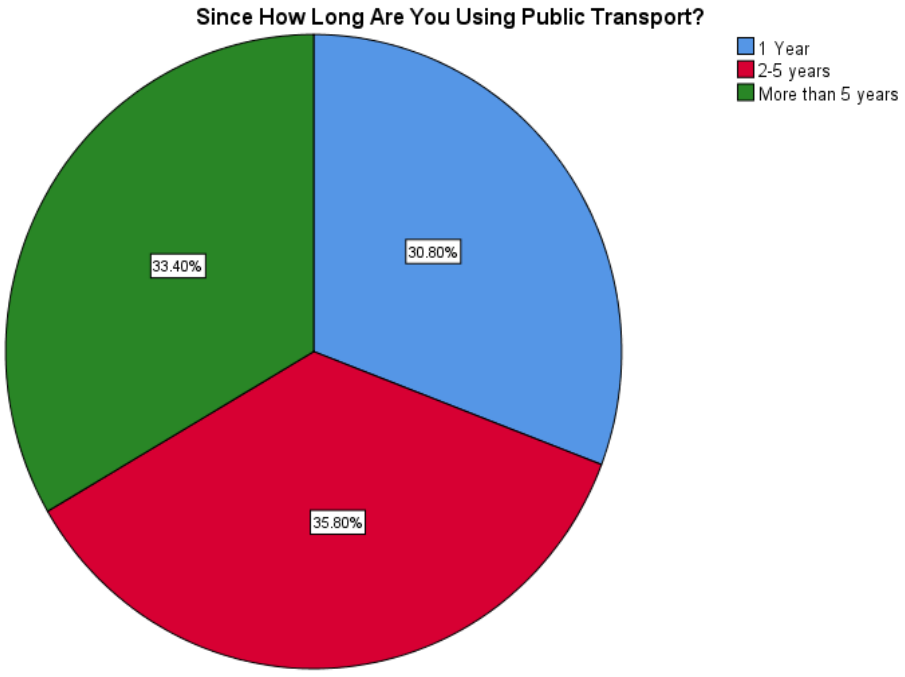


Figure 4.8 Since How Long Respondent Using Public Transport

Table 4.8 and figure 4.8 (Pie Chart) shows the Respondent Using Public Transport. According to table and Chart 4.8, out of 500 respondents, 30.8% of respondents are using public transportation from 1 Year, 35.8% of respondents are using public transportation from 2-5 years, 33.4% of respondents are using public transportation from More than 5 years. This indicates a fairly even split in usage of Public Transport.

Table 4.9 Major impact of COVID-19 on Transportation

The major impact of COVID-19 on Transportation					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Traffic congestion	79	15.8	15.8	15.8
	Shortage/lack of Transportation mode	156	31.2	31.2	47.0
	Social distancing	112	22.4	22.4	69.4
	Cost of Transportation	153	30.6	30.6	100.0
	Total	500	100.0	100.0	

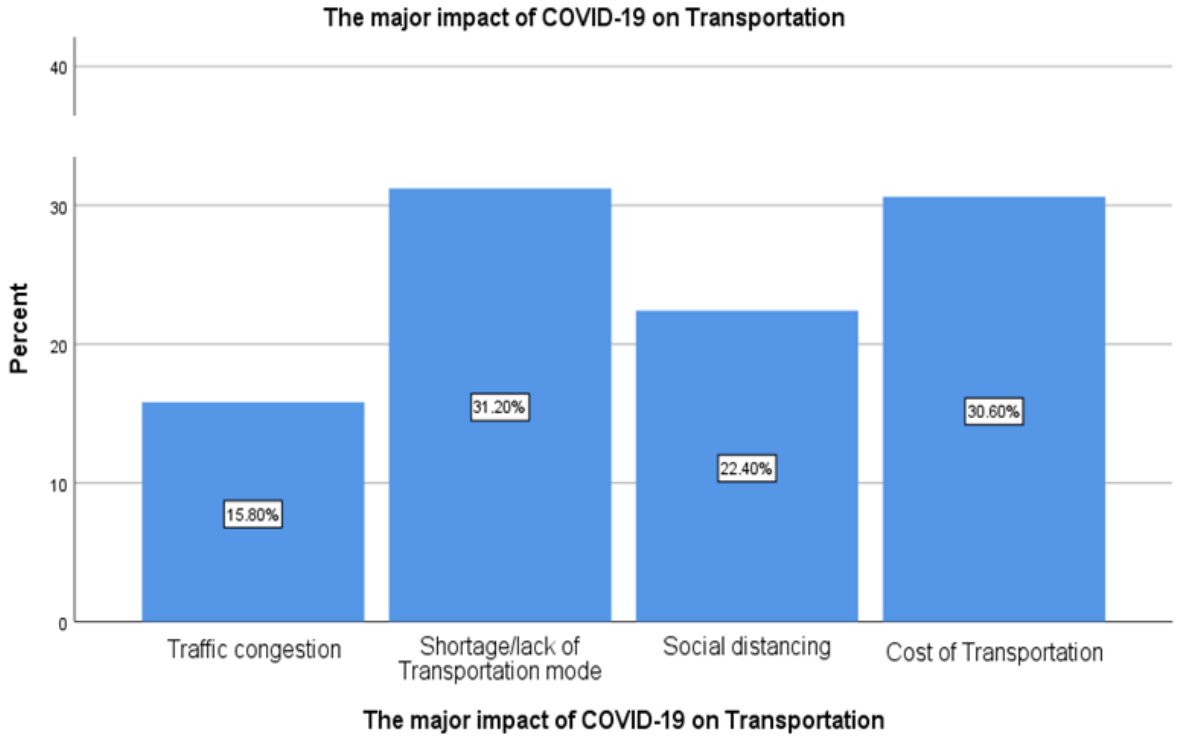


Figure 4.9 Major impact of COVID-19 on Transportation

Table 4.9 and figure 4.9 (Bar Graph) shows the Major impact of COVID-19 on Transportation of the respondents. According to table and Chart 4.9, out of 500 respondents, 15.8% of respondents responded that due to covid-19 there was a Traffic congestion, 31.2% of respondents responded that covid-19 has major impact on Shortage/lack of Transportation

mode, 22.4% of respondents responded that due to covid-19 social distancing is applied in transport, 30.6% of respondents responded that due to covid-19 Cost of Transportation is majorly affected.

Table 4.10 Location of the Respondents

Location					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Bengaluru	110	22.0	22.0	22.0
	Delhi	90	18.0	18.0	40.0
	Indore	80	16.0	16.0	56.0
	Kolkata	120	24.0	24.0	80.0
	Mumbai	100	20.0	20.0	100.0
	Total	500	100.0	100.0	

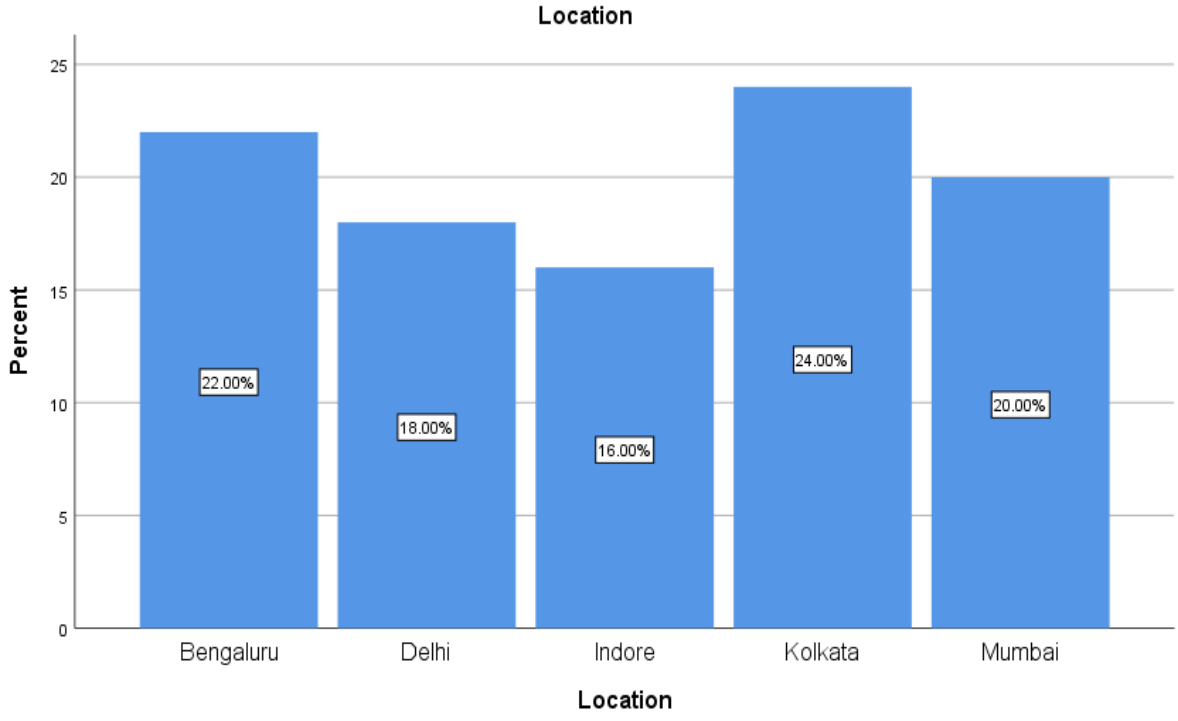


Figure 4.10 Location of the Respondents

Table 4.10 and figure 4.10 (Bar Graph) shows the Location of the Respondents. According to table and Chart 4.10, out of 500 respondents, 22.0% of respondents from Bengaluru, 18.0% of respondents from Delhi, 16.0% of respondents from Indore, 24.0% of respondents from Kolkata, 20.0% of respondents from Mumbai.

- ## Response regarding the Covid-19 Pandemic

Table 4.11 Covid-19 had affected the Use of Public Transport

Does Covid-19 had affected the use of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	83	16.6	16.6	16.6
	Disagree	88	17.6	17.6	34.2
	Neutral	63	12.6	12.6	46.8
	Agree	172	34.4	34.4	81.2
	Strongly Agree	94	18.8	18.8	100.0
	Total	500	100.0	100.0	

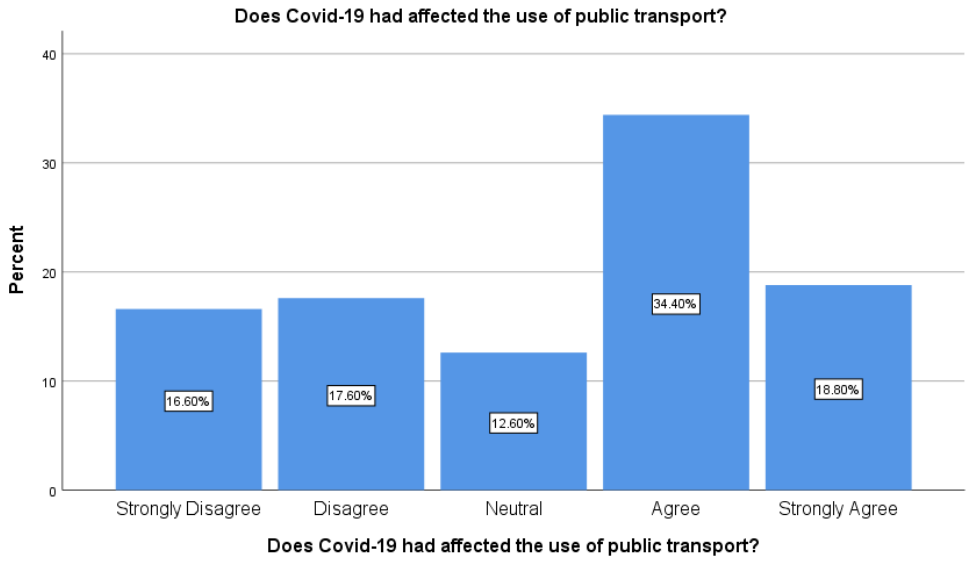


Figure 4.11 Covid-19 had affected the Use of Public Transport

Table 4.11 and figure 4.11 show the response regarding the statement "Covid-19 had affected the use of public transport". "According to table 4.11 and figure 4.11 (Bar chart), out of 500 respondents, 16.6% of the respondents strongly disagree with the statement., 17.6% of the respondents disagreed with the statement, 12.6% of the respondents were neutral with the statement, 34.4% of the respondents agreed with the statement and 18.8% of the respondents strongly agreed with the statement".

Table 4.12 Lockdown affect the Use of Public Transport

Does Lockdown affect the use of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	28	5.6	5.6	5.6
	Disagree	30	6.0	6.0	11.6
	Neutral	64	12.8	12.8	24.4
	Agree	196	39.2	39.2	63.6
	Strongly Agree	182	36.4	36.4	100.0
	Total	500	100.0	100.0	

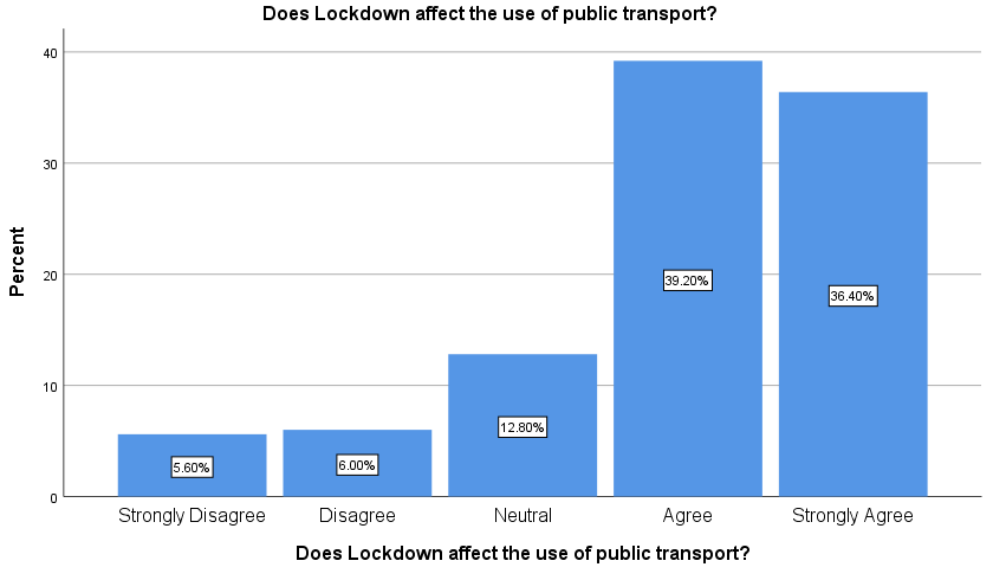


Figure 4.12 Lockdown affect the Use of Public Transport

Table 4.12 and figure 4.12 show the response regarding the statement "lockdown affect the use of public transport." "According to table 4.12 and figure 4.12 (Bar chart), out of 500 respondents, 5.6% of the respondents strongly disagree with the statement., 12.8% of the respondents were neutral with the statement, 39.2% of the respondents agreed with the statement and 36.4% of the respondents strongly agreed with the statement".

Table 4.13 Social Distancing had affected the Use of Public Transport

Does social distancing had affected the use of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	22	4.4	4.4	4.4
	Disagree	59	11.8	11.8	16.2
	Neutral	89	17.8	17.8	34.0
	Agree	227	45.4	45.4	79.4
	Strongly Agree	103	20.6	20.6	100.0

	Total	500	100.0	100.0	

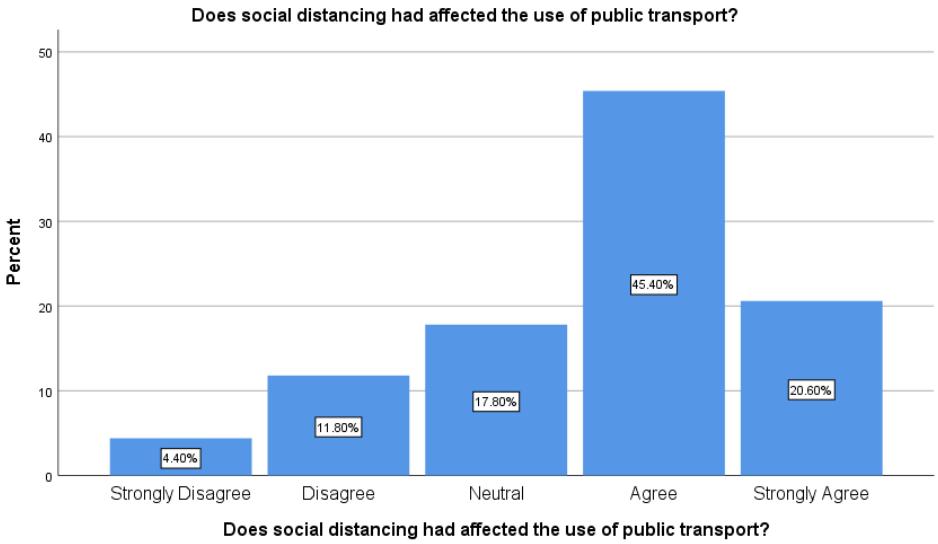


Figure 4.13 Social Distancing had affected the Use of Public Transport

Table 4.21 and figure 4.13 show the response regarding the statement "social distancing had affected the use of public transport." "According to table 4.21 and figure 4.13 (Bar chart), out of 500 respondents, 4.4% of the respondents strongly disagree with the statement., 11.8% of the respondents disagreed with the statement, 17.8% of the respondents were neutral with the statement, 45.4% of the respondents agreed with the statement and 20.6% of the respondents strongly agreed with the statement".

Table 4.14 New Covid-19 Variants Results in a New Challenge Regarding the Use of Public Transport

Do the new Covid-19 variants results in a new challenge regarding the use of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	44	8.8	8.8	8.8
	Disagree	45	9.0	9.0	17.8

	Neutral	131	26.2	26.2	44.0
	Agree	196	39.2	39.2	83.2
	Strongly Agree	84	16.8	16.8	100.0
	Total	500	100.0	100.0	

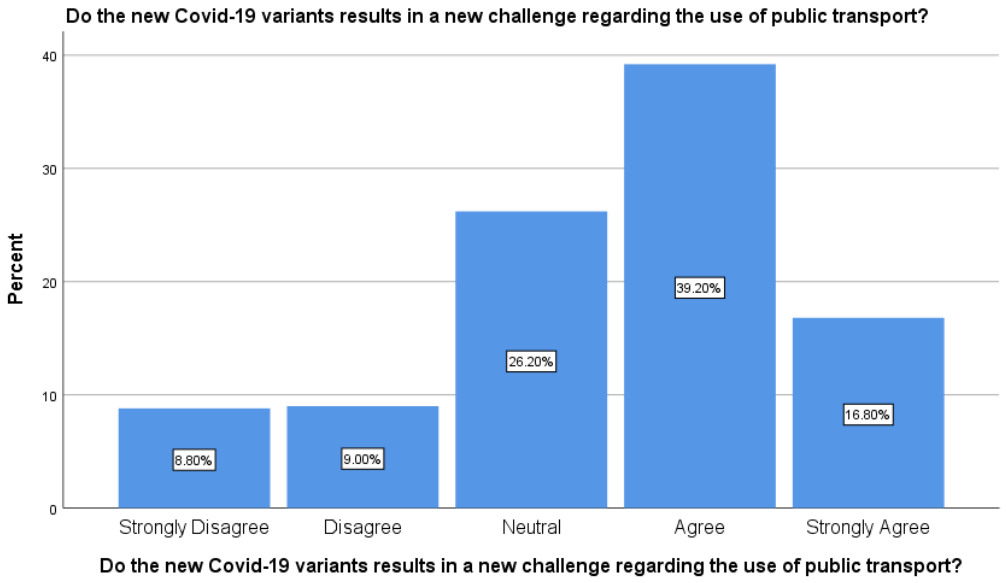


Figure 4.14 New Covid-19 Variants Results in a New Challenge Regarding the Use of Public Transport

Table 4.22 and figure 4.14 show the response regarding the statement "New Covid-19 Variants Results in a New Challenge Regarding the Use of Public Transport". "According to table 4.22 and figure 4.14 (Bar chart), out of 500 respondents, 8.8% of the respondents strongly disagree with the statement., 9.0% of the respondents disagree with the statement, 26.2% of the respondents neutral with the statement, 39.2% of the respondents agree with the statement and 16.8% of the respondents strongly agree with the statement".

Table 4.15 Traveling through Public Transport Increase Covid-19 Transmission

Does traveling in public transport increase Covid-19 transmission?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	46	9.2	9.2	9.2
	Disagree	89	17.8	17.8	27.0
	Neutral	182	36.4	36.4	63.4
	Agree	91	18.2	18.2	81.6
	Strongly Agree	92	18.4	18.4	100.0
	Total	500	100.0	100.0	

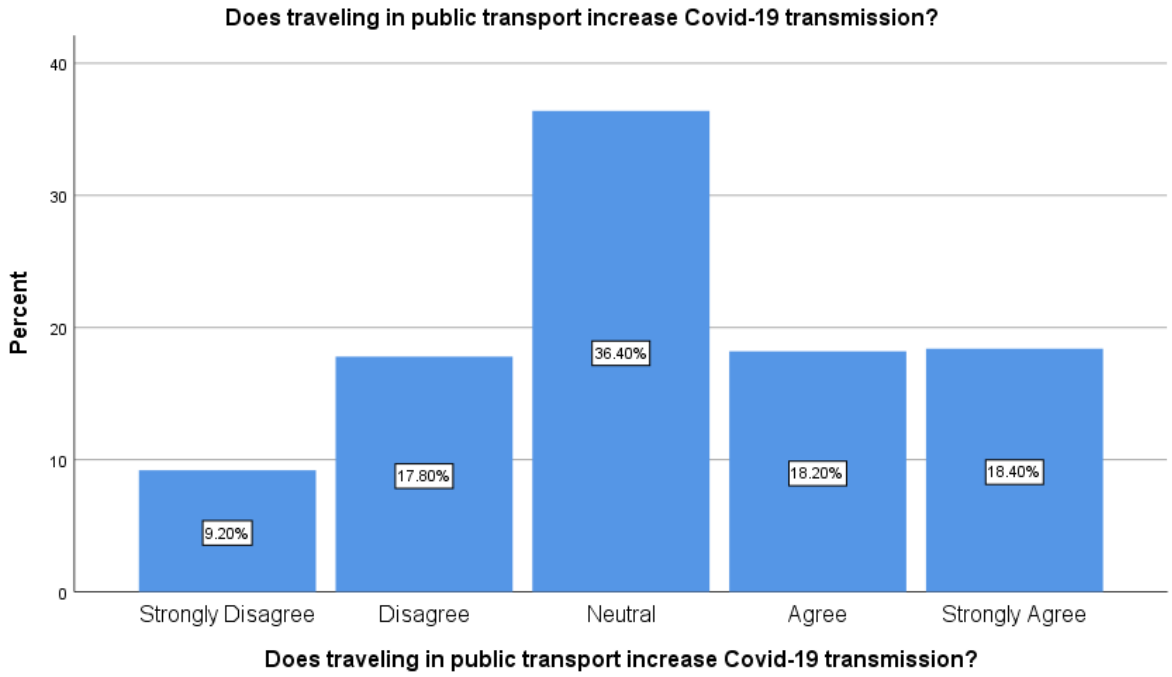


Figure 4.15 Traveling through Public Transport Increase Covid-19 Transmission

Table 4.15 and figure 4.15 show the response regarding the statement "Traveling through Public Transport Increase Covid-19 Transmission". "According to table 4.15 and figure 4.15 (Bar chart), out of 500 respondents, 9.2% of the respondents responded strongly disagree with the statement., 9.0% of the respondents responded disagree with the statement, 26.2% of the respondents responded neutral with the statement, 39.2% of the respondents responded agree with the statement and 16.8% of the respondents responded strongly agree with the statement".

Table 4.16 Correlation between the Confirmed Cases and the Volume of Public Transport Trips

Is there a correlation between the confirmed cases and the volume of public transport trips?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	56	11.2	11.2	11.2
	Disagree	46	9.2	9.2	20.4
	Neutral	195	39.0	39.0	59.4
	Agree	119	23.8	23.8	83.2
	Strongly Agree	84	16.8	16.8	100.0
	Total	500	100.0	100.0	

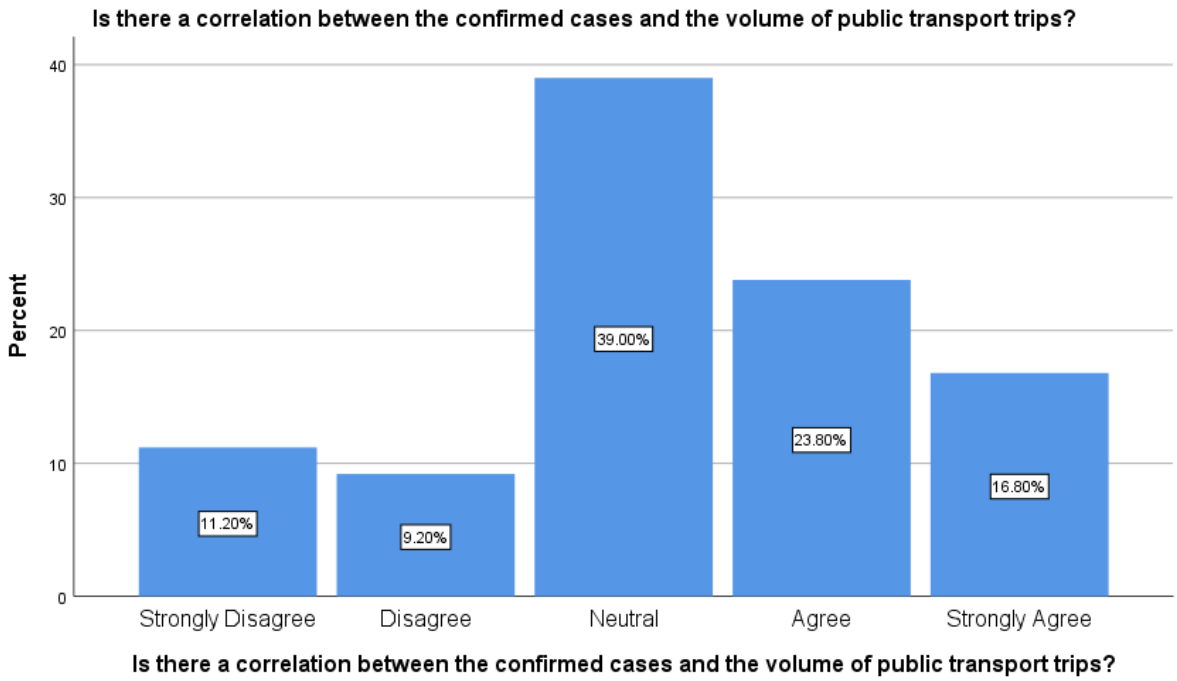


Figure 4.16 Correlation between the Confirmed Cases and the Volume of Public Transport Trips

Table 4.16 and figure 4.16 show the response regarding the statement “Correlation between the Confirmed Cases and the Volume of Public Transport Trips.” “According to table 4.16 and figure 4.16 (Bar chart), out of 500 respondents, 11.2% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 39.0% of the respondents responded neutral with the statement, 23.8% of the respondents responded agreed with the statement and 16.8% of the respondents responded strongly agree with the statement”.

Table 4.17 Covid-19 Affect the Attitude and Behavior of the General Public Regarding the Usage of Public Transport

Does Covid-19 affect the attitude and behavior of the general public regarding the usage of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	42	8.4	8.4	8.4
	Disagree	46	9.2	9.2	17.6
	Neutral	65	13.0	13.0	30.6
	Agree	127	25.4	25.4	56.0
	Strongly Agree	220	44.0	44.0	100.0
	Total	500	100.0	100.0	

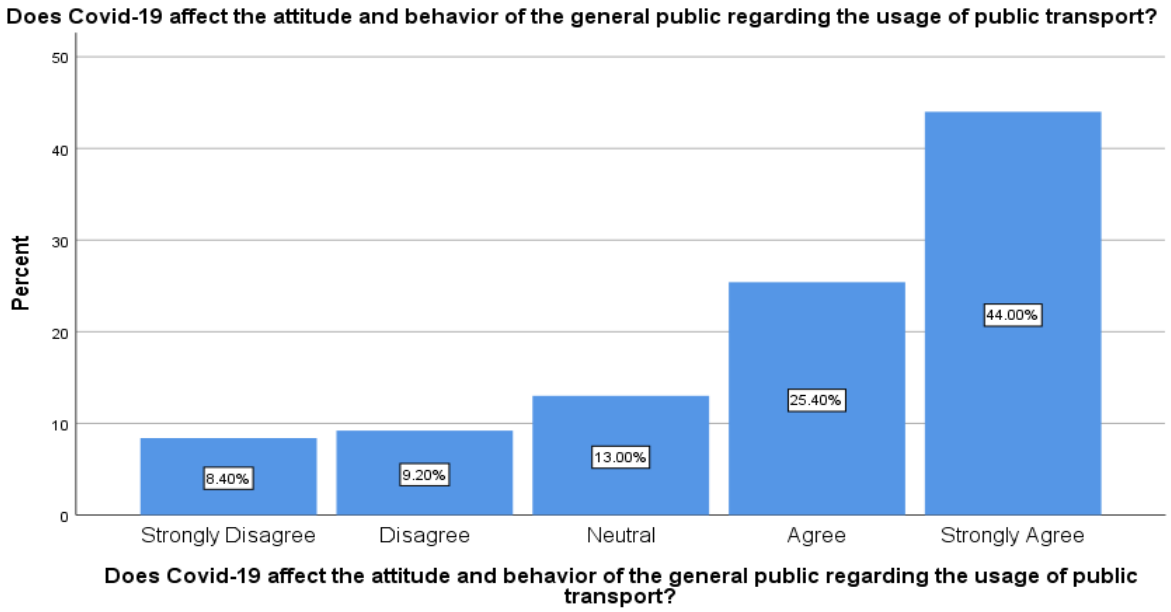


Figure 4.17 Covid-19 Affect the Attitude and Behavior of the General Public Regarding the Usage of Public Transport

Table 4.17 and figure 4.17 show the response regarding the statement the "Covid-19 Affect the Attitude and Behavior of the General Public Regarding the Usage of Public Transport". "According to table 4.17 and figure 4.17 (Bar chart), out of 500 respondents, 8.4% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 13.0% of the respondents responded neutral with the statement, 25.4% of the respondents responded agree with the statement and 44.0% of the respondents responded strongly agree with the statement".

Table 4.18 Public Transport Ridership Reduce During the Pandemic

Does the public transport ridership reduce during the pandemic?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	33	6.6	6.6	6.6
	Disagree	39	7.8	7.8	14.4
	Neutral	75	15.0	15.0	29.4

	Agree	150	30.0	30.0	59.4
	Strongly Agree	203	40.6	40.6	100.0
	Total	500	100.0	100.0	

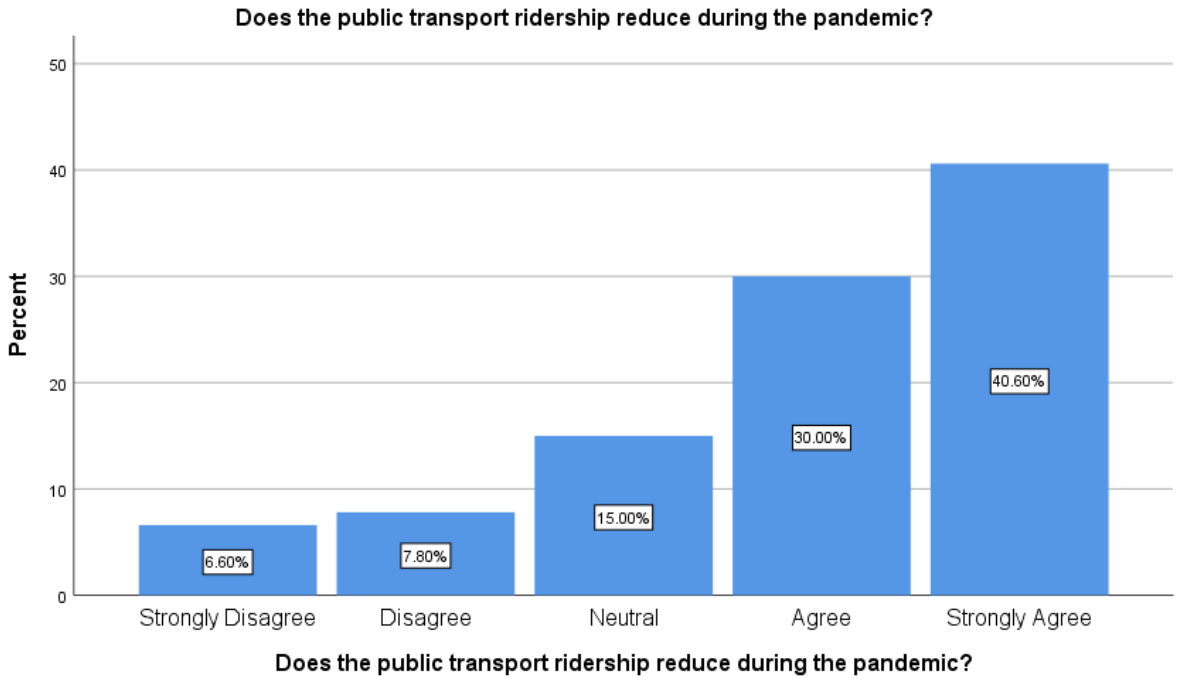


Figure 4.18 Public Transport Ridership Reduce During the Pandemic

Table 4.18 and figure 4.18 show the response regarding the statement the "public transport ridership reduce during the pandemic." "According to table 4.18 and figure 4.18 (Bar chart), out of 500 respondents, 8.4% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 13.0% of the respondents responded neutral with the statement, 25.4% of the respondents responded agree with the statement and 44.0% of the respondents responded strongly agree with the statement".

Table 4.27 Public Transportation Suffer More than Private Transportation during the Pandemic

Does public transportation suffer more than private transportation during the pandemic?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	32	6.4	6.4	6.4
	Disagree	53	10.6	10.6	17.0
	Neutral	91	18.2	18.2	35.2
	Agree	148	29.6	29.6	64.8
	Strongly Agree	176	35.2	35.2	100.0
	Total	500	100.0	100.0	

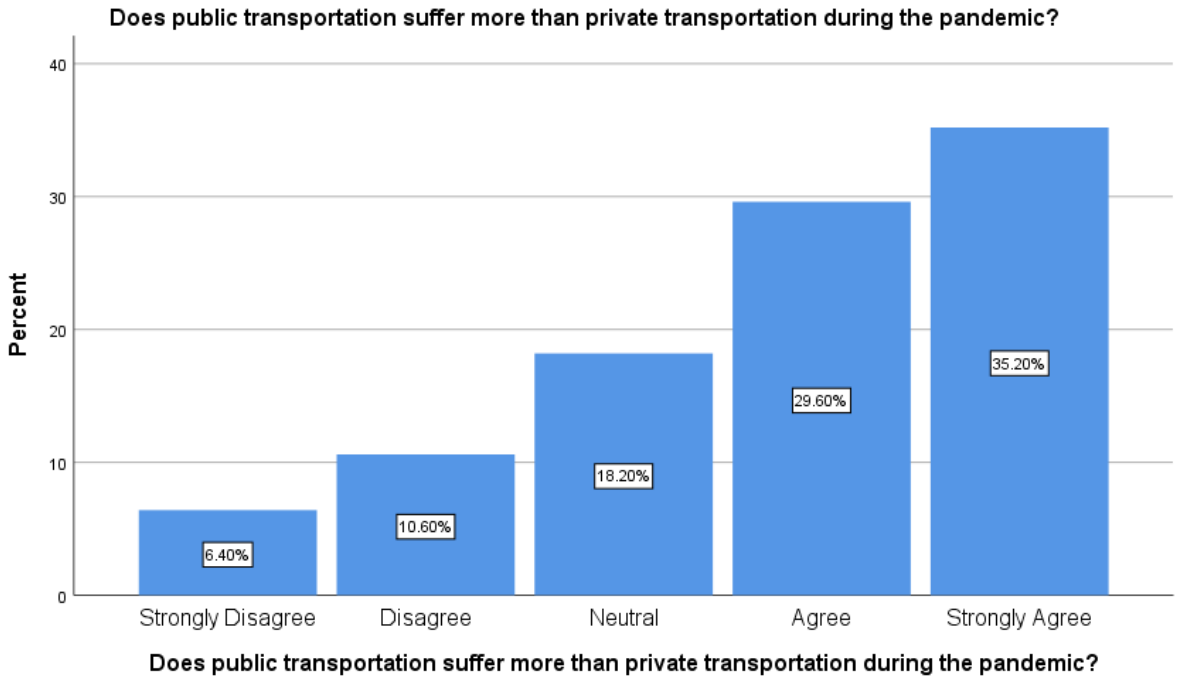


Figure 4.19 Public Transportation Suffer More than Private Transportation During the Pandemic

Table 4.19 and figure 4.19 show the response regarding the statement the "Public Transportation Suffer More than Private Transportation During the Pandemic." "According to table 4.19 and figure 4.19 (Bar chart), out of 500 respondents, 6.6% of the respondents responded strongly disagree with the statement, 7.8% of the respondents responded disagree with the statement, 15.0% of the respondents responded neutral with the statement, 30.0% of the respondents responded agree with the statement and 40.6% of the respondents responded strongly agree with the statement".

- **Response Regarding the Usage of Public Transport**

Table 4.20 Public Transport is Affordable in Comparison to Private Transport

Is public transport Affordable in comparison to private transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	28	5.6	5.6	5.6
	Disagree	38	7.6	7.6	13.2
	Neutral	156	31.2	31.2	44.4
	Agree	135	27.0	27.0	71.4
	Strongly Agree	143	28.6	28.6	100.0
	Total	500	100.0	100.0	

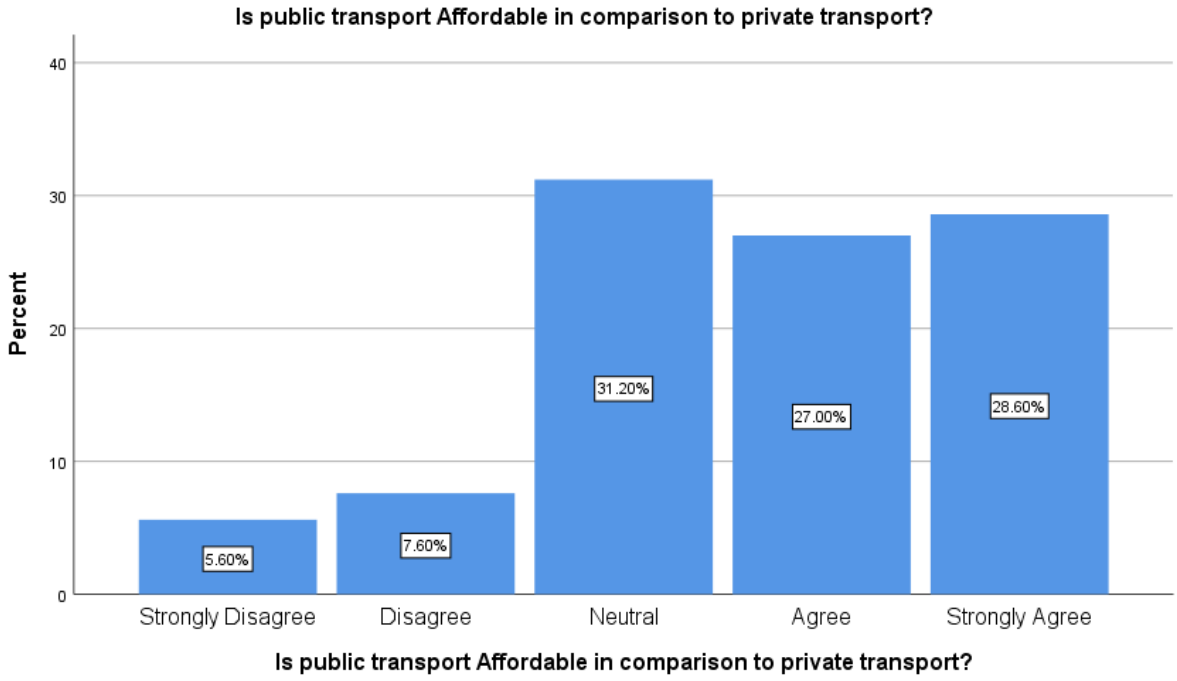


Figure 4.20 Public Transport is Affordable in Comparison to Private Transport

Table 4.20 and figure 4.20 show the response regarding the statement "public transport is

Affordable in comparison to private transport." "According to table 4.20 and figure 4.20 (Bar chart), out of 500 respondents, 5.6% of the respondents responded strongly disagree with the statement., 7.6% of the respondents responded disagree with the statement, 31.2% of the respondents responded neutral with the statement, 27.0% of the respondents responded agree with the statement and 28.6% of the respondents responded strongly agree with the statement".

Table 4.21 Long Walking Distances from Stations Affect the Usage of Public Transport

Does the long walking distances from stations affect the usage of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	32	6.4	6.4	6.4
	Disagree	54	10.8	10.8	17.2
	Neutral	235	47.0	47.0	64.2
	Agree	109	21.8	21.8	86.0
	Strongly Agree	70	14.0	14.0	100.0
	Total	500	100.0	100.0	

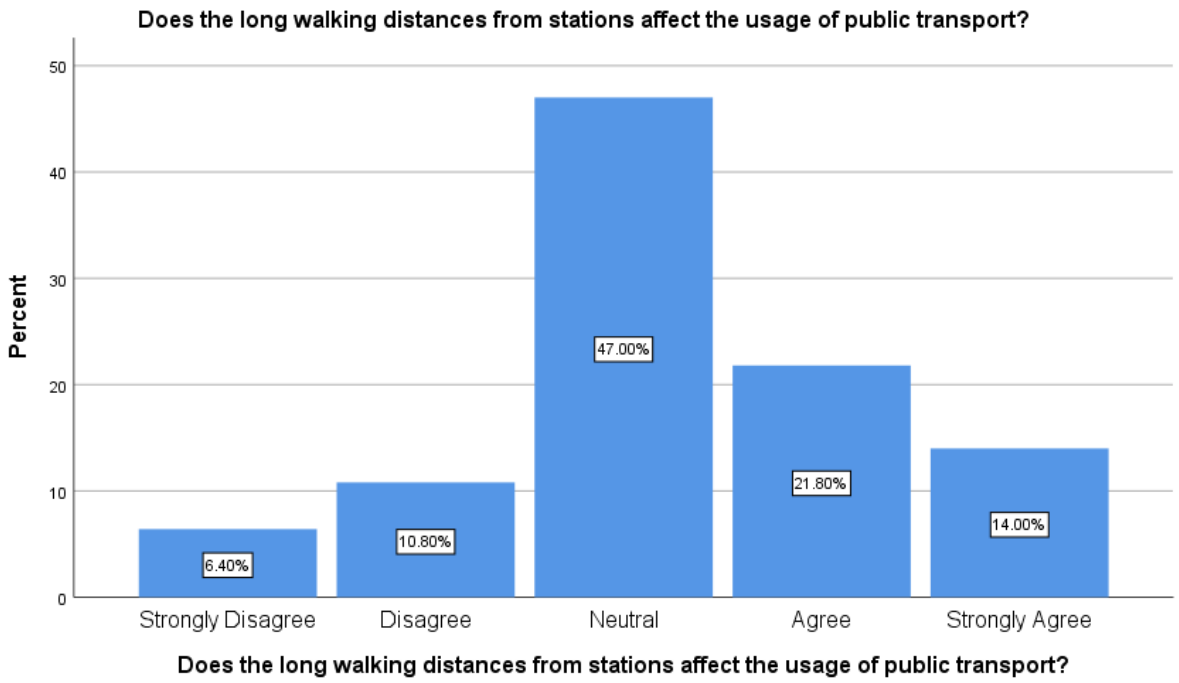


Figure 4.21 Long Walking Distances from Stations Affect the Usage of Public Transport

Table 4.21 and figure 4.21 show the response regarding the statement "Long Walking Distances from Stations Affect the Usage of Public Transport." "According to table 4.21 and figure 4.21 (Bar chart), out of 500 respondents, 6.4% of the respondents responded strongly disagree with the statement., 10.8% of the respondents responded disagree with the statement, 47.0% of the respondents responded neutral with the statement, 21.8% of the respondents responded agreed with the statement and 14.0% of the respondents responded strongly agree with the statement".

Table 4.22 Time Travelled by the Passenger Create an Impact on the Usage of Public Transportation

Does the time travelled by the passenger create an impact on the usage of public transportation?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	22	4.4	4.4	4.4

	Disagree	39	7.8	7.8	12.2
	Neutral	215	43.0	43.0	55.2
	Agree	113	22.6	22.6	77.8
	Strongly Agree	111	22.2	22.2	100.0
	Total	500	100.0	100.0	

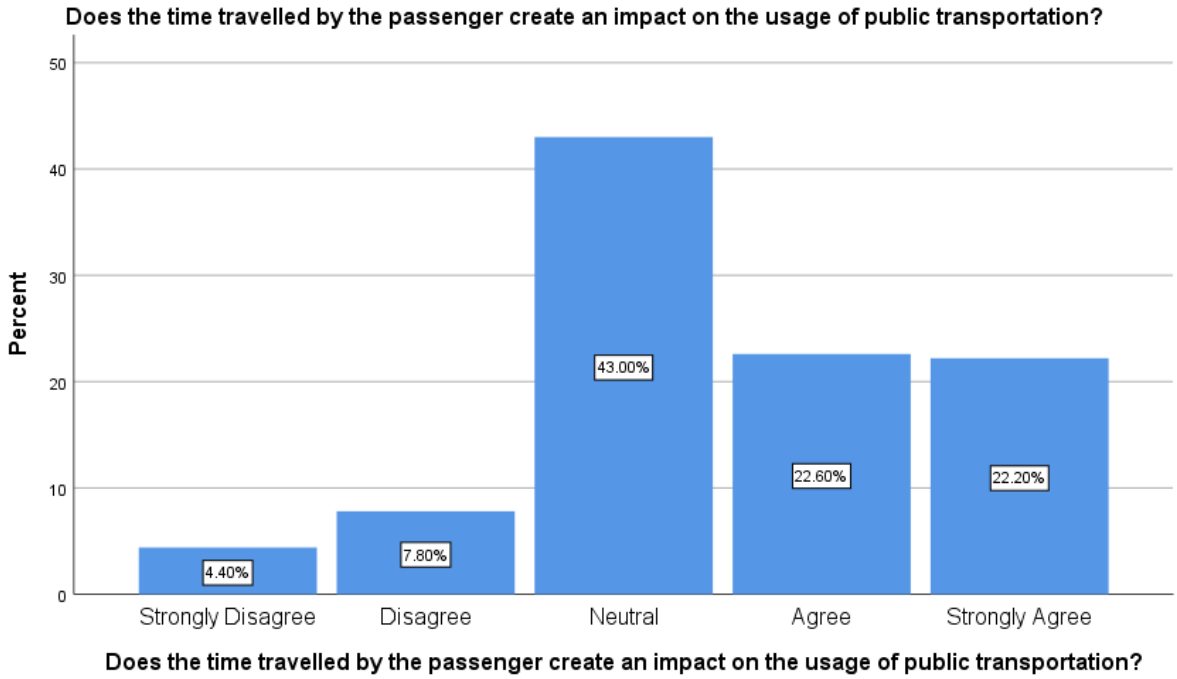


Figure 4.22 Time Travelled by the Passenger Create an Impact on the Usage of Public Transportation

Table 4.30 and figure 4.22 show the response regarding the statement "Time Travelled by passenger create an impact on the usage of public transportation." "According to table 4.22 and figure 4.22 (Bar chart), out of 500 respondents, 4.4% of the respondents responded strongly disagree with the statement., 7.8% of the respondents responded disagree with the statement, 43.0% of the respondents responded neutral with the statement, 22.6% of the respondents responded agree with the statement and 22.2% of the respondents responded strongly agree with the statement".

Table 4.23 Low Bus Frequency Create an Impact on the Usage of Public Transportation

Does the low bus frequency create an impact on the usage of public transportation?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	27	5.4	5.4	5.4
	Disagree	48	9.6	9.6	15.0
	Neutral	100	20.0	20.0	35.0
	Agree	125	25.0	25.0	60.0
	Strongly Agree	200	40.0	40.0	100.0
	Total	500	100.0	100.0	

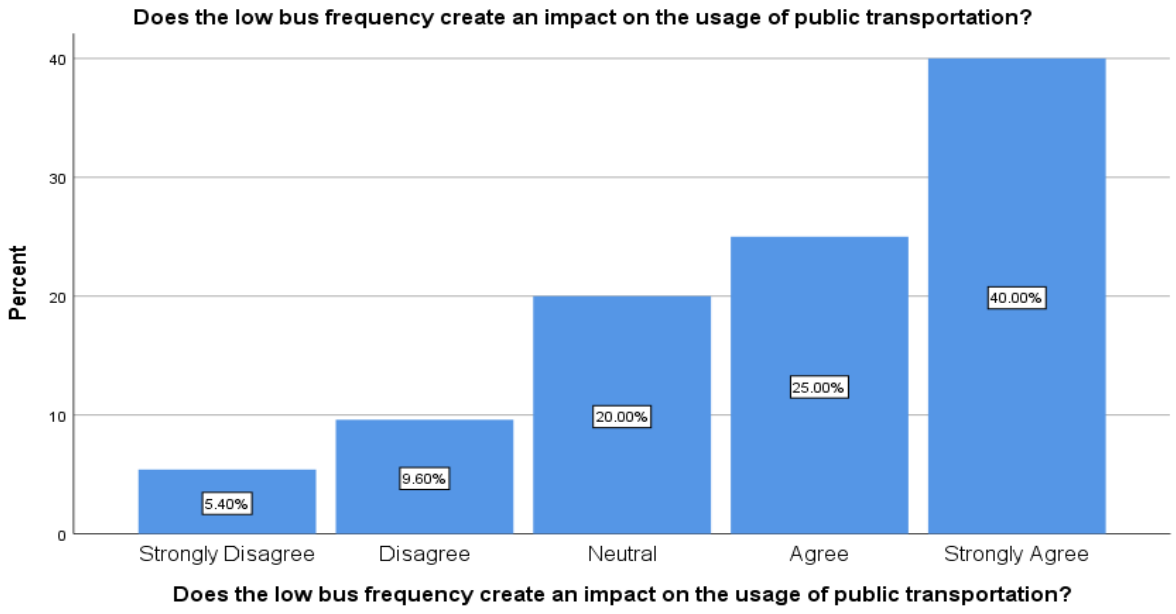


Figure 4.23 Low Bus Frequency Create an Impact on the Usage of Public Transportation

Table 4.23 and figure 4.23 show the response regarding the statement "Low Bus Frequency Create an Impact on the Usage of Public Transportation." "According to table 4.23 and figure

4.23 (Bar chart), out of 500 respondents, 4.4% of the respondents responded strongly disagree with the statement., 7.8% of the respondents responded disagree with the statement, 43.0% of the respondents responded neutral with the statement, 22.6% of the respondents responded agree with the statement and 22.2% of the respondents responded strongly agree with the statement".

Table 4.24 Population Density Influence the Usage of Public Transportation

Does population density influence the usage of public transportation?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	61	12.2	12.2	12.2
	Disagree	59	11.8	11.8	24.0
	Neutral	74	14.8	14.8	38.8
	Agree	155	31.0	31.0	69.8
	Strongly Agree	151	30.2	30.2	100.0
	Total	500	100.0	100.0	

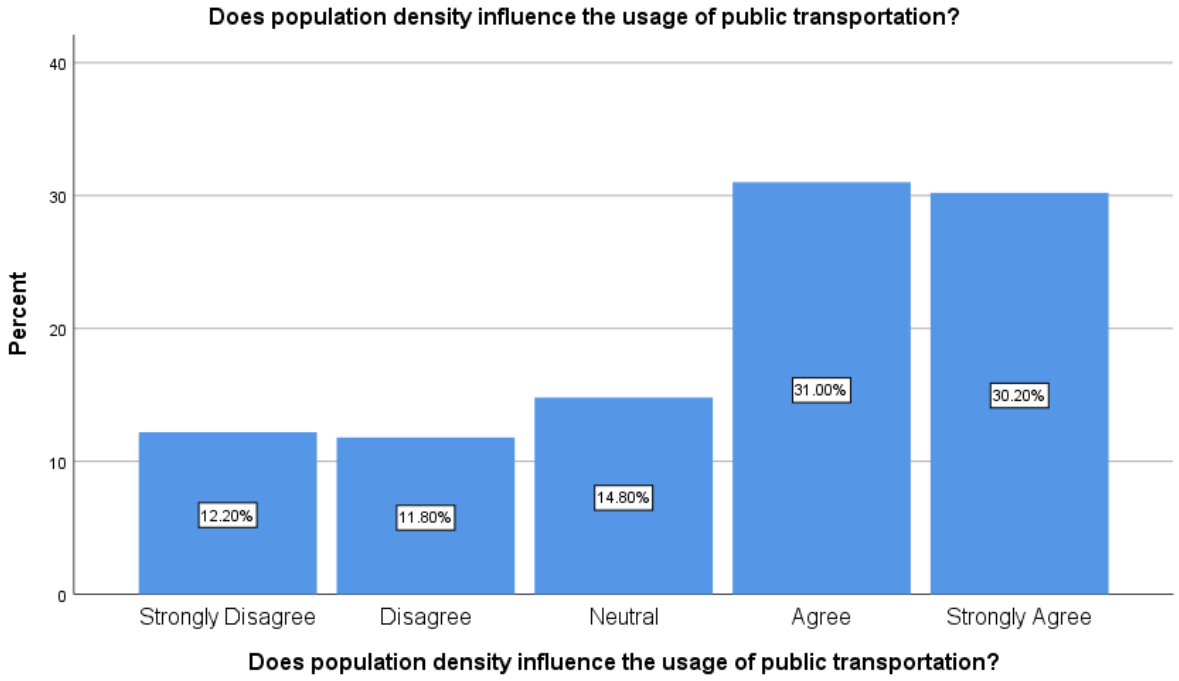


Figure 4.24 Population Density Influence the Usage of Public Transportation

The answers to the question "Population Density Affects the Use of Public Transportation" can be seen in Table 4.24 and Figure 4.24. "According to table 4.24 and figure 4.24 (Bar chart), out of 500 respondents, 12.2% strongly disagreed with the statement, 11.8% disagreed with the

statement, 14.8% were neutral with the statement, 31.0% agreed with the statement, and 30.2% strongly agreed with the statement."

Table 4.25 Unavailability of Parking for Private Vehicles Increase the Usage of Public Transport

Does the unavailability of parking for private vehicles increase the usage of public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	51	10.2	10.2	10.2
	Disagree	63	12.6	12.6	22.8
	Neutral	100	20.0	20.0	42.8
	Agree	187	37.4	37.4	80.2
	Strongly Agree	99	19.8	19.8	100.0
	Total	500	100.0	100.0	

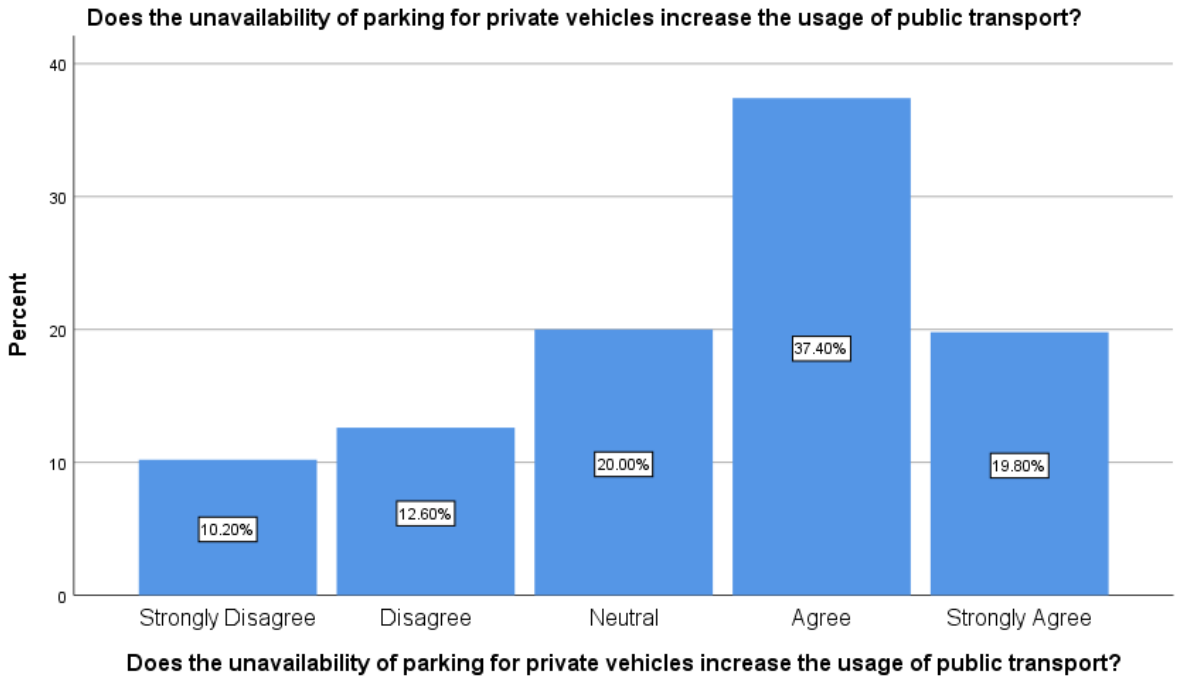


Figure 4.25 Unavailability of Parking for Private Vehicles Increase the Usage of Public Transport

The answers to the question "Not being able to park your own car makes people use public transportation more" are shown in Table 4.25 and Figure 4.25. "According to table 4.25 and figure 4.25 (Bar chart), out of 500 respondents, 10.2% strongly disagreed with the statement, 12.6% disagreed with the statement, 20.0% were neutral with the statement, 37.4% agreed with the statement, and 19.8% strongly agreed with the statement.

Table 4.26 Public Transport is Mostly used by Employees Rather than Businessmen

Does public transport is mostly used by employees rather than businessmen?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	16	3.2	3.2	3.2
	Disagree	68	13.6	13.6	16.8
	Neutral	86	17.2	17.2	34.0

	Agree	183	36.6	36.6	70.6
	Strongly Agree	147	29.4	29.4	100.0
	Total	500	100.0	100.0	

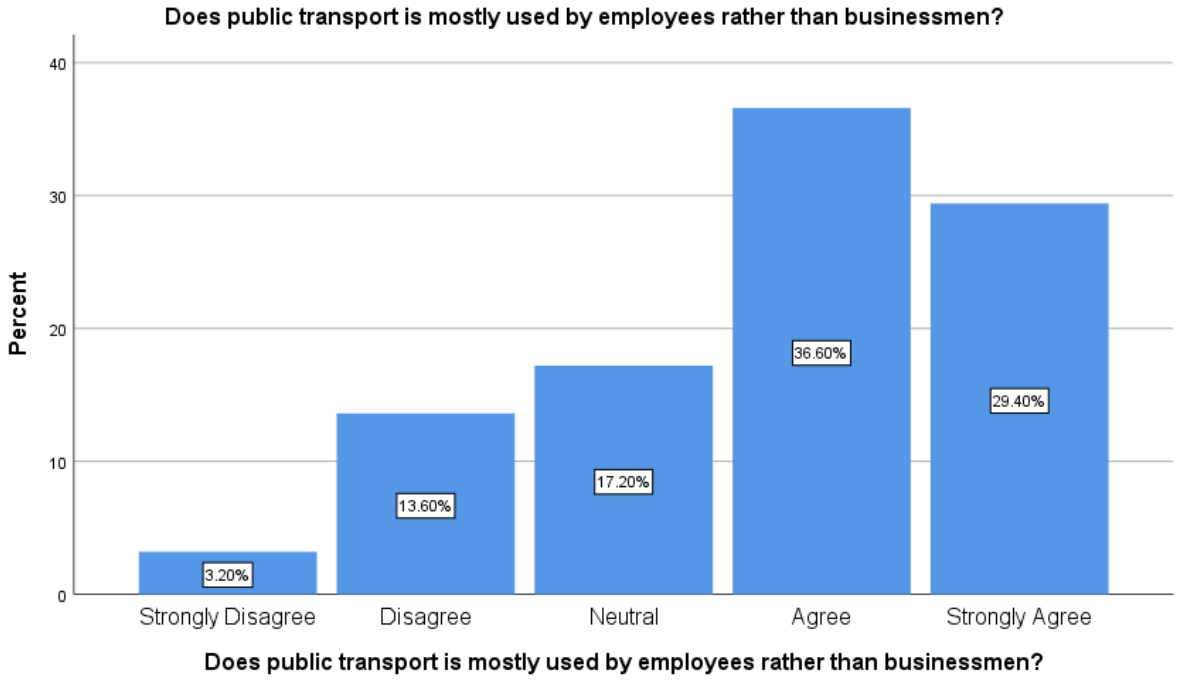


Figure 4.26 Public Transport is Mostly used by Employees Rather than Businessmen

The answers to the question "Public transportation is mostly used by employees rather than businesspeople" can be seen in Table 4.26 and Figure 4.26. "According to table 4.26 and figure 4.26 (Bar chart), out of 500 respondents, 3.2% strongly disagreed with the statement, 13.6% disagreed with the statement, 17.2% were neutral with the statement, 36.6% agreed with the statement, and 29.4% strongly agreed with the statement."

Table 4.27 High Usage of Public Transport Reduce Road Congestion

Does the high usage of public transport reduce road congestion?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	38	7.6	7.6	7.6
	Disagree	87	17.4	17.4	25.0
	Neutral	96	19.2	19.2	44.2
	Agree	103	20.6	20.6	64.8
	Strongly Agree	176	35.2	35.2	100.0
	Total	500	100.0	100.0	

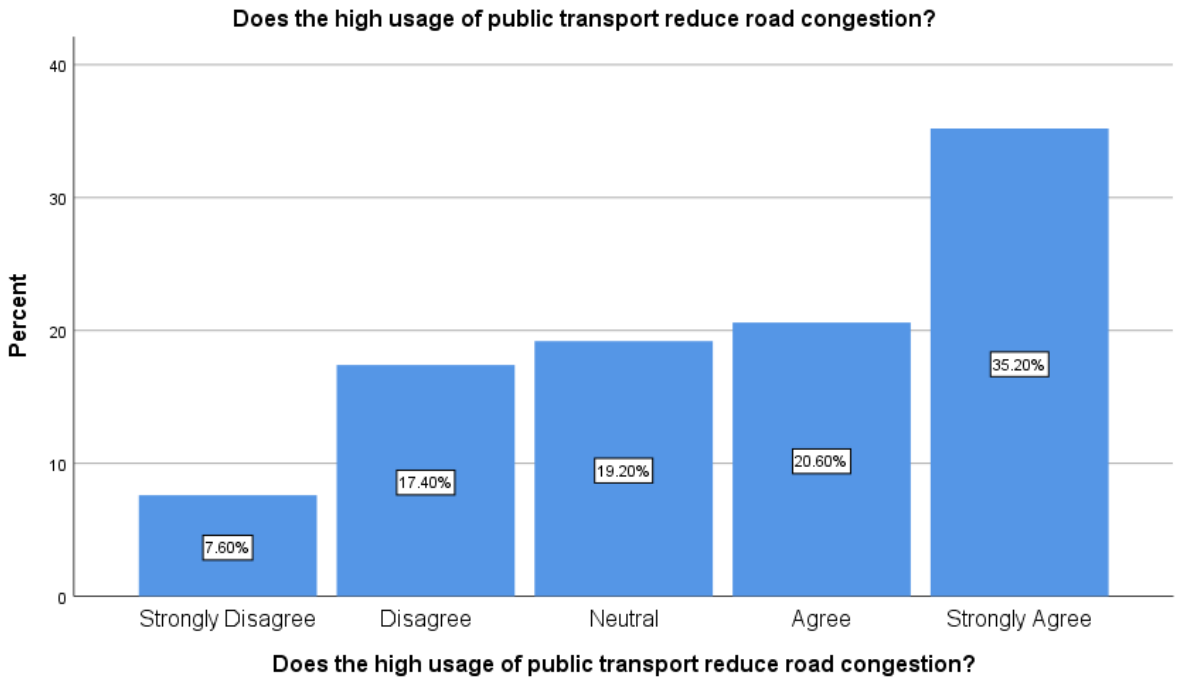


Figure 4.27 High Usage of Public Transport Reduce Road Congestion

The answers to the question "High use of public transportation reduces traffic on the roads" are shown in Table 4.27 and Figure 4.27. Table 4.27 and Figure 4.27 (Bar chart) show that out of 500 people who answered, 3.2% strongly disagreed with the statement, 13.6% disagreed with the statement, 17.2% were neutral about the statement, 36.6% agreed with the statement, and 29.4% strongly agreed with the statement.

Table 4.28 High Usage of Public Transport Reduce Co2 Emissions (Air Pollution)

Does the high usage of public transport reduce Co2 emissions (air pollution)?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	26	5.2	5.2	5.2
	Disagree	44	8.8	8.8	14.0
	Neutral	119	23.8	23.8	37.8
	Agree	125	25.0	25.0	62.8
	Strongly Agree	186	37.2	37.2	100.0
	Total	500	100.0	100.0	

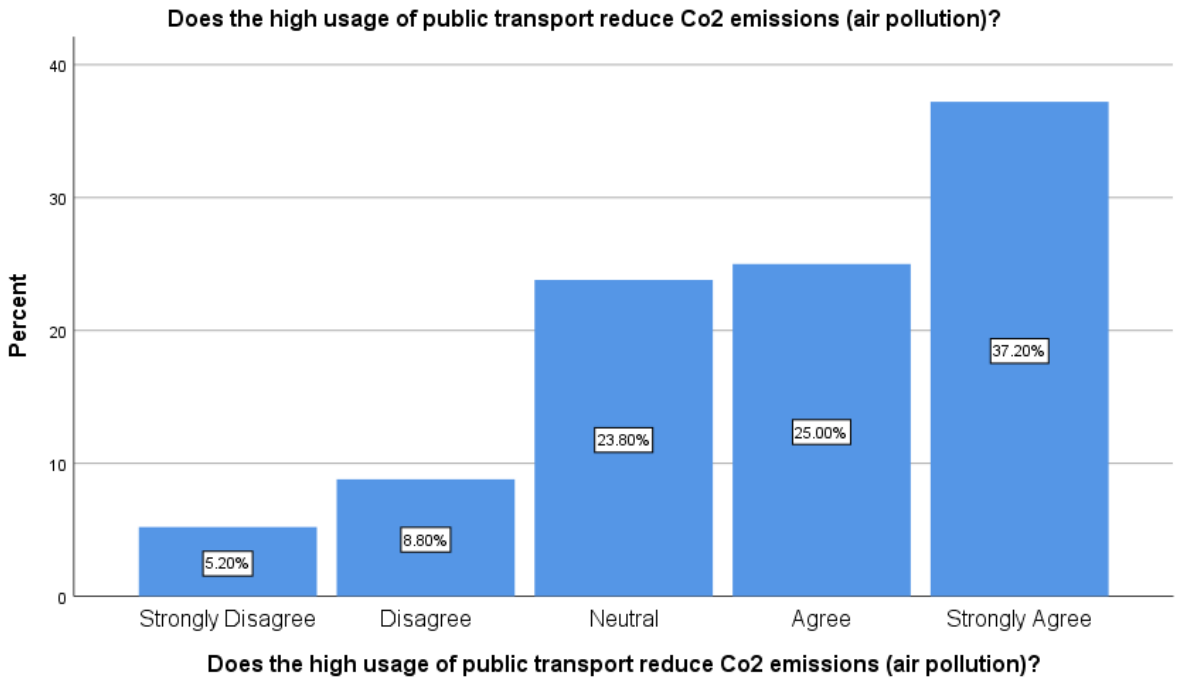


Figure 4.28 High Usage of Public Transport Reduce Co2 Emissions (Air Pollution)

The answers to the question "High use of public transportation lowers CO2 emissions" are shown in Table 4.28 and Figure 4.28. Out of 500 people who answered, 5.2% strongly disagreed with the statement, 8.8% disagreed with the statement, 23.8% were neutral with the statement, 25.0% agreed with the statement, and 37.2% strongly agreed with the statement.

- **Response Regarding Attitude of Users Towards Public Transport**

Table 4.29 Comfort and Quality of Seats Influence the Attitude of Users while Using Public Transport

Does Comfort and Quality of seats influence the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	15	3.0	3.0	3.0
	Disagree	27	5.4	5.4	8.4
	Neutral	126	25.2	25.2	33.6
	Agree	139	27.8	27.8	61.4
	Strongly Agree	193	38.6	38.6	100.0
	Total	500	100.0	100.0	

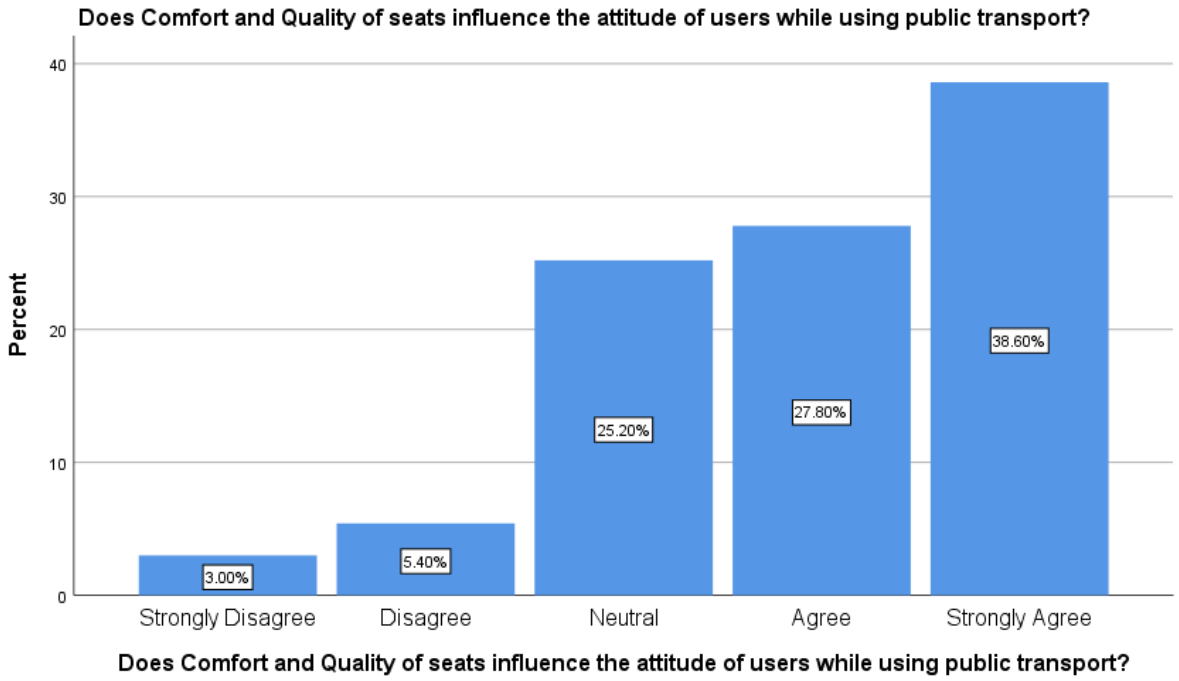


Figure 4.29 Comfort and Quality of Seats Influence the Attitude of Users while Using Public Transport

The answers to the question "Comfort and Quality of Seats Affect the Attitude of Users While Using Public Transportation" can be seen in Table 4.29 and Figure 4.29. Out of 500 people who answered, 3.0% strongly disagreed with the statement, 5.4% disagreed with the statement, 25.2% were neutral with the statement, 27.8% agreed with the statement, and 38.6% strongly agreed with the statement.

Table 4.30 Cleanliness and Condition of the Vehicle Change the Attitude of Users while Using Public Transport

Does the Cleanliness and Condition of the vehicle change the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	27	5.4	5.4	5.4
	Disagree	46	9.2	9.2	14.6

	Neutral	56	11.2	11.2	25.8
	Agree	231	46.2	46.2	72.0
	Strongly Agree	140	28.0	28.0	100.0
	Total	500	100.0	100.0	

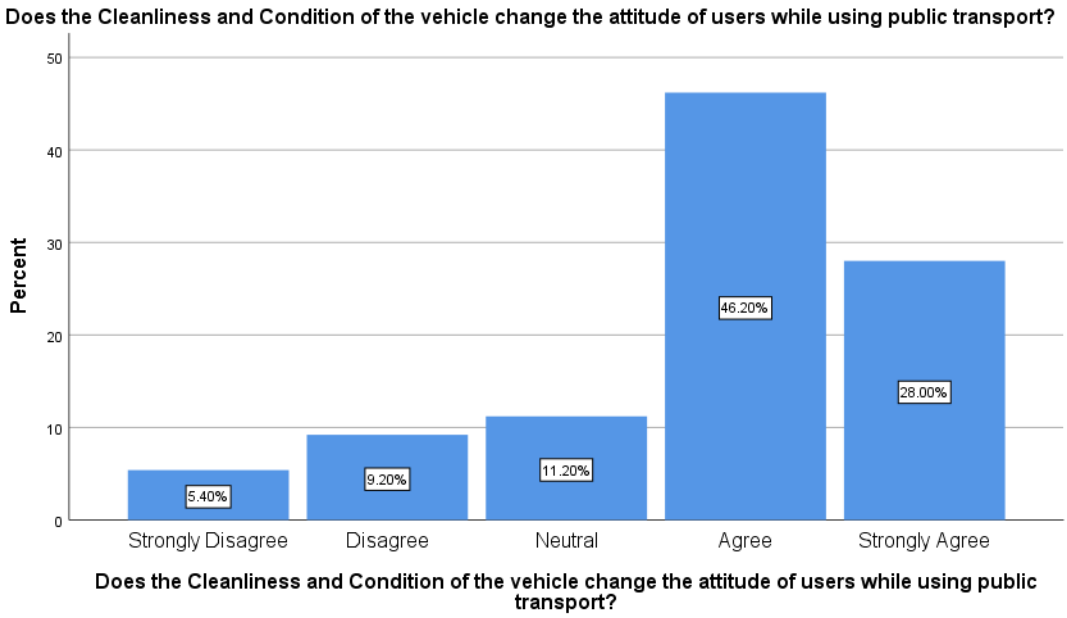


Figure 4.30 Cleanliness and Condition of the Vehicle Change the Attitude of Users while Using Public Transport

The answers to the question "Cleanliness and Condition of the Vehicle Change the Attitude of Users While Using Public Transport" are shown in Table 4.30 and Figure 4.30. Table 4.30 and Figure 4.30 (Bar chart) show that out of 500 people who answered, 5.4% strongly disagreed with the statement, 9.2% disagreed with the statement, 11.2% were neutral about the statement, 46.2% agreed with the statement, and 28.0% strongly agreed with the statement.

Table 4.31 Regularity and Frequency of Service Provided by Public Transport Change the Attitude of the User

Does the Regularity and Frequency of service provided by public transport change the attitude of the user?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	25	5.0	5.0	5.0
	Disagree	58	11.6	11.6	16.6
	Neutral	66	13.2	13.2	29.8
	Agree	206	41.2	41.2	71.0
	Strongly Agree	145	29.0	29.0	100.0
	Total	500	100.0	100.0	

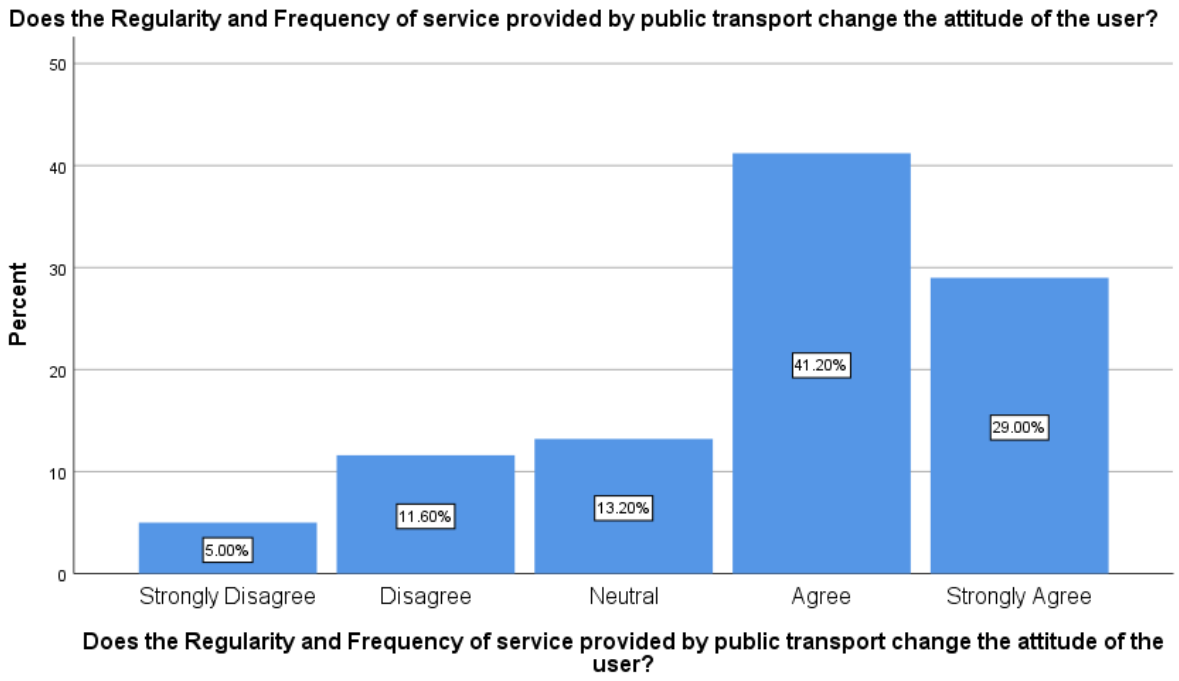


Figure 4.31 Regularity and Frequency of Service Provided by Public Transport Change the Attitude of the User

The answers to the question "Does the Regularity and Frequency of Service Provided by Public Transport Change the Attitude of the User?" can be seen in Table 4.31 and Figure 4.31. Table 4.31 and Figure 4.31 (Bar chart) show that out of 500 people who answered, 5.0% strongly

disagreed with the statement, 11.6% disagreed with the statement, 13.2% were neutral about the statement, 41.2% agreed with the statement, and 29.0% strongly agreed with the statement.

Table 4.32 Timetable of the Vehicle Available at the Terminus Influence the Attitude of Users while Using Public Transport

Does the timetable of the vehicle available at the terminus influence the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	22	4.4	4.4	4.4
	Disagree	56	11.2	11.2	15.6
	Neutral	128	25.6	25.6	41.2
	Agree	131	26.2	26.2	67.4
	Strongly Agree	163	32.6	32.6	100.0
	Total	500	100.0	100.0	

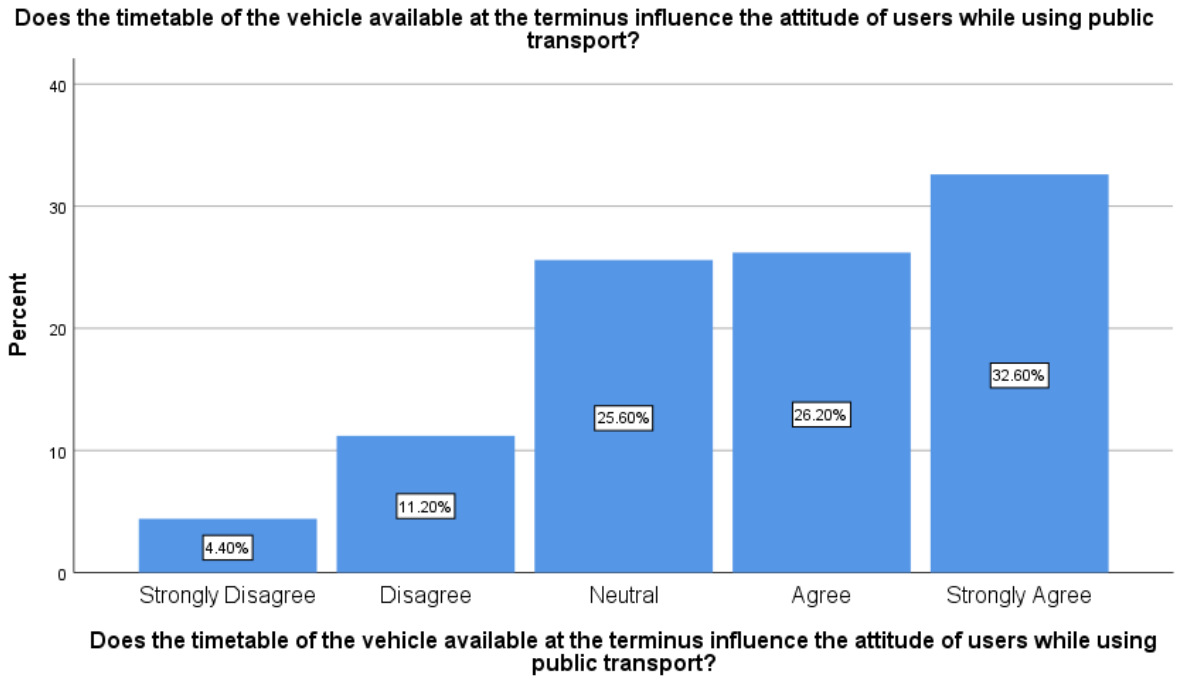


Figure 4.32 Timetable of the Vehicle Available at the Terminus Influence the Attitude of Users while Using Public Transport

Responses to the statement "Timetable of the vehicles available at the terminus affects how people feel while using public transportation" can be seen in Table 4.32 and Figure 4.32. Table 4.32 and Figure 4.32 (Bar chart) show that out of 500 people who answered, 4.4% strongly disagreed with the statement, 11.2% disagreed with the statement, 25.6% were neutral with the statement, 26.2% agreed with the statement, and 32.6% strongly agreed with the statement.

Table 4.33 Rate of Fare Change the Attitude of Users while Using Public Transport

Does the Rate of Fare change the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	32	6.4	6.4	6.4
	Disagree	41	8.2	8.2	14.6
	Neutral	87	17.4	17.4	32.0

	Agree	180	36.0	36.0	68.0
	Strongly Agree	160	32.0	32.0	100.0
	Total	500	100.0	100.0	

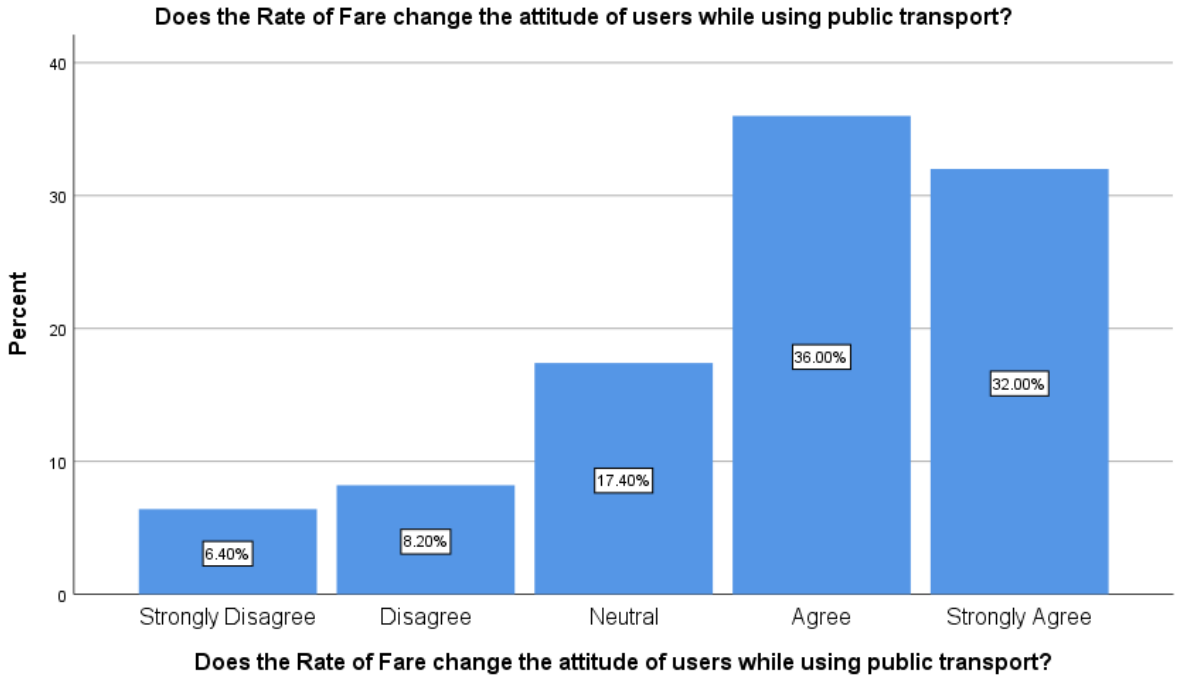


Figure 4.33 Rate of Fare Change the Attitude of Users while Using Public Transport

The answers to the question "Rate of Fare changes the way people feel about using public transportation" can be seen in Table 4.33 and Figure 4.33. Table 4.33 and Figure 4.33 (Bar chart) show that of the 500 people who answered, 6.4% strongly disagreed with the statement, 8.2% disagreed with the statement, 17.4% were neutral about the statement, 36.0% agreed with the statement, and 32.0% strongly agreed with the statement.

Table 4.34 Behaviour of Crew Members Change the Attitude of the User

Does the Behaviour of crew members change the attitude of the user?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	27	5.4	5.4	5.4
	Disagree	42	8.4	8.4	13.8
	Neutral	138	27.6	27.6	41.4
	Agree	176	35.2	35.2	76.6
	Strongly Agree	117	23.4	23.4	100.0
	Total	500	100.0	100.0	

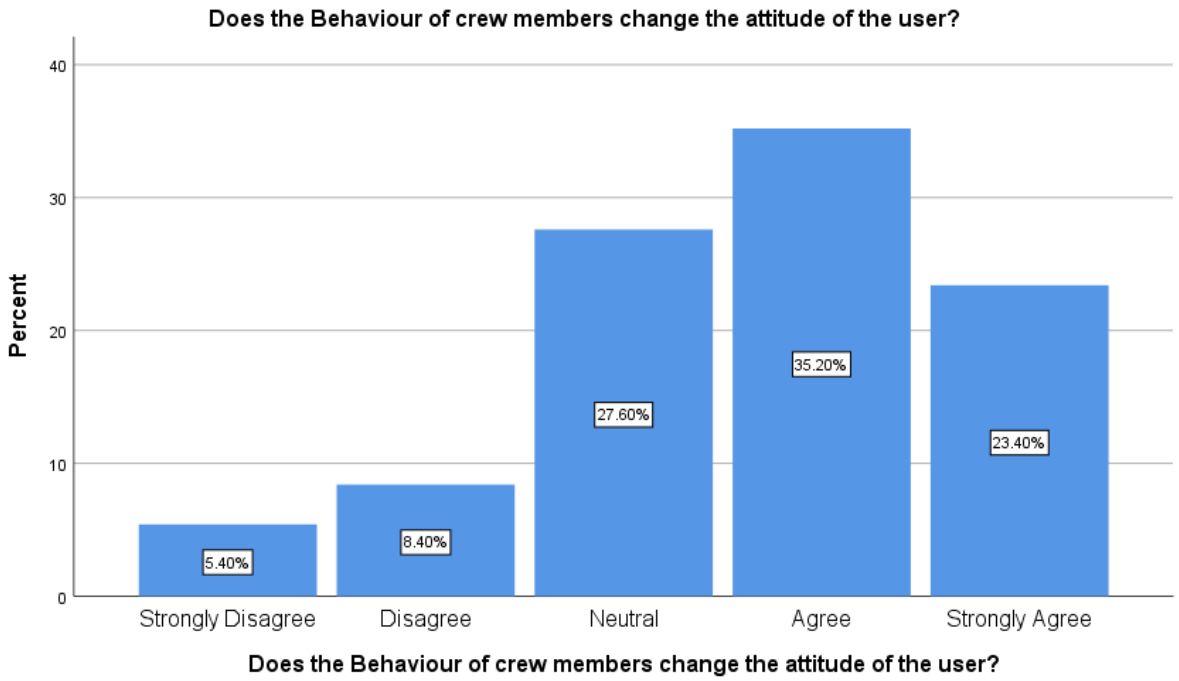


Figure 4.34 Does the Behaviour of Crew Members Change the Attitude of the User

The answers to the question "Behavior of crew members changes the attitude of the user" can be seen in Table 4.34 and Figure 4.34. Table 4.34 and Figure 4.34 (Bar chart) show that out of 500 people who answered, 6.4% strongly disagreed with the statement, 8.4% disagreed with the statement, 27.6% were neutral about the statement, 35.2% agreed with the statement, and 23.4% strongly agreed with the statement.

Table 4.35 Alternate Arrangement Made by the Crew for the Passengers Influence the

Attitude of Users While Using Public Transport

Does the alternate arrangement made by the crew for the passengers in case of a breakdown of vehicle seats influence the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	42	8.4	8.4	8.4
	Disagree	46	9.2	9.2	17.6
	Neutral	127	25.4	25.4	43.0
	Agree	204	40.8	40.8	83.8
	Strongly Agree	81	16.2	16.2	100.0
	Total	500	100.0	100.0	

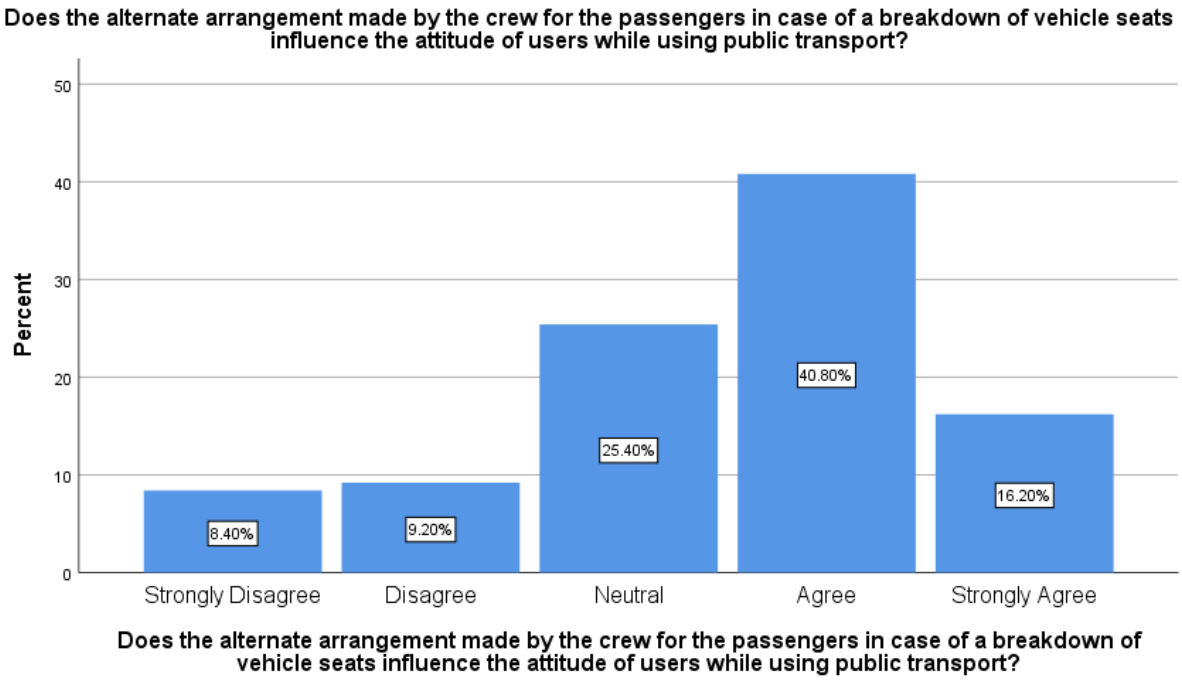


Figure 4.35 Alternate Arrangement Made by the Crew for the Passengers Influence the Attitude of Users While Using Public Transport

The answers to the question "Alternate Arrangements Made by the Crew for the Passengers Affect the Attitude of Users While Using Public Transport" can be seen in Table 4.35 and Figure 4.35. Table 4.35 and Figure 4.35 (Bar chart) show that out of 500 people who answered, 8.4% strongly disagreed with the statement, 9.2% disagreed with the statement, 25.4% were neutral about the statement, 40.8% agreed with the statement, and 16.2% strongly agreed with the statement.

Table 4.36 Facility Provided to Handicapped, Women, Kids, and Senior Citizens Change the Attitude of Users While Using Public Transport

Does the Facility provided to handicapped, women, kids, and senior citizens change the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	5.8	5.8	5.8
	Disagree	42	8.4	8.4	14.2
	Neutral	105	21.0	21.0	35.2
	Agree	226	45.2	45.2	80.4
	Strongly Agree	98	19.6	19.6	100.0
	Total	500	100.0	100.0	

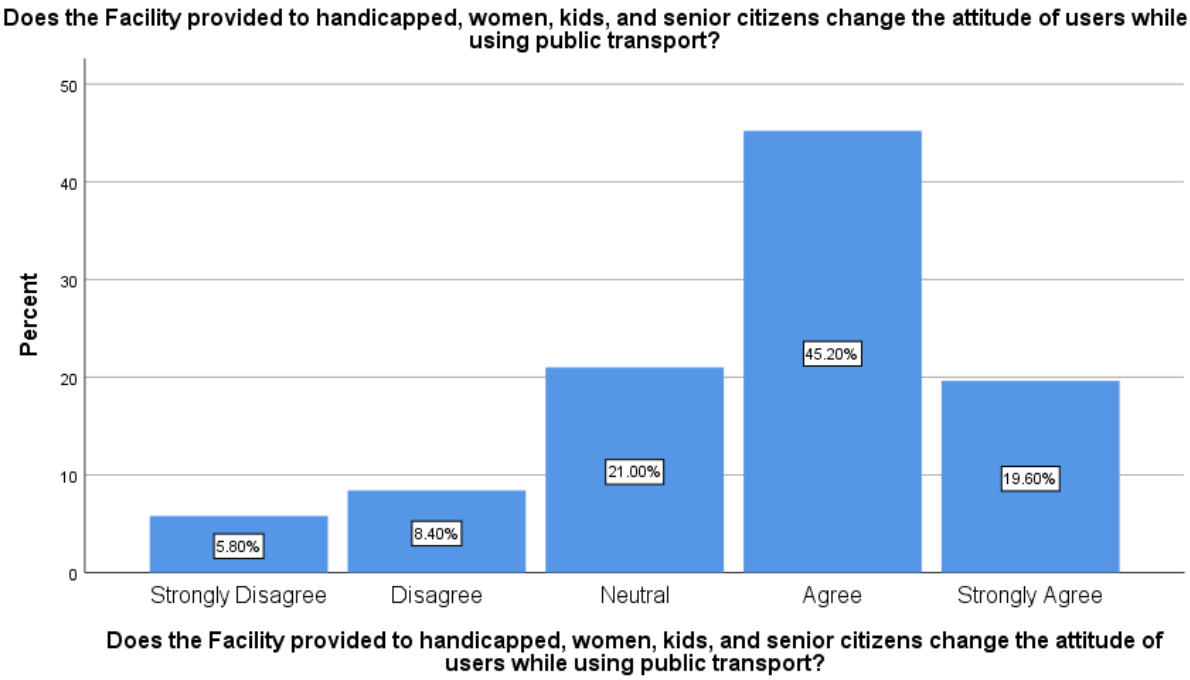


Figure 4.36 Facility Provided to Handicapped, Women, Kids, and Senior Citizens Change the Attitude of Users While Using Public Transport

The answers to the question "Facilities for the Handicapped, Women, Children, and Senior Citizens Change the Attitude of Users While Using Public Transportation" are shown in Table 4.36 and Figure 4.36. Table 4.36 and Figure 4.36 (Bar chart) show that out of 500 people who answered, 5.8% strongly disagreed with the statement, 8.4% disagreed with the statement, 21.0% were neutral about the statement, 45.2% agreed with the statement, and 19.6% strongly agreed with the statement.

Table 4.37 Level of Passenger Intake in Transit Influence the Attitude of Users While Using Public Transport

Does the Level of passenger intake in transit influence the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	29	5.8	5.8	5.8

	Disagree	39	7.8	7.8	13.6
	Neutral	159	31.8	31.8	45.4
	Agree	181	36.2	36.2	81.6
	Strongly Agree	92	18.4	18.4	100.0
	Total	500	100.0	100.0	

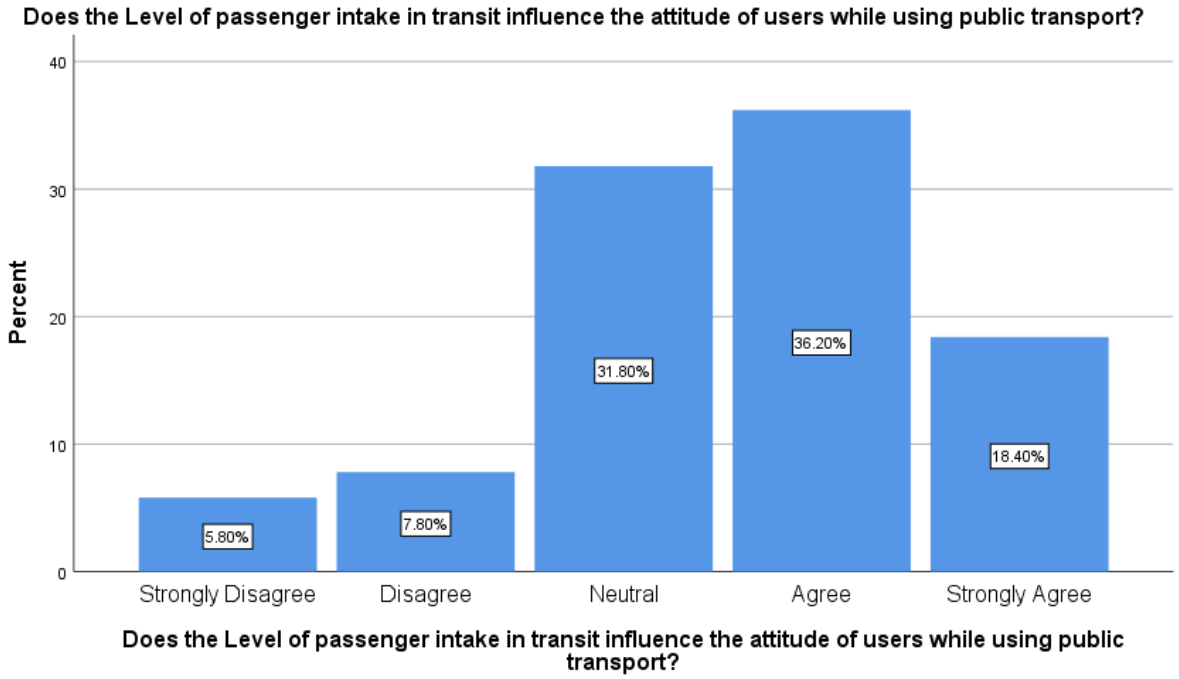


Figure 4.37 Level of Passenger Intake in Transit Influence the Attitude of Users While Using Public Transport

The answers to the question "Level of Passenger Intake in Transit Affects the Attitude of Users While Using Public Transport" can be seen in Table 4.37 and Figure 4.37. Table 4.37 and Figure 4.37 (Bar chart) show that out of 500 people who answered, 5.8% strongly disagreed with the statement, 7.8% disagreed with the statement, 31.8% were neutral about the statement, 36.2% agreed with the statement, and 18.4% strongly agreed with the statement.

Table 4.38 Availability of Transit at a Convenient Place Influence the Attitude of Users While Using Public Transport

Does the Availability of transit at a convenient place influence the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	31	6.2	6.2	6.2
	Disagree	47	9.4	9.4	15.6
	Neutral	195	39.0	39.0	54.6
	Agree	135	27.0	27.0	81.6
	Strongly Agree	92	18.4	18.4	100.0
	Total	500	100.0	100.0	

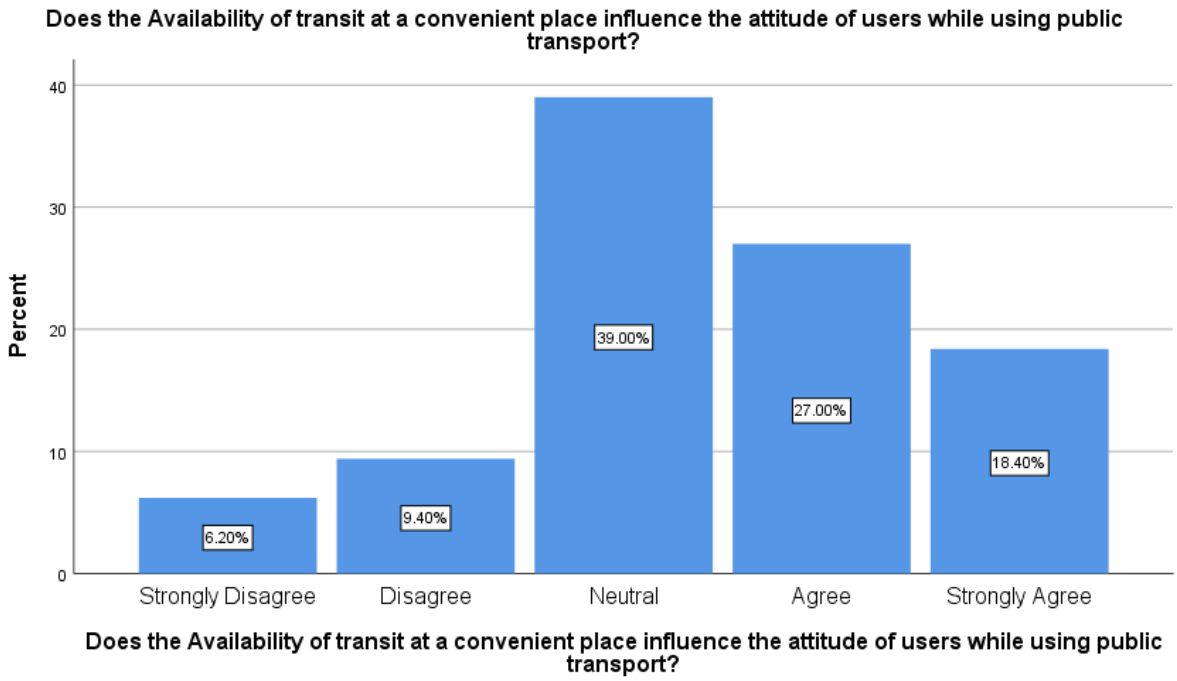


Figure 4.38 Availability of Transit at a Convenient Place Influence the Attitude of Users While Using Public Transport

The answers to the question "Availability of Transit at a Convenient Place Affects the Attitude of Users While Using Public Transport" can be seen in Table 4.38 and Figure 4.38. Table 4.38 and Figure 4.38 (Bar chart) show that out of 500 people who answered, 6.2% strongly disagreed with the statement, 9.4% disagreed with the statement, 39.0% were neutral on the statement, 27.0% agreed with the statement, and 18.4% strongly agreed with the statement.

Table 4.39 Facility for CCTV Cameras in Vehicles Change the Attitude of the User

Does the Facility for CCTV cameras in vehicles change the attitude of the user?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	31	6.2	6.2	6.2
	Disagree	55	11.0	11.0	17.2
	Neutral	161	32.2	32.2	49.4
	Agree	163	32.6	32.6	82.0
	Strongly Agree	90	18.0	18.0	100.0
	Total	500	100.0	100.0	

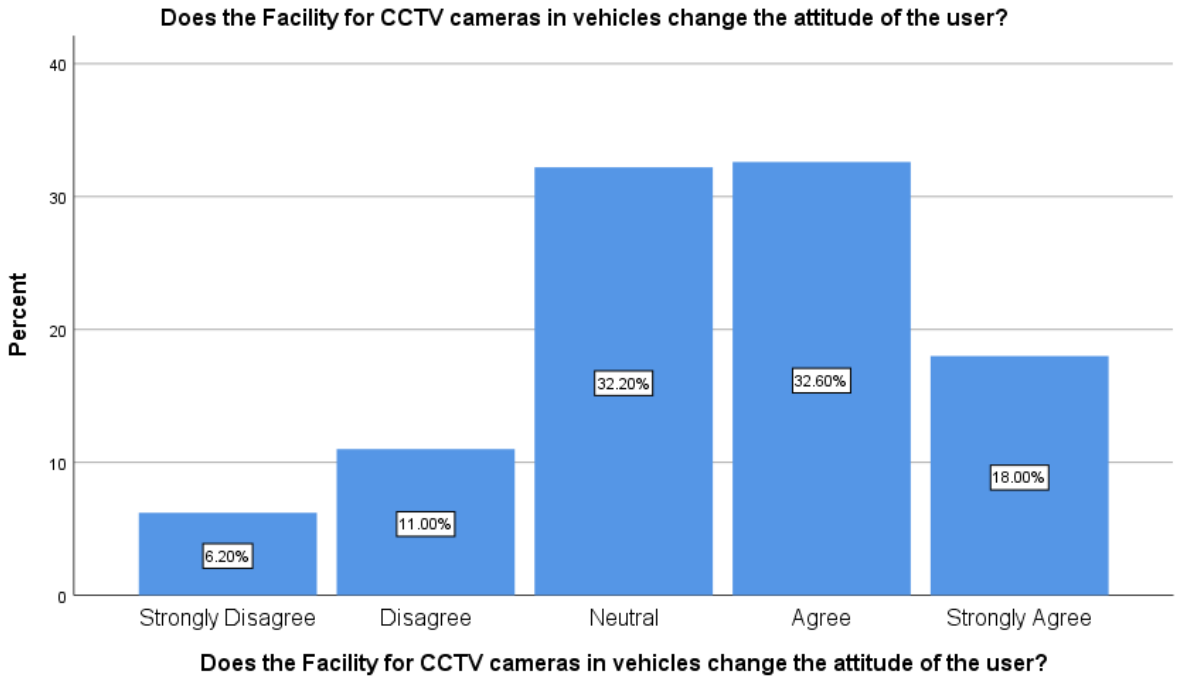


Figure 4.39 Facility for CCTV Cameras in Vehicles Change the Attitude of the User

The answers to the question "Facility for CCTV Cameras in Vehicles Change the Attitude of the User" can be seen in Table 4.39 and Figure 4.39. Table 4.39 and Figure 4.39 (Bar chart) show that of the 500 people who answered, 6.2% strongly disagreed with the statement, 11.0% disagreed with the statement, 32.2% were neutral with the statement, 32.6% agreed with the statement, and 18.0% strongly agreed with the statement.

Table 4.40 Speed of The Vehicle Change the Attitude of Users While Using Public Transport

Does the Speed of the vehicle change the attitude of users while using public transport?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	28	5.6	5.6	5.6
	Disagree	77	15.4	15.4	21.0
	Neutral	125	25.0	25.0	46.0

	Agree	180	36.0	36.0	82.0
	Strongly Agree	90	18.0	18.0	100.0
	Total	500	100.0	100.0	

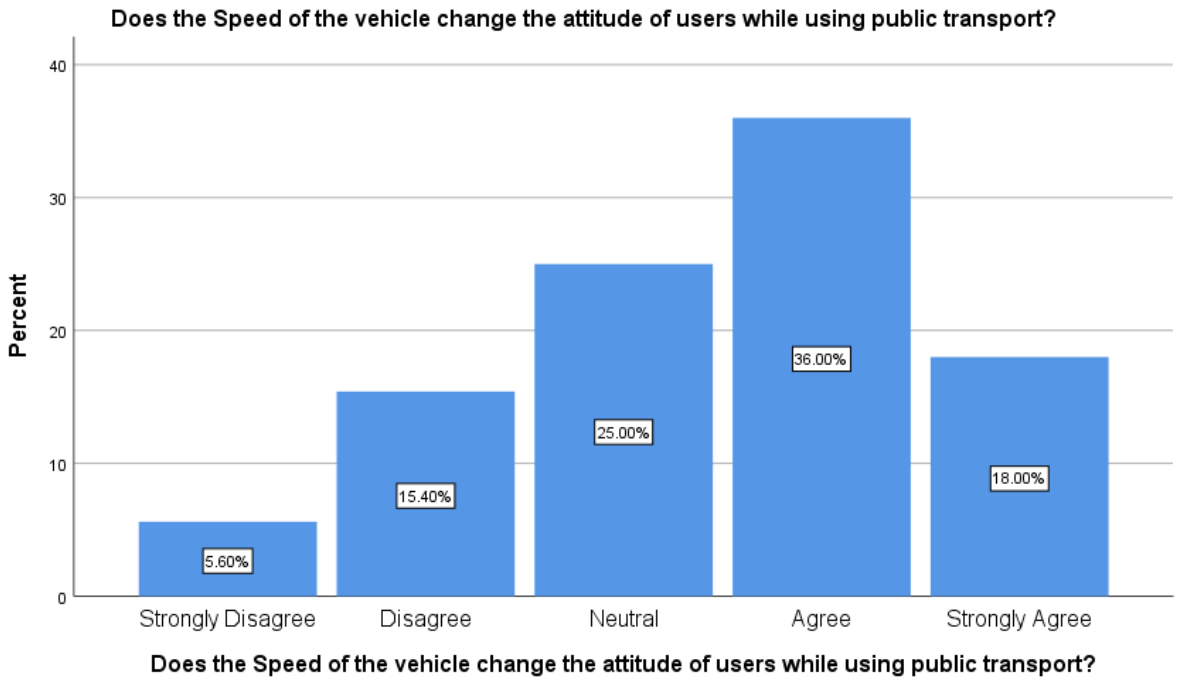


Figure 4.40 Speed of the Vehicle Change the Attitude of Users While Using Public Transport

The answers to the question "Does the Speed of the Vehicle Change the Attitude of Users While Using Public Transportation?" can be seen in Table 4.40 and Figure 4.40. Table 4.40 and Figure 4.40 (Bar chart) show that out of 500 people who answered, 5.6% strongly disagreed with the statement, 15.4% disagreed with the statement, 25.0% were neutral about the statement, 36.0% agreed with the statement, and 18.0% strongly agreed with the statement.

- **Response Regarding the Functioning of public transit**

Table 4.41 Functioning of Public Transit was Smooth before the Pandemic

Does the functioning of public transit was smooth before the pandemic?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	35	7.0	7.0	7.0
	Disagree	46	9.2	9.2	16.2
	Neutral	96	19.2	19.2	35.4
	Agree	201	40.2	40.2	75.6
	Strongly Agree	122	24.4	24.4	100.0
	Total	500	100.0	100.0	

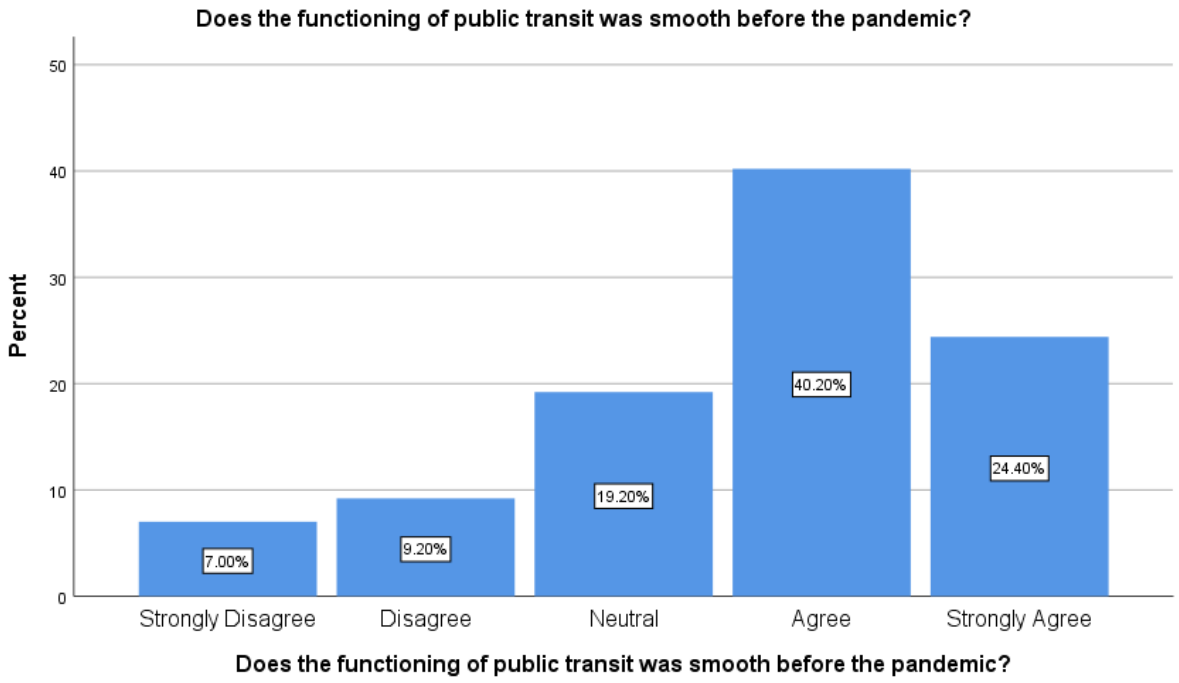


Figure 4.41 Functioning of Public Transit was Smooth Before the Pandemic

The answers to the question "Public Transit Worked Well Before the Pandemic" are shown in Table 4.41 and Figure 4.41. Table 4.41 and Figure 4.41 (Bar chart) show that out of 500 people who answered, 5.6% strongly disagreed with the statement, 15.4% disagreed with the

statement, 25.0% were neutral on the statement, 36.0% agreed with the statement, and 18.0% strongly agreed with the statement.

Table 4.42 Law Regarding the functioning of Public Transit was not Rigid

Does the law regarding the functioning of public transit was not rigid?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	42	8.4	8.4	8.4
	Disagree	45	9.0	9.0	17.4
	Neutral	159	31.8	31.8	49.2
	Agree	153	30.6	30.6	79.8
	Strongly Agree	101	20.2	20.2	100.0
	Total	500	100.0	100.0	

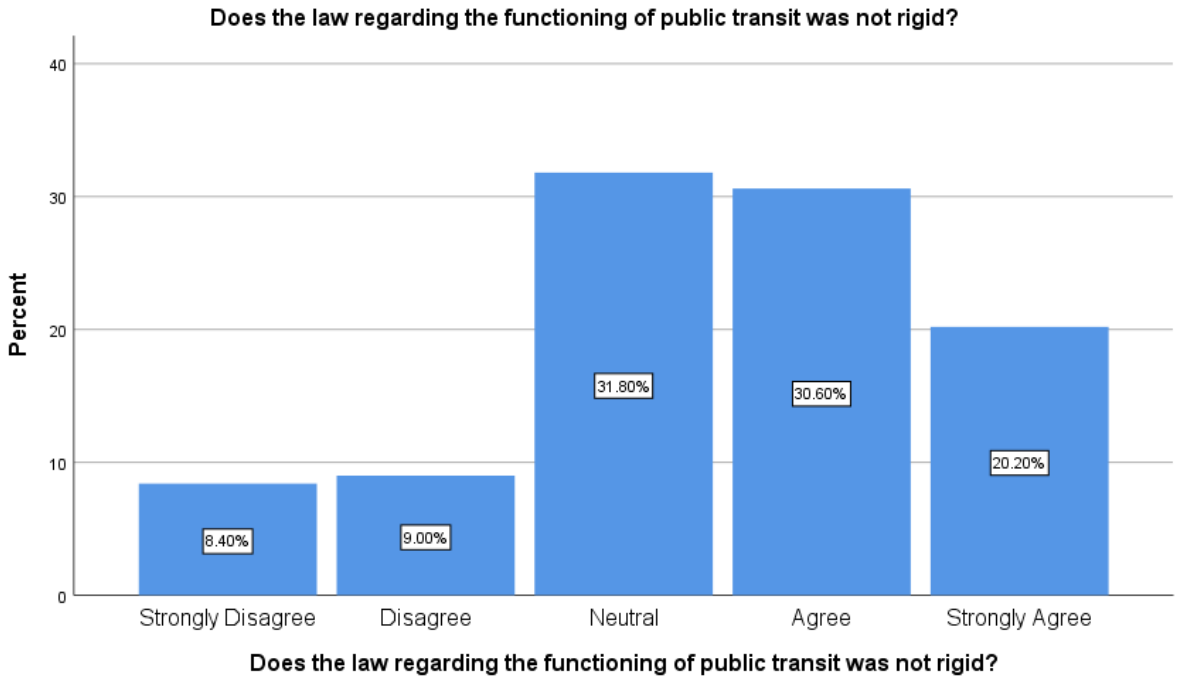


Figure 4.42 Law Regarding the functioning of Public Transit was not Rigid

The answers to the question "laws about how public transit worked were not rigid" are shown in Table 4.42 and Figure 4.42. Table 4.42 and Figure 4.42 (Bar chart) show that of the 500 people who answered, 8.4% strongly disagreed with the statement, 9.0% disagreed with the statement, 31.8% were neutral with the statement, 30.6% agreed with the statement, and 20.2% strongly agreed with the statement.

Table 4.43 The Characteristics of Roads Affect the Functioning of Public Transit

Do the characteristics of roads affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	40	8.0	8.0	8.0
	Disagree	48	9.6	9.6	17.6
	Neutral	151	30.2	30.2	47.8
	Agree	134	26.8	26.8	74.6
	Strongly Agree	127	25.4	25.4	100.0
	Total	500	100.0	100.0	

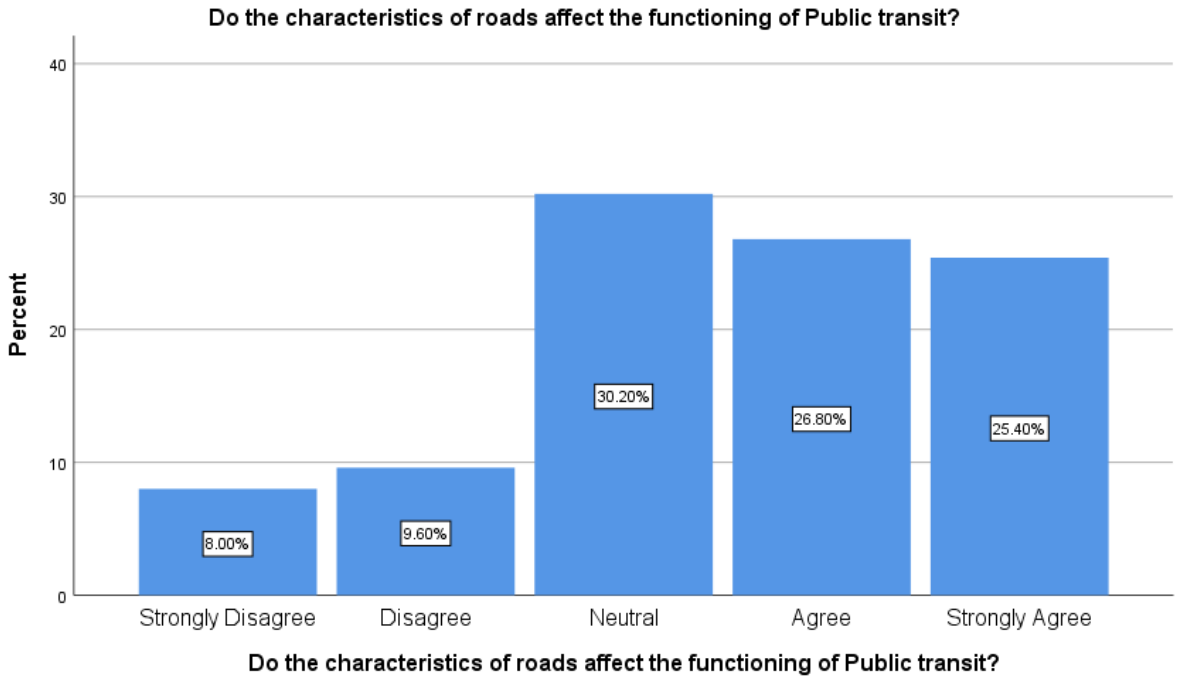


Figure 4.43 The Characteristics of Roads Affect the Functioning of Public Transit

The answers to the question "Characteristics of roads affect the functioning of public transit" can be seen in Table 4.43 and Figure 4.43. Table 4.43 and Figure 4.43 (Bar chart) show that out of 500 people who answered, 8.0% strongly disagreed with the statement, 9.6% disagreed with the statement, 30.2% were neutral on the statement, 26.8% agreed with the statement, and 25.4% strongly agreed with the statement.

Table 4.44 The Length of the Route Affect the Functioning of Public Transit

Does the length of the route affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	25	5.0	5.0	5.0
	Disagree	41	8.2	8.2	13.2
	Neutral	131	26.2	26.2	39.4
	Agree	211	42.2	42.2	81.6

	Strongly Agree	92	18.4	18.4	100.0
	Total	500	100.0	100.0	

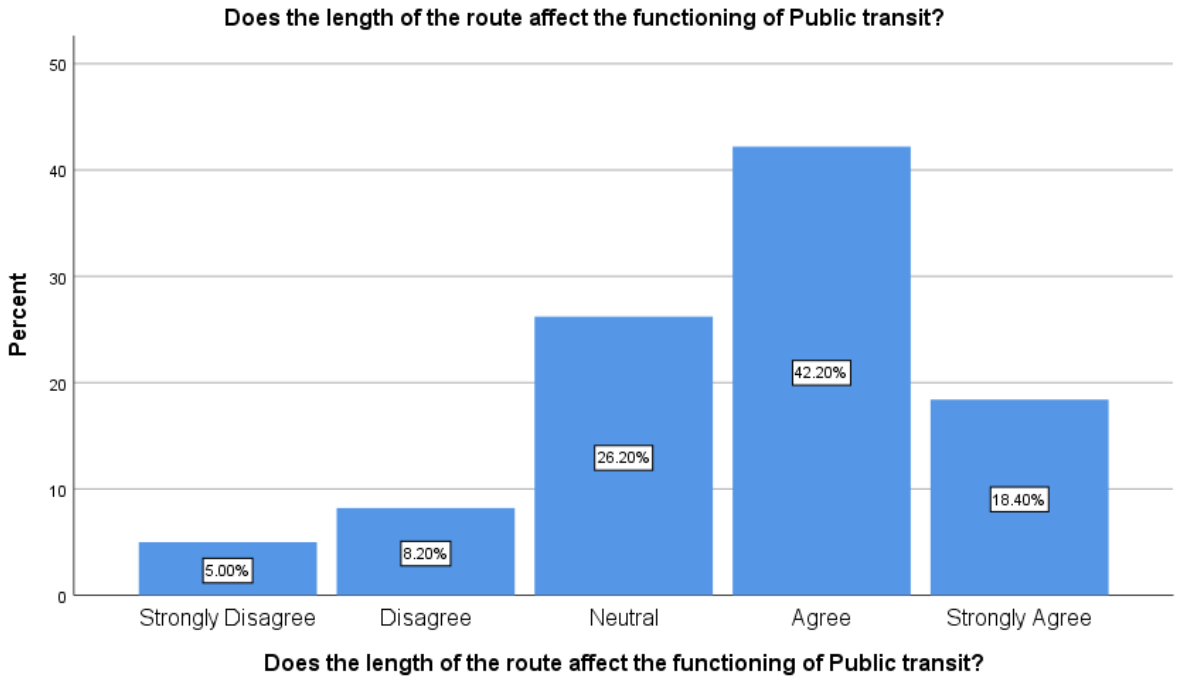


Figure 4.44 The Length of the Route Affect the Functioning of Public Transit

The answers to the question "The Length of the Route Affects the Functioning of Public Transit" can be seen in Table 4.44 and Figure 4.44. Table 4.44 and Figure 4.44 (Bar chart) show that out of 500 people who answered, 8.0% strongly disagreed with the statement, 9.6% disagreed with the statement, 30.2% were neutral on the statement, 26.8% agreed with the statement, and 25.4% strongly agreed with the statement.

Table 4.45 The Financing and Funding Affect the Functioning of Public Transit

Do the financing and funding affect the functioning of public transit?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	26	5.2	5.2	5.2
	Disagree	23	4.6	4.6	9.8
	Neutral	186	37.2	37.2	47.0
	Agree	182	36.4	36.4	83.4
	Strongly Agree	83	16.6	16.6	100.0
	Total	500	100.0	100.0	

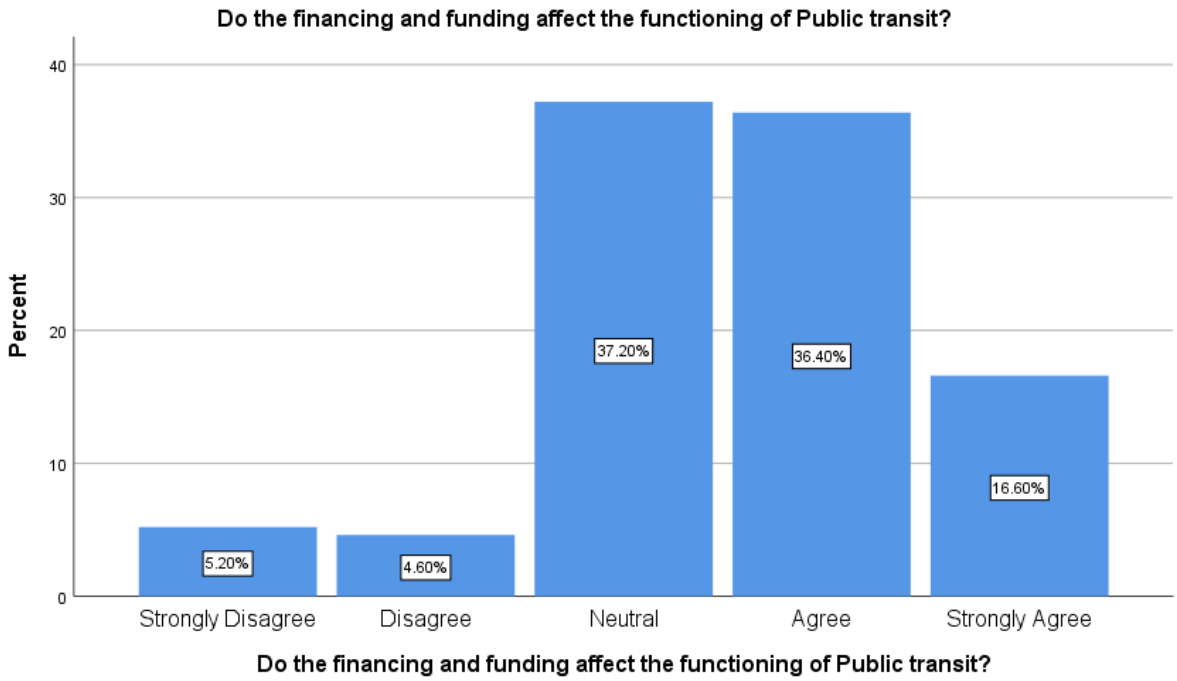


Figure 4.45 The Financing and Funding Affect the Functioning of Public Transit

The answers to the question "The Financing and Funding Affect the Functioning of Public Transit" can be seen in Table 4.45 and Figure 4.45. Table 4.45 and Figure 4.45 (Bar chart) show that out of 500 people who answered, 8.0% strongly disagreed with the statement, 9.6% disagreed with the statement, 30.2% were neutral on the statement, 26.8% agreed with the statement, and 25.4% strongly agreed with the statement.

Table 4.46 The Financing and Funding Affect the Functioning of Public Transit

Do the Interchanges (switch from one public transport route to another) affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	17	3.4	3.4	3.4
	Disagree	32	6.4	6.4	9.8
	Neutral	151	30.2	30.2	40.0
	Agree	166	33.2	33.2	73.2
	Strongly Agree	134	26.8	26.8	100.0
	Total	500	100.0	100.0	

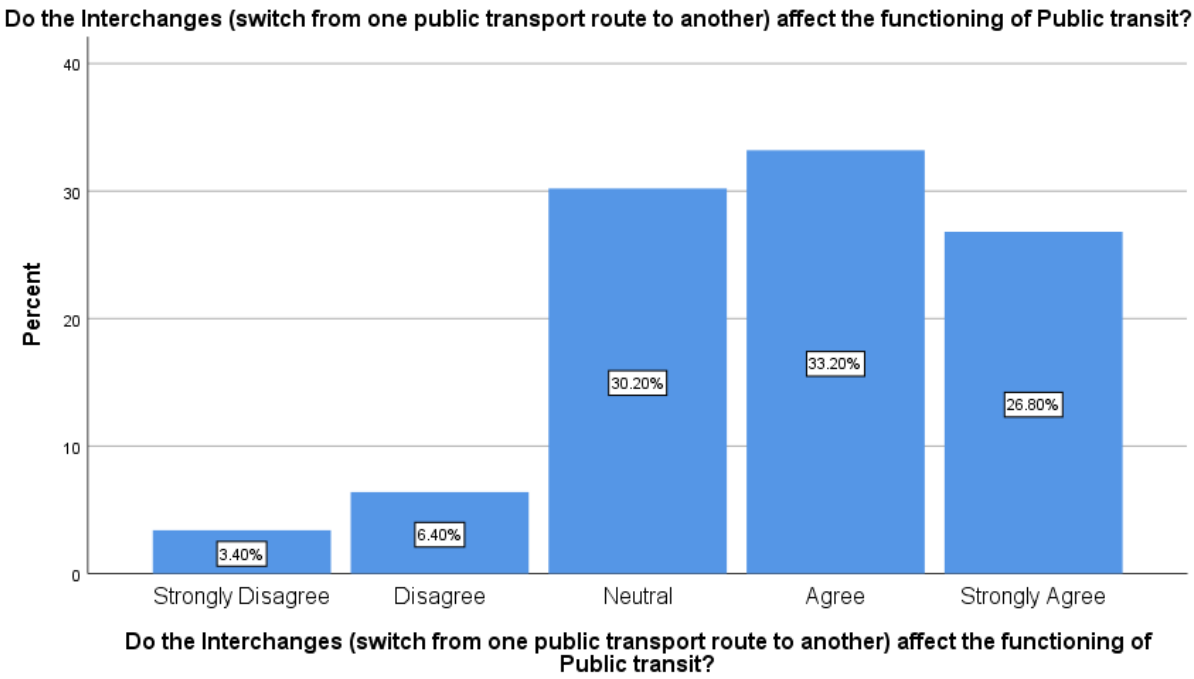


Figure 4.46 The Financing and Funding Affect the Functioning of Public Transit

The answers to the question "The Financing and Funding Affect the Functioning of Public Transit" can be seen in Table 4.46 and Figure 4.46. Out of 500 people who answered, 3.4% strongly disagreed with the statement, 6.4% disagreed with the statement, 30.2% were neutral with the statement, 33.2% agreed with the statement, and 26.8% strongly agreed with the statement.

Table 4.47 The Timetables (Journey Plan) Affect the Functioning of Public Transit

Do the Timetables (journey plan) affect the functioning of Public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	22	4.4	4.4	4.4
	Disagree	19	3.8	3.8	8.2
	Neutral	102	20.4	20.4	28.6
	Agree	214	42.8	42.8	71.4
	Strongly Agree	143	28.6	28.6	100.0
	Total	500	100.0	100.0	

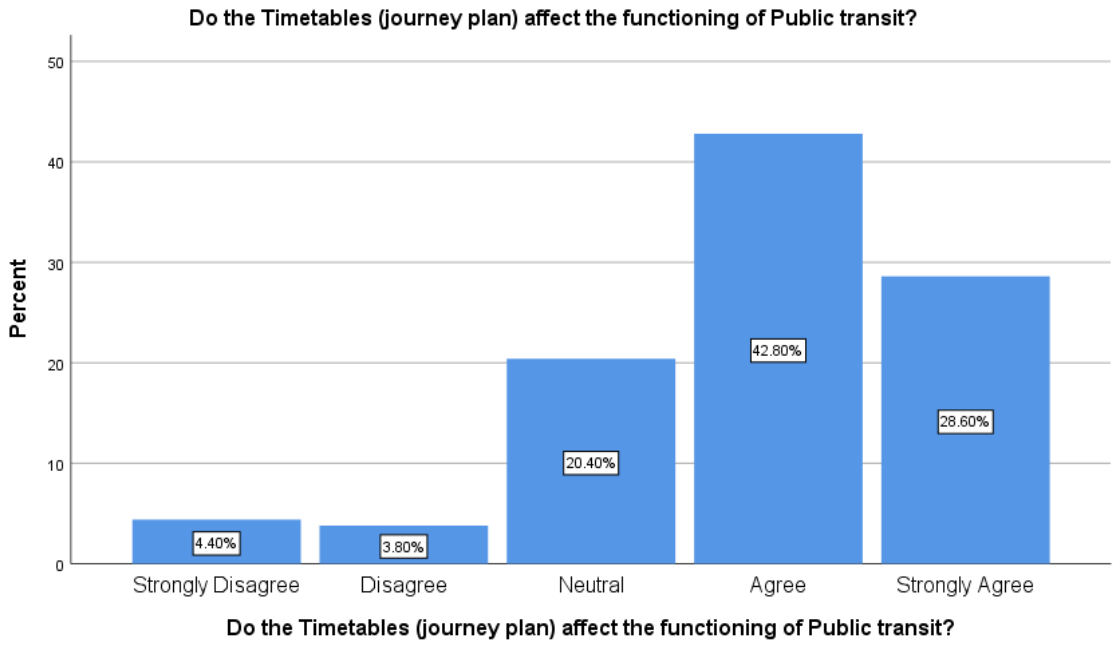


Figure 4.47 The Timetables (Journey Plan) Affect the Functioning of Public Transit

The answers to the question "The Timetables (Journey Plan) Affect the Functioning of Public Transit" can be seen in Table 4.47 and Figure 4.47. Table 4.47 and Figure 4.47 (Bar chart) show that of the 500 people who answered, 4.4% strongly disagreed with the statement, 3.8% disagreed with the statement, 20.4% were neutral about the statement, 42.8% agreed with the statement, and 28.6% strongly agreed with the statement.

- **Give a Response Regarding Functioning of public transit after Pandemic.**

Table 4.48 Pandemic Negatively Affect the Functioning of Public Transit

Does the pandemic negatively affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	30	6.0	6.0	6.0
	Disagree	61	12.2	12.2	18.2
	Neutral	106	21.2	21.2	39.4

	Agree	207	41.4	41.4	80.8
	Strongly Agree	96	19.2	19.2	100.0
	Total	500	100.0	100.0	

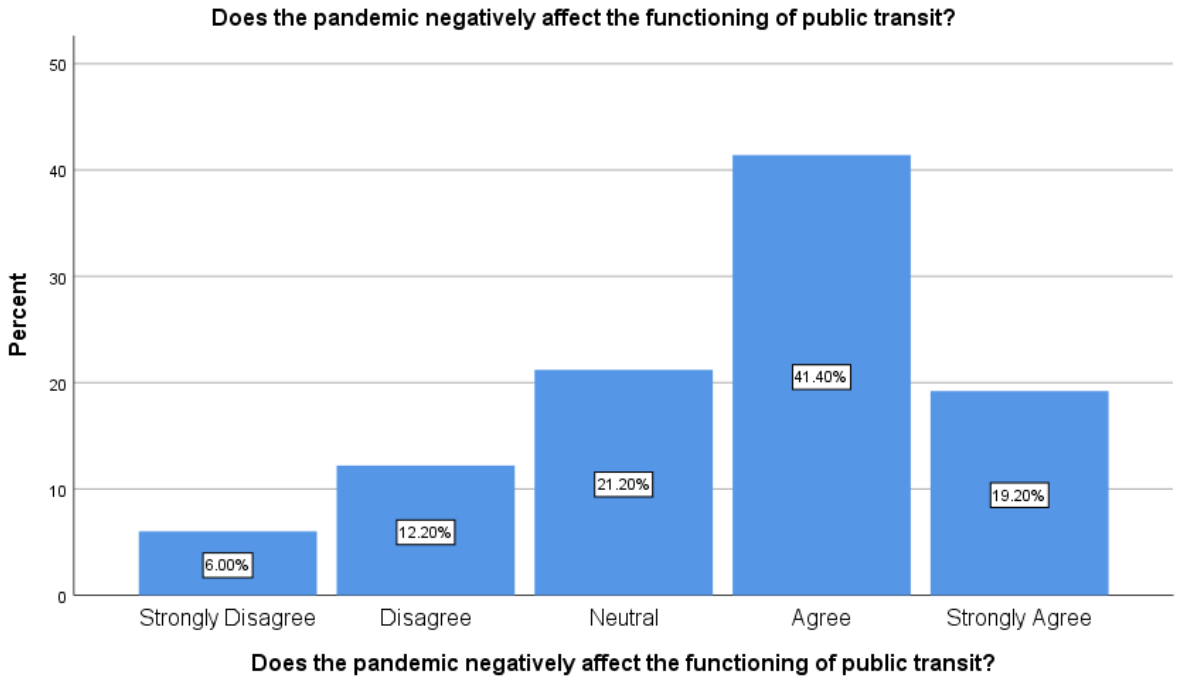


Figure 4.48 Pandemic Negatively Affect the Functioning of Public Transit

The answers to the question "The pandemic negatively affects the functioning of public transit" can be seen in Table 4.48 and Figure 4.48. Table 4.48 and Figure 4.48 (Bar chart) show that out of 500 people who answered, 6.0% strongly disagreed with the statement, 12.2% disagreed with the statement, 21.2% were neutral about the statement, 41.4% agreed with the statement, and 19.2% strongly agreed with the statement.

Table 4.49 Inclusion of Social Distancing Affect the Functioning of Public Transit After the Pandemic

Does the inclusion of social distancing affect the functioning of public transit after the pandemic?				
	Frequency	Percent	Valid Percent	Cumulative Percent

Valid	Strongly Disagree	35	7.0	7.0	7.0
	Disagree	39	7.8	7.8	14.8
	Neutral	105	21.0	21.0	35.8
	Agree	118	23.6	23.6	59.4
	Strongly Agree	203	40.6	40.6	100.0
	Total	500	100.0	100.0	

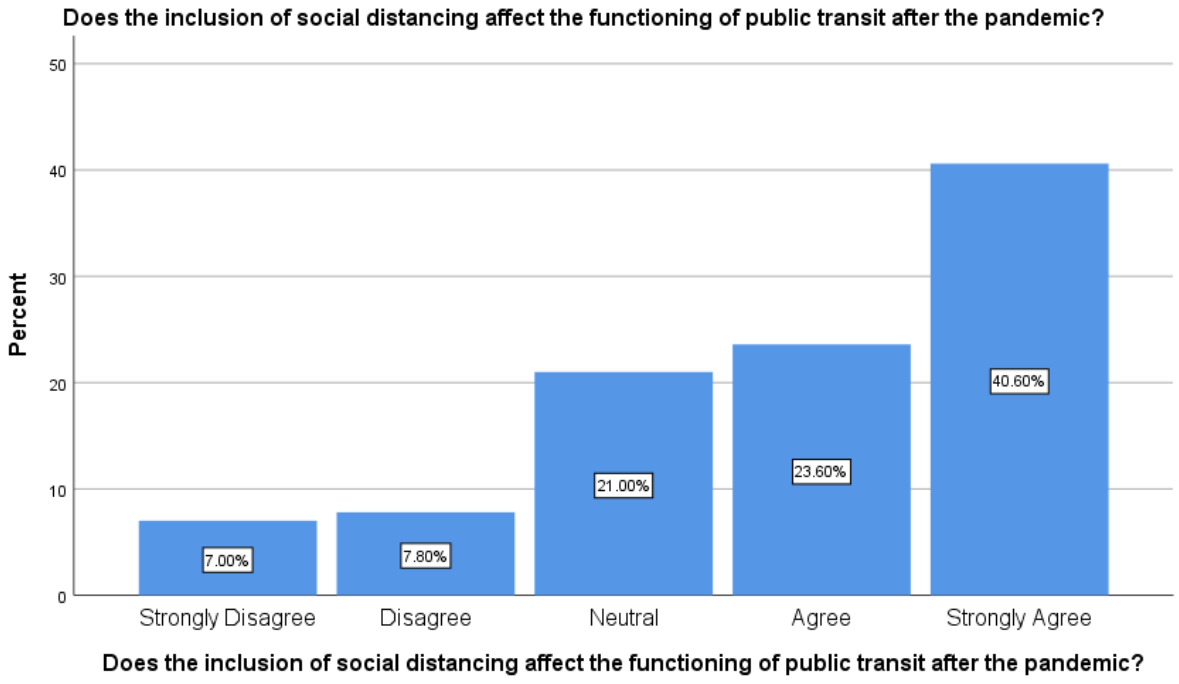


Figure 4.49 Inclusion of Social Distancing Affect the Functioning of Public Transit After the Pandemic

The answers to the question "How Does Including Social Distancing Affect the Functioning of Public Transit After the Pandemic?" can be seen in Table 4.49 and Figure 4.49. Table 4.49 and Figure 4.49 (Bar chart) show that out of 500 people who answered, 7.0% strongly disagreed with the statement, 7.8% disagreed with the statement, 21.0% were neutral about the statement, 23.6% agreed with the statement, and 40.6% strongly agreed with the statement.

Table 4.50 The Enhancement of Safety and Security Measures Influence the Functioning of Public Transit After the Pandemic

Does the enhancement of Safety and security measures influence the functioning of public transit after the pandemic?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	21	4.2	4.2	4.2
	Disagree	56	11.2	11.2	15.4
	Neutral	164	32.8	32.8	48.2
	Agree	130	26.0	26.0	74.2
	Strongly Agree	129	25.8	25.8	100.0
	Total	500	100.0	100.0	

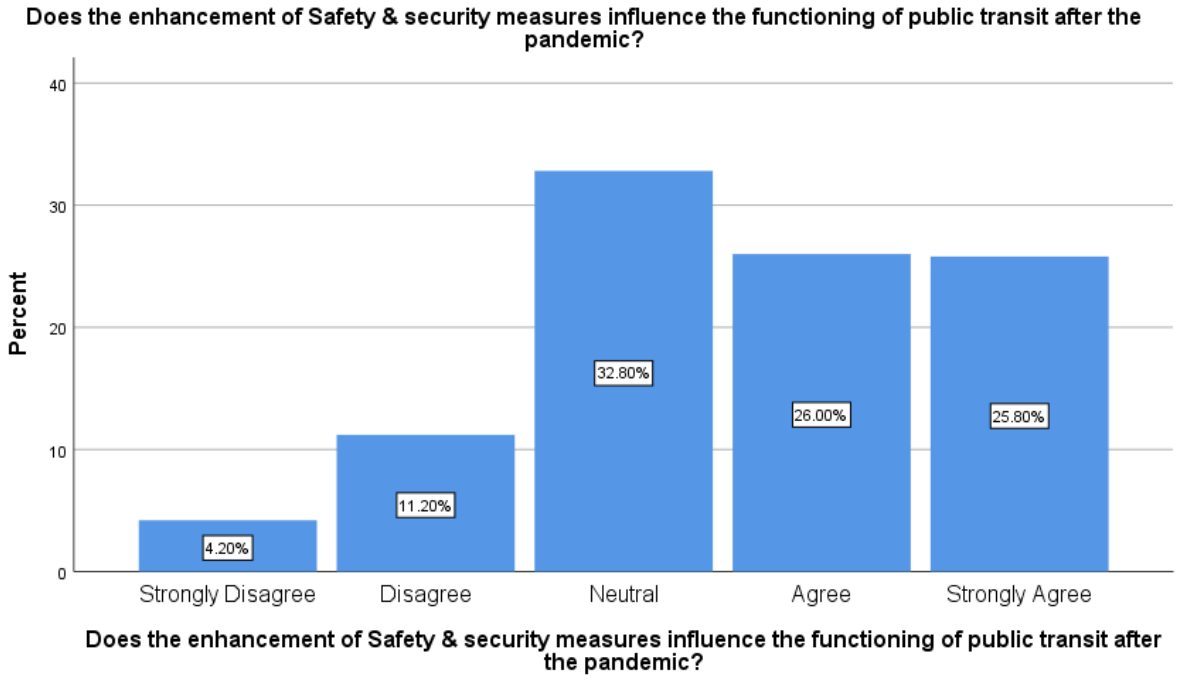


Figure 4.50 The Enhancement of Safety and Security Measures Influence the Functioning of Public Transit After the Pandemic

The answers to the question "How do the improved safety and security measures affect the operation of public transit after the pandemic?" can be seen in Table 4.50 and Figure 4.50. Out

of 500 people who answered, 4.2% strongly disagreed with the statement, 11.2% disagreed with the statement, 32.8% were neutral with the statement, 26.0% agreed with the statement, and 25.8% strongly agreed with the statement.

Table 4.51 Implementation of Covid-19 Laws Affect the Functioning of Public Transit After the Pandemic

Does the implementation of covid-19 laws affect the functioning of public transit after the pandemic?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	35	7.0	7.0	7.0
	Disagree	45	9.0	9.0	16.0
	Neutral	124	24.8	24.8	40.8
	Agree	149	29.8	29.8	70.6
	Strongly Agree	147	29.4	29.4	100.0
	Total	500	100.0	100.0	

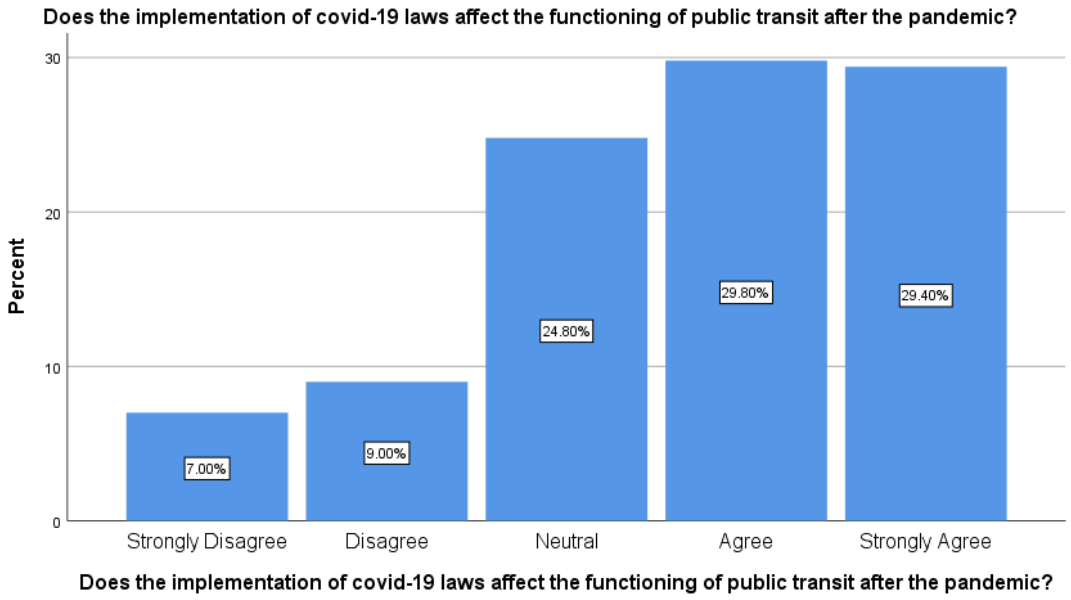


Figure 4.51 Implementation of Covid-19 Laws Affect the Functioning of Public Transit After the Pandemic

Table 4.51 and figure 4.51 show the response regarding the statement "Implementation of Covid-19 Laws Affect the Functioning of Public Transit After the Pandemic". "According to table 4.51 and figure 4.51 (Bar chart), out of 500 respondents, 7.0% of the respondents responded strongly disagree with the statement., 9.0% of the respondents responded disagree with the statement, 24.8% of the respondents responded neutral with the statement, 29.8% of the respondents responded agree with the statement and 29.4% of the respondents responded strongly agree with the statement".

Table 4.52 Increment of Financing and Funding for Sanitation Affect the Functioning of Public Transit After the Pandemic

Does the increment of financing and funding for sanitation affect the functioning of public transit after the pandemic?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	79	15.8	15.8	15.8
	Disagree	125	25.0	25.0	40.8

	Neutral	104	20.8	20.8	61.6
	Agree	135	27.0	27.0	88.6
	Strongly Agree	57	11.4	11.4	100.0
	Total	500	100.0	100.0	

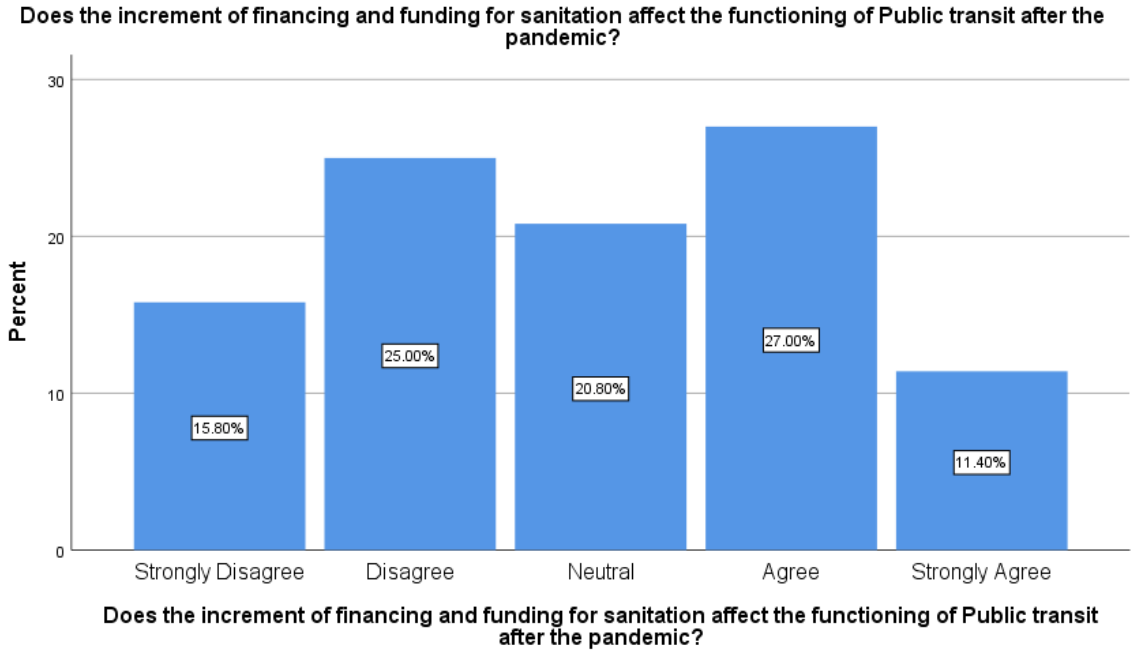


Figure 4.52 Increment of Financing and Funding for Sanitation Affect the Functioning of Public Transit After the Pandemic

Table 4.52 and figure 4.52 show the response regarding the statement "Increment of Financing and Funding for Sanitation Affect the Functioning of Public Transit After the Pandemic." "According to table 4.52 and figure 4.52 (Bar chart), out of 500 respondents, 15.8% of the respondents responded strongly disagree with the statement., 25.0% of the respondents responded disagree with the statement, 20.8% of the respondents responded neutral with the statement, 27.0% of the respondents responded agree with the statement and 11.4% of the respondents responded strongly agree with the statement".

Table 4.53 The Changes in Timetables (Journey Plans) Due to the Pandemic Affect the Functioning of Public Transit

Do the changes in Timetables (journey plans) due to the pandemic affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	21	4.2	4.2	4.2
	Disagree	78	15.6	15.6	19.8
	Neutral	89	17.8	17.8	37.6
	Agree	177	35.4	35.4	73.0
	Strongly Agree	135	27.0	27.0	100.0
	Total	500	100.0	100.0	

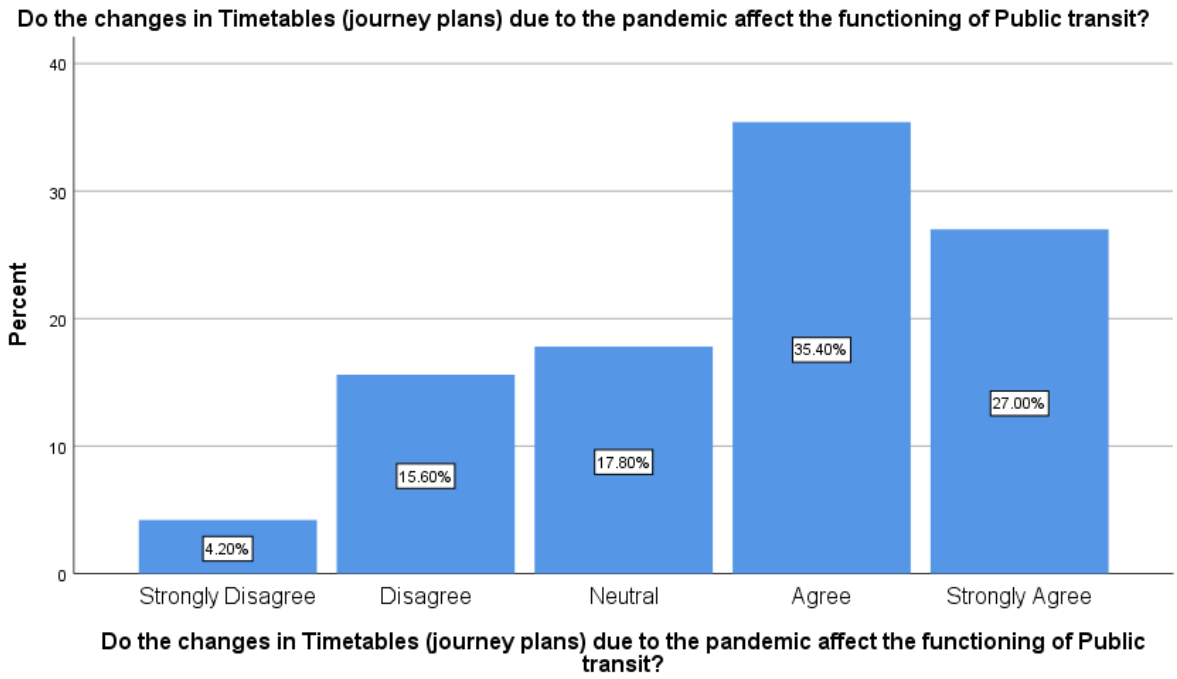


Figure 4.53 The Changes in Timetables (Journey Plans) Due to the Pandemic Affect the Functioning of Public Transit

Table 4.53 and figure 4.53 show the response regarding the statement “The Changes in Timetables (Journey Plans) Due to the Pandemic Affect the Functioning of Public Transit.” “According to table 4.53 and figure 4.53 (Bar chart), out of 500 respondents, 4.2% of the respondents responded strongly disagree with the statement., 15.6% of the respondents responded disagree with the statement, 17.8% of the respondents responded neutral with the statement, 35.4% of the respondents responded agree with the statement and 27.0% of the respondents responded strongly agree with the statement”.

Table 4.54 The Renovation of Public Transport Infrastructure Due to the Pandemic Affect the Functioning of Public Transit

Does the renovation of public transport infrastructure due to the pandemic affect the functioning of public transit?					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	46	9.2	9.2	9.2
	Disagree	46	9.2	9.2	18.4
	Neutral	104	20.8	20.8	39.2
	Agree	167	33.4	33.4	72.6
	Strongly Agree	137	27.4	27.4	100.0
	Total	500	100.0	100.0	

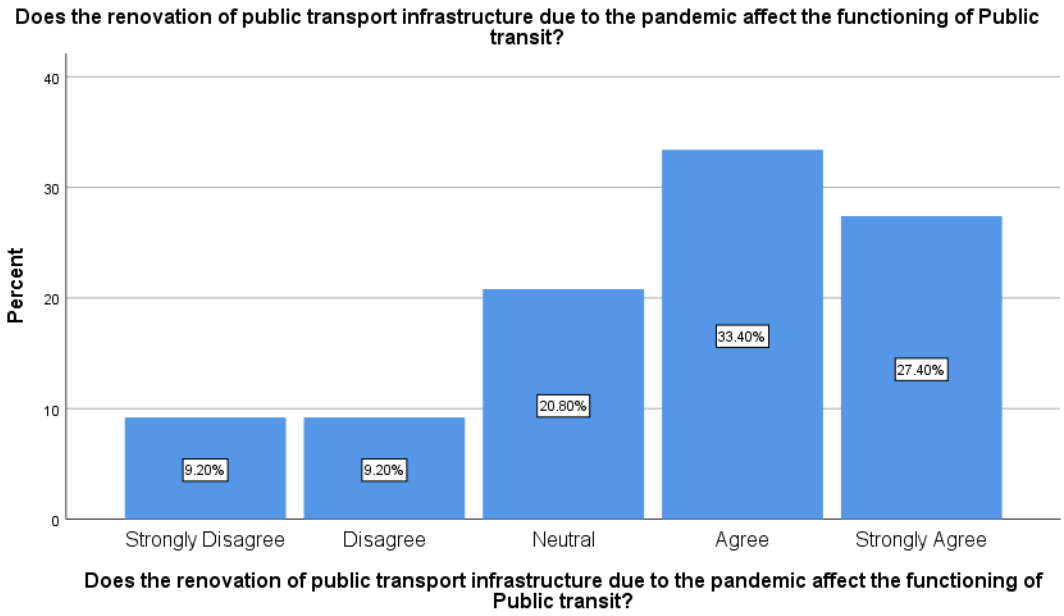


Figure 4.54 The Renovation of Public Transport Infrastructure Due to the Pandemic Affect the Functioning of Public Transit

Table 4.54 and figure 4.54 show the response regarding the statement "The Renovation of Public Transport Infrastructure Due to the Pandemic Affect the Functioning of Public Transit." "According to table 4.54 and figure 4.54 (Bar chart), out of 500 respondents, 9.2% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 20.8% of the respondents responded neutral with the statement, 33.4% of the respondents responded agree with the statement and 27.4% of the respondents responded strongly agree with the statement".

CHAPTER V:

DISCUSSION

5.1 Discussion of Research Questions

Objective 1: To find out the impact of the "Covid-19" pandemic on public transport usage in India.

H1: There is a significant impact of the "Covid-19" pandemic on public transport usage in India.

Table 5.1 Model Summary

Model Summary				
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.336[a]	.113	.111	4.62309
a. Predictors: (Constant), Covid-19 pandemic				

Table 5.1 defines the model summary, indicating a significant degree of connection. The R-value for the simple correlation is 0.336, which reflects how much of the overall variance in the dependent variable, "public transport usage in India," the independent variable (Covid-19 pandemic) can be used to explain the results.

Table 5.2 ANOVA

ANOVA[a]						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1350.047	1	1350.047	63.166	.000[b]
	Residual	10643.751	498	21.373		
	Total	11993.798	499			

a. Dependent Variable: public transport usage in India
b. Predictors: (Constant), Covid 19 pandemic

The above table 5.2 is the ANOVA, which reports how well the regression equation fits the data (i.e., predicts the dependent variable). This table indicates that the regression model predicts the dependent variable significantly well. This indicates the statistical significance of the regression model .000, which is less than 0.05, and indicates that, overall, the regression model statistically significantly predicts the outcome variable (i.e., it is a good fit for the data).

Table 5.3 Coefficients

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	19.919	1.584		12.578	.000
	Covid 19 pandemic	.387	.049	.336	7.948	.000
a. Dependent Variable: public transport usage in India						

The Coefficients table 5.3 provides the necessary information to predict the effect of the "public transport usage" in "India," as well as determine whether the "Covid 19 pandemic" is statistically significant to the model. From this above hypothesis, it was found that there is a significant impact of the "Covid 19" pandemic on public transport usage in India, Hence, the calculated value is smaller than the standard significance value.

Objective 2: To find out the reasons behind the change in the attitude of the general public towards the usage of public transport.

H2: There is a significant relationship between the change in the attitude of the public and Covid-19 towards the usage of public transport.

Table 5.4 Descriptive Statistics

Descriptive Statistics			
	Mean	Std. Deviation	N
public transport usage in India	32.3980	4.90262	500
change in the attitude of the public	43.6440	5.74345	500

In the above table 5.4, we define the descriptive statistics of public transport usage in India and change in the attitude of the public. Descriptive statistics represent the mean and standard deviation values of the variables. According to table 5.4, the mean value of public transport usage in India is 32.3980 and the mean value of the change in the attitude of the public is 43.6440.

Table 5.5 Correlations

Correlations			
		public transport usage in India	change in the attitude of the public
public transport usage in India	Pearson Correlation	1	.515**
	Sig. (2-tailed)		.000

	N	500	500
change in the attitude of the public	Pearson Correlation	.515**	1
	Sig. (2-tailed)	.000	
	N	500	500
**. Correlation is significant at the 0.01 level (2-tailed).			

Table 5.5 is the Correlations table which shows the correlation between public transport usage in India and change in the attitude of the public. According to table 4.15, there is a significant relationship between public transport usage in India and change in the attitude of the public, as the significant value is .000 which is smaller than 0.05.

Objective 3: To analyze the difference in the functioning of public transit and the "Covid-19" pandemic.

H3: There is a significant difference between the functioning of public transit and the Covid-19 pandemic.

Table 5.6 Paired Samples Statistics

Paired Samples Statistics					
		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Functioning of public transit	25.3940	500	3.91170	.17494
	Covid 19 pandemic	32.2700	500	4.25362	.19023

Table 5.6 displays the descriptive statistics. From pair 1, it can be seen that the mean of the Functioning of public transit is 25.3940, and the mean of Covid 19 pandemic is 32.2700. As per the meaning of both the pairs, it can be seen that Covid 19 pandemic play a greater role than functioning of public transit and the Covid 19 pandemic.

Table 5.7 Paired Samples Correlations

Paired Samples Correlations				
		N	Correlation	Sig.
Pair 1	Functioning of public transit and Covid 19 pandemics	500	.163	.000

Table 5.7 is the paired samples correlation table, which talks about the Pair 1 variables. The above table 4.17 show that there is a positive correlation between functioning of public transit and Covid 19 pandemics (significance value is less than 0.05).

Table 5.8 Paired Samples Test

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Functioning of public transit - Covid 19 pandemic	-6.87600	5.28853	.23651	-7.34068	-6.41132	-29.073	499	.000

Table 5.8 is the paired sample test table, as it contains the inferential t-test statistics and shows whether there is a statistically significant difference between the conditions. As per table 5.8. From Pair 1, it can be seen that there is a statistically significant relationship between Functioning of public transit and Covid-19 pandemic (significance value is smaller than 0.05).

Objective 4: To study the views and suggestions of the general public regarding public transport.

As society and technology progress, public transportation has become an absolute need.

The common person can afford public transportation since it is the least expensive option. Using the bus or the train instead of car or bike can help cut down on pollution since it decreases the number of cars/bikes on the road.

If more people start taking public transportation, that means fewer private vehicles on the road. Because of their reliance on energy, public transportation vehicles like subways, trams, and high-speed trains produce no emissions whatsoever. One further perk of taking the bus or the train is that it is the perfect place to get some work done, read, or catch up on some leisure reading.

One major effect has been a drop in demand for passenger transportation as a result of government lockdowns and concerns about catching and spreading the illness on public transportation. While freight transportation has slowed as a result of the crisis, there are a number of factors—including the need to maintain key services—that are driving freight activity at this time. Passenger transport, on the other hand, (for both pleasure and business travel) is typically discretionary and more subject to individual preferences.

Using public transportation is the most convenient option. There has to be a bigger push to educate the people about the benefits of taking public transportation. As a result, public transportation will have less of an impact on the environment, traffic, and accident rates thanks to these efforts. And as always, using the bus or train will save money compared to hiring a car or using private vehicle. More services and amenities for the public are needed so that people will use public transportation.

More people taking the bus or train means fewer people driving their own private vehicles. High-speed trains, metro trains, and trams are just a few examples of electric public transportation options that do not contribute to air pollution. Another perk of traveling public transit is that you can get anything done, from finishing an assignment to reading a book while travelling. Walking to and from the bus or train station is a terrific way to work some additional exercise into day. Using public transportation is less expensive than using a personal automobile. It may also help to save money on maintenance of personal automobile. With more people using public transportation, fewer people will use their own cars and bikes, lowering emissions from traffic congestion.

5.2 Discussion of findings based on objectives

Objective 1: To determine the impact of the “Covid 19” pandemic on public transport

utilization in India.

- The findings indicate a sizable degree of correlation. The simple correlation has an R-value of 0.336, which indicates how much of the whole variance in the dependent variable, "public transport usage in India," can be accounted for by the independent variable, the Covid-19 epidemic.
- The results show that the regression model substantially and accurately predicts the dependent variable. It shows that the regression model's statistical significance is .000, which is less than 0.05, and that it statistically substantially predicts the outcome variable, i.e., that the data it fits well.
- The hypothesis found a significant impact of the "Covid 19" pandemic on public transport usage in India. Hence, the calculated value is smaller than the standard significance value.

Objective 2: To find out the reasons behind the change in the attitude of the general public towards the usage of public transport.

- Descriptive statistics represent the mean and standard deviation values of the variables. It also indicates the mean value of public transport usage in India is 32.3980, and the mean value of the change in the public's attitude is 43.6440.
- According to the findings, the Correlations table shows the correlation between public transport usage in India and change in the attitude of the public and that there is a significant relationship between public transport usage in India and change in the attitude of the public, as the significant value is .000 which is smaller than 0.05.

Objective 3: To analyze the difference in the functioning of public transit and the COVID-19 pandemic.

- The findings indicated that the mean of the Functioning of public transit is 25.3940, and the mean of the Covid-19 pandemic is 32.2700. As per the meaning of both pairs, it can be seen that Covid-19 pandemic plays a greater role than the functioning of public transit and the Covid-19 pandemic.
- The findings talk about the Pair 1 variables. Shows a positive correlation between the functioning of public transit and Covid-19 pandemics (significance value is less than 0.05).

- The findings are the paired sample test table, as it contains the inferential t-test statistics and show whether there is a statistically significant difference between the conditions. The findings also indicated that it could be seen that there is a statistically significant relationship between the Functioning of public transit and Covid-19 pandemic (the significance value is smaller than 0.05).

Objective 4: To study the views and suggestions of the general public regarding public transport.

- The findings indicated the response regarding the statement "Covid-19 had affected the use of public transport." In addition, the data showed that 16.6% of the respondents, out of a total of 500 respondents, completely opposed with the statement.17.6% of those polled did not agree with the statement, 12.6% of those polled had a neutral stance on the remark, 34.4% of those polled said they agreed with the statement, and 18.8% of those polled said they completely concurred with the assertion.
- The results showed how the statement "Lockdown affects the use of public transportation" should be interpreted. According to the data, 5.6% of the 500 respondents, strongly disagreed with the statement. 39.2% of respondents agreed with the statement, 36.4% of respondents agreed strongly with the statement, and 12.8% of respondents had no opinion.

5.3 Discussion on the findings as per the Questionnaire

- **Response regarding the Covid-19 Pandemic**

- The findings indicated the response regarding the statement "Covid-19 had affected the use of public transport." Additionally, out of the 500 individuals who took part in the survey, 16.6% of those individuals were completely opposed with the assertion, 17.6% of those individuals opposed with the assertion, 12.6% of those individuals were neutral with the statement, 34.4% of those individuals concurred with the assertion, and 18.8% of those individuals completely concurred with the assertion.
- The findings indicated the response to the statement, "Lockdown affects the use of public transport." Also, out of the 500 people who participated in the survey, 5.6% of respondents strongly disagreed with the statement, 12.8% of respondents had no opinion one way or the other regarding the statement, 36.4% of respondents absolutely concurred with the concept, and 39.2% of participants concurred with it.

- The findings indicated the response to the statement “social distancing had affected the use of public transport.” According to the data, out of a total of 500 respondents, 4.4% of respondents strongly disagreed with the assertion being made. 11.8% of respondents said they disapproved with the assertion, 17.8% said they were unsure whether they agreed or disapproval with the assertion, 45.4% said they concurred with the assertion, and 20.6% of participants said they totally concurred.
- The findings indicated the response to the assertion “New Covid-19 Variants Results in a New Challenge Regarding the Use of Public Transport”. According to the data, 8.8% of the respondents out of the total of 500 did not agree with the statement at all.9.0% of those polled have a negative opinion about the remark, 26.2% of those polled have a neutral opinion regarding the statement, 16.8% of those questioned had a favorable impression of the assertion, compared to 39.2% who have a favorable opinion.
- The findings indicated the response regarding the statement “Traveling through Public Transport Increase Covid-19 Transmission”. Also, out of the 500 people who participated in the survey, 9.2% of those people responded that they completely disagree with the assertion, 9.0% of those people responded that they disagree with the statement, 26.2% of those people responded that they were neutral with the statement, 39.2% of those people responded that they agree with the statement, and 16.8% of those people responded that they completely concur with the assertion.
- The findings indicated the response to the statement “Correlation Between the Confirmed Cases and the Volume of Public Transport Trips.” Also, out of the 500 people who responded, 11.2% of them strongly disagreed with the statement, 9.2% of them disagreed with the assertion, 39.0% of them were neutral with the statement, 23.8% of them agreed with the assertion, and 16.8% of them completely concurred with the assertion.
- The findings indicated that the response regarding the statement “Covid-19 Affect the Attitude and Behavior of the General Public Regarding the Usage of Public Transport”. Out of the 500 people who participated in the survey, 8.4% of them strongly disagreed with the assertion, 9.2% of them disagreed with the statement, A total of 44.0% of them absolutely concurred with the claim, 25.4% of them concurred with it, and 13.0% were undecided about it.

- The findings indicated that the response of respondent regarding the statement "public transport ridership reduced during the pandemic." According to the data, 8.4% of those who replied that they strongly disagreed with the statement, out of a total of 500 respondents. There were 9.2% of respondents who said they disagreed with the statement, 13.0% of respondents who said they had no opinion on the statement, 25.4% respondents who said they agreed with the statement, and 44.0% respondents who said they completely concurred with the assertion.
- The findings indicated that the response regarding the statement "Public Transportation Suffer More than Private Transportation During the Pandemic." According to the findings, out of a total of 500 respondents, 6.6% of the respondents completely opposed with the assertion, followed by 7.8% of the participants who also disapproved with the assertion, 15% of the participants who expressed no opinion, 30.0% of the participants who expressed agreement, and 40.6% of the respondents who expressed complete agreement.

- **Response Regarding the Usage of Public Transport**
  - The findings indicated the response regarding the statement "public transport is Affordable in comparison to private transport." Out of the 500 people who participated in the survey, 5.6% of the respondents said they were completely opposed with the concept, while 7.6% said they disapproved with it. 31.2% of those people responded that they were neutral with the statement, 27.0% of those people responded that they agree with the statement, and 28.6% of those people responded that they completely concur with the assertion.
  - The results showed that the reaction to the remark "Long Walking Distances from Stations Affect the Usage of Public Transport." Out of 500 respondents, 6.4% of the respondents responded strongly disagree with the statement., 10.8% of the respondents responded disagree with the statement, 47.0% of the respondents responded neutral with the statement, 21.8% of the respondents responded agreed with the statement, 14.0% of the respondents responded strongly agree with the statement.
  - The findings indicated that the response regarding the statement "Time Travelled by passenger create an impact on the usage of public transportation." Also, out of 500 respondents, 4.4% of respondents responded strongly disagree with the statement., 7.8% of respondents responded disagree with the statement, 43.0% of respondents

responded neutral with the statement, 22.6% of respondents responded agree with the statement, and 22.2% the respondents responded strongly agree with the statement.

- The results showed that the reaction to the remark "Low Bus Frequency Create an Impact on the Usage of Public Transportation." The findings indicated that, out of 500 respondents, 4.4% of the respondents responded strongly disagree with the statement., 7.8% of the respondents responded disagree with the statement, 43.0% of the respondents responded neutral with the statement, 22.6% of the respondents responded agree with the statement and 22.2% of the respondents responded strongly agree with the statement.
- The results showed that the reaction to the remark "Population Density Influence the Usage of Public Transportation." The findings indicated that, out of 500 respondents, 12.2% of the respondents responded strongly disagree with the statement., 11.8% of the respondents responded disagree with the statement, 14.8% of the respondents responded neutral with the statement, 31.0% of respondents responded agree with the statement and 30.2% of the respondents responded strongly agree with the statement.
- The results showed that the reaction to the remark "Unavailability of Parking for Private Vehicles Increase the Usage of Public Transport." The findings indicated that, out of 500 respondents, 19.8% of the participants completely concurred with the assertion, 10.2% of participants completely disapproved, 12.6% of participants disagreed, 20.0% of participants were unbiased toward the assertion, 37.4% of participants concurred and 20.0% of participants were unbiased toward the assertion.
- The findings indicated that the response regarding the statement "Public Transport is Mostly used by Employees Rather than Businessmen." According to the data, out of a total of 500 respondents, 3.2% of them stated that they strongly dissatisfied with the statement. There were 13.6% of respondents who said they disagreed with the statement, 17.2% of respondents who said they had no opinion on the statement, 36.6% respondents who said they agreed with the statement, and 29.4% respondents who said they completely concurred with the assertion.
- The findings indicated that the response regarding the statement "high usage of public transport reduces road congestion." According to the data, out of a total of 500 respondents, 3.2% of them stated that they strongly disagreed with the assertion. There were 13.6% of respondents who said they disagreed with the statement, 17.2% of

respondents who said they had no opinion on the assertion, 36.6% respondents who said they agreed with the statement, and 29.4% respondents who said they completely concurred with the assertion.

- The findings indicated the response regarding the statement "high usage of public transport reduces Co2 emissions." According to the data, out of a total of 500 respondents, 5.2% of those respondents strongly disagreed with the assertion.8.8% of those polled said that they disagree with the statement, 23.8% of those polled responded that they have no opinion on the statement, 25% of those polled responded that they agree with the assertion, and 37.2% of those polled responded that they completely concur with the assertion.

- **Response Regarding Attitude of Users Towards Public Transport**

  - The findings indicated that the response regarding the statement "Comfort and Quality of Seats Influence the Attitude of Users while Using Public Transport." In addition, out of a total of 500 respondents, 3.0% of them strongly disagreed with the assertion, 5.4% of them disagreed with the assertion, 25.2% of them were neutral with the statement, 27.8% of them agreed with the assertion, and 38.6% of them completely concurred with the assertion.

  - The results showed that the reaction to the remark "Cleanliness and Condition of the Vehicle Change the Attitude of Users while Using Public Transport." The findings indicated that, out of 500 respondents, In contrast to the assertions that 5.4% of the participants completely opposed with, 9.2% of participants disapproved with the assertion, 11.2% of participants were unbiased toward the assertion, 46.2% of participants concurred with the declaration, and 28.0% of participants completely concurred with it.

  - The results showed that the reaction to the remark "Regularity and Frequency of Service Provided by Public Transport Change, the Attitude of the User." The findings indicated that out of 500 respondents, 5.0% of the respondents responded strongly disagree with the statement., 11.6% of the respondents responded disagree with the statement, 13.2% of respondents responded neutral with the statement, 41.2% of respondents responded agree with the statement and 29.0% of the respondents responded strongly agree with the statement.

- The results showed that the reaction to the remark "Timetable of the vehicle available at the terminus influences the attitude of users while using public transport." The findings indicated, out of 500 respondents, 4.4% of the respondents responded strongly disagree with the statement., 11.2% of respondents responded disagree with the statement, 25.6% of the respondents responded neutral with the statement, 26.2% of the respondents responded agree with the statement and 32.6% respondents responded strongly agree with the statement.
- The results showed that the reaction to the remark "Rate of Fare changes users' attitude while using public transport." Also, out of 500 respondents, 6.4% respondents responded strongly disagree with the statement., 8.2% of respondents responded disagree with the statement, 17.4% the respondents responded neutral about the statement, 36.0% of the respondents responded agree with the statement, and 32.0% of the respondents responded strongly agree with the statement.
- The results showed that the reaction to the remark, "Behaviour of crew members changes the user's attitude." Also, out of 500 respondents, 6.4% the respondents responded strongly disagree with the statement., 8.4% of respondents responded disagree with the statement, 27.6% of the respondents responded neutral about the statement, 35.2% of the respondents responded agree with the statement, and 23.4% of the respondents responded strongly agree with the statement.
- The results showed that the reaction to the remark, "Alternate Arrangement Made by the Crew for the Passengers Influence the Attitude of Users While Using Public Transport." Also, out of 500 respondents, 8.4% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 25.4% of the respondents responded neutral with the statement, 40.8% of the participants responded agree with the assertion and 16.2% of respondents said that they completely concurred with the assertion.
- The results showed that the reaction to the remark "Facility Provided to Handicapped, Women, Kids, and Senior Citizens Change the Attitude of Users While Using Public Transport." Also, out of the 500 people who participated in the survey, 5.8% of those people responded that they strongly disagree with the assertion, 8.4% of those people responded that they disagree with the assertion, 21.0% of those people responded that they were neutral with the statement, 45.2% of those people responded that they agree

with the statement, and 19.6% of those people responded that they completely concur with the assertion.

- The findings indicated the response to "Level of Passenger Intake in Transit Influence, the Attitude of Users While Using Public Transport." A total of 500 people took part in the survey, and of those, 5.8% were completely opposed with the assertion, 7.8% disapproved with the assertion, 31.8% were unbiased about the claim, 36.2% agreed with the assertion, and 18.4% entirely concurred.
- The findings indicated the response to "Availability of Transit at a Convenient Place Influences the Attitude of Users While Using Public Transport." Also, out of the 500 people who participated in the survey, 6.2% of those people responded that they strongly disagree with the assertion, 9.4% of those people responded that they disagree with the assertion, 39.0% of those people responded that they were neutral with the statement, 27.0% of those people responded that they agree with the statement, and 18.4% of those people responded that they completely concur with the assertion.
- The results showed that the reaction to the remark "Facility for CCTV Cameras in Vehicles Change the Attitude of the User." Also, out of the 500 people who participated in the survey, 6.2% of those people responded that they completely disagree with the assertion, 11.0% of those people responded that they disagree with the assertion, 32.2% of those people responded that they were neutral with the assertion, 32.6% of those people responded that they agree with the statement, and 18.0% of those people responded that they completely concur with the assertion.
- The findings indicated that the response regarding the statement "Speed of The Vehicle Change the Attitude of Users While Using Public Transport." Also, out of the 500 people who participated in the survey, 5.6% of those people responded that they strongly disagree with the assertion, 15.4% of those people responded that they disagree with the assertion, 25% of those people responded that they were neutral with the assertion, 36.0% of those people responded that they agree with the statement, and 18.0% of those people responded that they completely concur with the assertion.

- **Response Regarding the Functioning of public transit**

- The findings indicated that the response regarding the statement "Functioning of Public Transit was Smooth Before the Pandemic." According to the data, 5.6% of those who replied that they strongly disagreed with the statement, out of a total of 500

respondents.15.4% of those polled said that they disagree with the remark; 25% of those polled responded that they have no opinion on the topic; 36.0% of those polled responded that they agree with the remark; and 18.0% of those polled responded that they completely concur with the assertion.

- The findings indicated that the response regarding the statement "law regarding the functioning of public transit was not rigid." The results showed that 8.4% of the 500 people who replied strongly disagreed with the statement. 9.0% of respondents disagreed with the statement, 31.8% of respondents expressed moderate agreement with it, 30.6% of respondents expressed agreement with it, and 20.2% of respondents expressed strong agreement with it.
- The findings indicated that the response regarding the statement "Characteristics of roads affect the functioning of public transit." In addition, out of the 500 respondents, 8.0% of those polled strongly disagreed with the assertion, 9.6% of those polled said they disagreed with the assertion, 30.2% of those polled said they were neutral with the statement, 26.8% of those polled said they agreed with the assertion, and 25.4% of those polled said they completely concurred with the assertion.
- The findings indicated that "The Length of the Route Affects the Functioning of Public Transit." In addition to that, it showed that out of the total of 500, 8.0% of the respondents strongly disagreed with the statement. There were 9.6% of respondents who said that they did not agree with the assertion, 30.2% of respondents who indicated that they were indifferent on the assertion, 26.8% of respondents who indicated that they agreed with the statement, and 25.4% of respondents who indicated that they completely concurred with the assertion.
- The findings show the response regarding the statement "The Financing and Funding Affect the Functioning of Public Transit." In addition, out of the 500 respondents, 8.0% of those polled strongly disagreed with the assertion, 9.6% of those polled said they disagreed with the assertion, 30.2% of those polled said they were neutral with the assertion, 26.8% of those polled said they agreed with the statement, and 25.4% of those polled said they completely concurred with the assertion.
- The findings show the response to "The Financing and Funding Affect the Functioning of Public Transit." In addition, the statistics showed that out of a total of 500 respondents, 3.4% of those respondents answered with a significant disagreement with

the assertion. There were 6.4% of respondents who said they disagreed with the assertion, 30.2% of respondents who said they had no opinion on the assertion, 33.2% of respondents who said they agreed with the statement, and 26.8% of respondents who said they completely concurred with the assertion.

- The findings indicated the response to the statement "The Timetables (Journey Plan) Affect the Functioning of Public Transit." In addition, the investigation revealed that out of the total of 500 respondents, 4.4% of them stated that they strongly disagreed with the assertion. There were 3.8% of respondents who said they disagreed with the assertion, 20.4% of respondents said they had no opinion on the assertion, 42.8% of respondents said they agreed with the statement, and 28.6% of respondents said they completely concurred with the assertion.

- **Give a Response Regarding Functioning of public transit after the Pandemic**

- The findings indicated that the response regarding the statement, "The pandemic negatively affects the functioning of public transit. "Also, out of the 500 respondents, 6.0% of those polled responded that they strongly disagree with the assertion, 12.2% of those polled responded that they disagree with the assertion, 21.2% of those polled responded that they were neutral with the statement, 41.4% of those polled responded that they agree with the assertion, and 19.2% of those polled responded that they completely concur with the assertion.

- The findings indicated the response to "Inclusion of Social Distancing Affects the Functioning of Public Transit After the Pandemic." In addition, out of a total of 500 respondents, 7.0% of them strongly disagreed with the statement, 7.8% of them disagreed with the assertion, 21.0% of them were neutral with the statement, 23.6% of them agreed with the assertion, and 40.6% of them strongly agreed with the assertion.

- The findings indicated that the response regarding the statement "The Enhancement of Safety and Security Measures Influence the Functioning of Public Transit After the Pandemic." The findings also indicated out of 500 respondents, 4.2% of the respondents responded strongly disagree with the statement., 11.2% of respondents responded disagree with the statement, 32.8% of the respondents responded neutrally with the statement, 26.0% of the respondents responded agree with the statement and 25.8% of the respondents responded strongly agree with the statement.

- The findings indicated that the response regarding the statement "Implementation of Covid-19 Laws Affect the Functioning of Public Transit After the Pandemic". The findings also indicated that, out of 500 respondents, 7.0% of the respondents responded strongly disagree with the statement., 9.0% of the respondents responded disagree with the statement, 24.8% of the respondents responded neutral with the statement, 29.8% of the respondents responded agree with the statement and 29.4% of the respondents responded strongly agree with the statement.
- The findings indicated the response to the statement "Increment of Financing and Funding for Sanitation Affect the Functioning of Public Transit After the Pandemic." The findings also indicated that out of 500 respondents, 15.8% of the respondents responded strongly disagree with the statement., 25.0% respondents responded disagree with the statement, 20.8% the respondents responded neutral with the statement, 27.0% the respondents responded agree with the statement and 11.4% responded strongly agree with the statement.
- The findings show the response to "The Changes in Timetables (Journey Plans) Due to the Pandemic Affect the Functioning of Public Transit." The findings also indicated that out of 500 respondents, 4.2% of the respondents responded strongly disagree with the statement., 15.6% of the respondents responded disagree with the statement, 17.8% of respondents responded neutral with the statement, 35.4% of respondents responded agree with the statement and 27.0% of the respondents responded strongly agree with the statement.
- The findings indicated that "The Renovation of Public Transport Infrastructure Due to the Pandemic Affects the Functioning of Public Transit." The findings also indicated that out of 500 respondents, 9.2% of the respondents responded strongly disagree with the statement., 9.2% of the respondents responded disagree with the statement, 20.8% of the respondents responded neutral with the statement, 33.4% of respondents responded agree with the statement and 27.4% of the respondents responded strongly agree with the statement.

CHAPTER VI:

SUMMARY, IMPLICATIONS, AND RECOMMENDATIONS

6.1 Overview

People all around the world have been significantly impacted by the Covid-19 conundrum. The majority of the burden, however, fallen on individuals who work in the healthcare sector and other caregiving-related sectors, as well as those who provide crucial services and businesses like transportation, food production, and retail. They have also faced the biggest risks because their workplace health and safety has frequently not been sufficiently protected.

Workers in the transportation industry who have unstable occupations or are employed in the informal economy have suffered from lockdowns everywhere. Without proper protection from social security systems, they are being driven out of their jobs and out of options for earning a livelihood.

Many are compelled into poverty as a result and are unable to support their family. Consequently, there is a rising need for all-encompassing social protection. In particular, to help the world's poorest countries and regions provide their citizens with real support, there is an urgent need for a global, coordinated effort to embrace universal social protection and large investments in its support.

6.2 Summary of the Study

- **Introduction**

This chapter introduced the topic “Covid -19 pandemic outbreak prompted a shift in public transportation plans” and its importance. This particular chapter shows that transportation planning is a complicated system with many moving pieces. This chapter brought attention to various areas, i.e., Transportation Planning, Public Transportation Strategies, Transportation Planning Goals, Public Transport Development Strategies, Transport Planning Objectives changes during the Covid-19 Lockdowns, the Impact of Transportation on Covid 19, Socio-Economic Effects of the COVID-19 Outbreak on Public Transportation, Influence of coronavirus disease on passenger preventative actions and demand in public transport.

It is essential to remember that the system for planning transportation is extremely intricate and consists of many moving pieces. This area covers everything from the regulation

of pollution emissions to the organization of the construction of large transportation networks, such as busways, roads, freeways, and light and heavy rail systems, among other types of transportation infrastructure.

- **Review of Literature**

This chapter looks at a wide range of literary works, including articles, research papers, books, journal articles, and conference papers. A literature review has been carried out as a component of this investigation, with the primary focus being placed on the subject's theoretical and conceptual dimensions. This chapter analyzes and summarizes relevant research on the pandemic epidemic caused by COVID-19, which resulted in a modification in the plans for public transportation. The only way to remedy the existing findings is to thoroughly understand their weaknesses, and this is the only method to do so. The literature review uncovered several promising new lines of inquiry for researchers to pursue in the future. Remember the significant amount of weight that comes with the responsibility of creating a literature review first and foremost. The reliability of the study is renowned, particularly regarding its methods and findings, and it has earned a fantastic reputation as a result.

A literature review's objective is to provide a cohesive and short overview of the knowledge already available on a particular subject; it is not to offer new insights or arguments on the subject being researched. Because these allegations have some basis, it is reasonable to infer that the investigator took a different tack in their case investigation and approached it from a different angle. Some authors review as follows:

- **Methodology**

A summary of the study's methodology is given in this chapter, along with details on the goals, hypotheses, sample size, and instruments used. The study's results and findings are subsequently used to assess understanding statements. As a result, the techniques are defined by the research's viewpoints on approaching the issue. This study uses a variety of questionnaires and fact-gathering questions to conduct descriptive research.

Using the most up-to-date research, the scientific method investigates a problem, concern, or issue. Researchers perform rigorous and systematic searches for vital facts to find useful information. "research" refers to a combination of scientific investigation and creative work. For some, studying is a journey from the known to the unknown. The true quest aims to gain information through research, observation, comparison, and experimentation. In essence, research is a systematic approach to finding a solution to a problem.

For the primary data collection, the researcher made use of a questionnaire, and for the secondary data collection, the researcher relied on publications like journals and articles. The study's sample size was 500 people from five Indian cities: Kolkata, Mumbai, Indore, Bengaluru, and Delhi. A random sampling Technique was used. Arithmetic means, standard deviation, regression analysis, and correlation were only a few of the statistical methods employed in the study. The researcher employed Micro Soft Word, Excel, SPSS,

- **Result**

The study contains a presentation, an analysis, and an interpretation of the study's objectives. The results indicate that either the null or alternative hypothesis should be rejected. It examines the qualitative approach's findings and conclusions, the compilation of questionnaires, and the quantitative outcomes of the study analysis results in order to draw comparisons and contrasts between this research and previous studies and works of literature. The observations are also examined in relation to prior study results and other literature, when appropriate.

- **Discussion**

This section provides an in-depth analysis of the processes followed throughout the research. The material that was gathered will be examined to evaluate the hypothesis and provide answers to the questions that were posed for the research.

- **Summary, Implications and Recommendations**

The results of the study, as well as its overall conclusions, are discussed in this chapter. It will be accompanied by a discussion of the limitations of the research as well as the scope of future research that can be derived from the thesis. This debate will take place after the conclusion of the research.

6.3 Suggestions, Recommendations.

Transportation is a structure that allows individuals in a given area to take advantage of opportunities outside of their immediate vicinity and public transit that is low-cost efficient and proximate will reduce inequalities in access. Public transportation is an essential commodity that every economy needs. Maintaining a reliable supply chain for life-saving medicines and medical equipment following authorities regulations is paramount to public transportation operators during pandemic.

The Indian economy suffered greatly due to the state-wide lockdown, which led to a surge in unemployment and a steep drop in growth. The occurrence of COVID-19 brought about significant changes in every facet of life for everyone and one of the most significant areas that it affected was the public transportation system. Public Transportation organizations incurred heavy losses due to lockdowns and government restrictions. Many public transportation employees lost there jobs, multiple cost reduction measures were implemented to reduce losses. Even there was People all over the world who rely on public transportation on a regular basis have had their perspectives fundamentally shifted as a direct result of COVID-19 since people perceived it as unsafe and avoided it and there was shift to personal automobiles for transit. High concentration of people in a small area with poor air circulation makes public transportation a potentially dangerous environment for the spread of coronavirus. It is observed that changes in the accessibility to public transportation negatively impacted low-income and vulnerable populations who were not able to afford private transit modes and had no option available for them during pandemic. During initial period of pandemic lost their livelihood and employment. These are population who are completely dependent on public transport. Restoration of public transportation operations post pandemic brought them back to Public transportation in a phased manner.

Further it is observed that was/is a behavioral change towards the public transport post pandemic; this behavioral change will become habit over the time, habit is difficult to change. Hence before a change becomes habit, change has to be addressed and reversed. Thus it is important to build trust on the Public transport. Trust in Public transport is built when the Public transport is affordable in comparison to private transport, have last mile connectivity, have required number frequency during both peak and non-peak hours, regularity as per timetable, availability of sufficient parking spaces in public transport stops and stations, clean and conditioned vehicles, comfort and quality seats, polite and skilled crew members, alternative arrangements in case of breakdown, user-friendly vehicles, facilities provided to Handicapped, Women, Kids and Senior citizens, Secure and Safe, Intelligent Transportation Systems(ITS) in public transport such as Digital e-payments and contactless ticketing, Vehicle tracking, CCTV cameras, Passenger Information System boards, Scheduling and Planning applications and passenger Mobile apps.

ITS plays a significant role in Public Transport patronage. Travel during pandemic was considered unsafe in terms of manual ticketing, Digital e-payments and contactless ticketing, vehicle location, Information regarding estimated time of arrival, estimated time of journey helps in planning safe journey. Post-pandemic period, in a way pawed a way towards

implementation of these digital solutions and are providing a more efficient and cutting-edge transit experience. More the travel time in public transport, lesser it is preferred. It is high time now to start giving Public transport road priority. Public transport road priority reduces travel time in turn patronizing usage of Public transport.

Since Authorities and Public transportation operators had no preparedness for pandemic, many laws restricting the public transportation were enforced during pandemic. Which were though essential, its long term effects were not visualized. Several transportation-related initiatives need to be prepared for future industry disruptions.

- Strategies and Action plan needs to be prepared and kept ready. Regularity and Frequency of trips, social distancing measures and guidelines, disinfection plans that are to be followed during different phases of pandemic should be prepared. Authorities and public transportation operators must react to the pandemic crisis by enhancing the availability of safe mobility systems and services.
- Funding and Financing from authorities is essential to keep Public transportation fares affordable, cheap, attractive and sustainable.
- Pandemic disruption readiness mock drills should be conducted. Creation of Transport Task Force in Public Transportation industry.
- Investment on Research, Public feedbacks, Engaging civil groups in policy decision making and Public awareness programs needs to conduct at regular intervals.
- Complete implementation of ITS in Public transportation industry.
- Creation of database of users travels patterns so that demand analysis can be done.
- Providing incentives to use Public transport, like concession in taxes.
- Introduction of Electric vehicles in Public transportation.

6.4 Limitations of the Study

- The study was limited to 500 respondents from 5 cities.
- Respondents were biased in their views, which cannot be eliminated.
- The study only represents the thoughts and responses of a few people; the findings and suggestions drawn from it cannot be generalized to the entire population.

6.5 Implications of the Study

For public transportation operators, the study provides strategic insights for impact of COVID-19 on Public Transportation operations, helping to design effective policies and

support systems that keep them in readiness for any future disruptions. Prioritizing all the resource allocation towards technological infrastructure and passenger demand programs is likely to yield positive outcomes. Public transportation operators can develop policies that address challenges and opportunities, emphasizing flexibility, passenger friendly, and continuous learning. Future research can extend the scope to different geographical regions, providing a more comprehensive understanding of demands travel pattern and behavior patterns of commuters and a mixed methods approach combining quantitative and qualitative research can offer richer insights, complementing survey data with in-depth interviews and case studies. By addressing these aspects, the study significantly contributes to the existing body of knowledge on Public transport operations, Impact of COVID-19 on Public transportation and offering practical recommendations and identifying areas for further exploration.

6.6 Conclusion

Covid-19 disruptions are a lessons for future readiness to any such or larger disruptions. Further future studies can be conducted on the measures taken by the public transportation operators during pandemic. Create a database, analyze and use them for preparing the strategies and action plan for future industry disruptions without compromising livelihood and lives.

APPENDIX A
SURVEY COVER LETTER

APPENDIX B
INFORMED CONSENT

APPENDIX C

Interview Questionnaire

Dear Sir/Madam

Your assistance in completing this survey would be greatly appreciated as your views can help me to complete my research work more appropriately. If you have any inquiry, please feel free to mail on …….

Please express the degree to which you feel the following emotions using a five-point Likert scale ranging from 1-5, where 1=Strongly Disagree (SD), 2=Disagree (D), 3=Neutral (N), 4= Agree (A), and 5=Strongly Agree (SA).

Your participation in this study will be highly appreciated and the information you provide will be used for academic purposes only.

- **Demographics**

1. **Gender:**
   a) Male b) Female c) Others
2. **Age group:**
   a) 16-25 Years b) 26-33 Years c) 34-45 Years d) Above 45 years
3. **Occupation:**
   a) Students b) Salaried c) Self-Employed d) Unemployed e) Others
4. **Education Level:**
   a) Illiterate b) Can read and write c) Primary education d) Secondary education e) University level
5. **Residence:**
   a) Urban b) Rural
6. **Monthly Income:**
   a) Nil b) Less than 10,000 c) 10,001-20,000 d) 20,001- 40,000 e) More than 40,000
7. **Mode of Public Transportation:**
   a) Buses b) Trains c) Rapid Transit
8. **Since How Long Are You Using Public Transport?**

a) 1 Year b) 2-5 years c) More than 5 years

9. The major impact of COVID-19 on Transportation:

a) Cost of Transportation b) Shortage/lack of Transportation mode c) Traffic congestion d) Social distancing

- **Covid-19 Pandemic**

Please give a response regarding the Covid-19 Pandemic

S No.	Covid-19 Pandemic	SA	A	N	D	SD
1.	Does Covid-19 had affected the use of public transport?					
2.	Does Lockdown affect the use of public transport?					
3.	Does social distancing had affected the use of public transport?					
4.	Do the new Covid-19 variants results in a new challenge regarding the use of public transport?					
5.	Does traveling in public transport increase Covid-19 transmission?					
6.	Is there a correlation between the confirmed cases and the volume of public transport trips?					
7.	Does Covid-19 affect the attitude and behavior of the general public regarding the usage of public transport?					
8.	Does the public transport ridership reduce during the pandemic?					
9.	Does public transportation suffer more than private transportation during the pandemic?					

- **Usage of Public Transport**

Please give a response regarding the usage of public transport

S No.	Usage Of Public Transport	SA	A	N	D	SD
1.	Is public transport Affordable in comparison to private transport?					
2.	Does the long walking distances from stations affect the usage of public transport?					
3.	Does the time travelled by the passenger create an impact on the usage of public transportation?					

4.	Does the low bus frequency create an impact on the usage of public transportation?					
5.	Does population density influence the usage of public transportation?					
6.	Does the unavailability of parking for private vehicles increase the usage of public transport?					
7.	Does public transport is mostly used by employees rather than businessmen?					
8.	Does the high usage of public transport reduce road congestion?					
9.	Does the high usage of public transport reduce Co2 emissions (air pollution)?					

- **The Attitude of Users Towards Public Transport**

Please Give a Response Regarding Attitude of Users Towards Public Transport

S No.	The attitude of Users Towards Public Transport	SA	A	N		D	SD
1.	Does Comfort and Quality of seats influence the attitude of users while using public transport?						
2.	Does the Cleanliness and Condition of the vehicle change the attitude of users while using public transport?						
3.	Does the Regularity and Frequency of service provided by public transport change the attitude of the user?						
4.	Does the timetable of the vehicle available at the terminus influence the attitude of users while using public transport?						
5.	Does the Rate of Fare change the attitude of users while using public transport?						
6.	Does the Behaviour of crew members change the attitude of the user?						
7.	Does the alternate arrangement made by the crew for the passengers in case of a breakdown of vehicle seats influence the attitude of users while using public transport?						
8.	Does the Facility provided to handicapped, women, kids, and senior citizens change the attitude of users while using public transport?						

9.	Does the Level of passenger intake in transit influence the attitude of users while using public transport?						
10.	Does the Availability of transit at a convenient place influence the attitude of users while using public transport?						
11.	Does the Facility for CCTV cameras in vehicles change the attitude of the user?						
12.	Does the Speed of the vehicle change the attitude of users while using public transport?						

- **Functioning of Public Transit Before the Pandemic**

Please Give a Response Regarding the Functioning of public transit

S No.	Functioning of public transit before Pandemic	SA	A	N	D	SD
1.	Does the functioning of public transit was smooth before the pandemic?					
2.	Does the law regarding the functioning of public transit was not rigid?					
3.	Do the characteristics of roads affect the functioning of Public transit?					
4.	Does the length of the route affect the functioning of Public transit?					
5.	Do the financing and funding affect the functioning of Public transit?					
6.	Do the Interchanges (switch from one public transport route to another) affect the functioning of Public transit?					
7.	Do the Timetables (journey plan) affect the functioning of Public transit?					

- **Functioning of Public Transit After Pandemic**

Please Give a Response Regarding Functioning of public transit after Pandemic

S No.	Functioning of public transit after Pandemic	SA	A	N	D	SD
1.	Does the pandemic negatively affect the functioning of public transit?					
2.	Does the inclusion of social distancing affect the functioning of public transit after the pandemic?					

3.	Does the enhancement of Safety and security measures influence the functioning of public transit after the pandemic?					
4.	Does the implementation of covid-19 laws affect the functioning of public transit after the pandemic?					
5.	Does the increment of financing and funding for sanitation affect the functioning of Public transit after the pandemic?					
6.	Do the changes in Timetables (journey plans) due to the pandemic affect the functioning of Public transit?					
7.	Does the renovation of public transport infrastructure due to the pandemic affect the functioning of Public transit?					

I sincerely appreciate your time and cooperation.

Please check to make sure that all the questions are answered.

Thank you so much for your contribution.

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