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Review to the Barriers of Last-Mile Connectivity in Urban Mobility around the Globe

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Abstract - Transport heralds the economic development of a region and plays a very crucial role in its urbanization. Urbanization has headed to horizontal development of the cities thus generating problems of urban sprawl, increase of trip lengths and increased demand of private vehicles which adversely impacted on environment. Demand for the public transport sector in Indian cities is increasing continuously. To meet these demands, the Government of India has provided a variety of transportation systems such as the Mass Rapid Transit System (MRTS), Bus Rapid Transit System (BRTS), and Light Rail Transit System (LRTS) in every major city. However, the potential of offering affordable and convenient last mile connectivity (LMC) from the point where a trip finishes to the point where a public transportation system may be accessed, is mostly ignored and not designed properly, so public transport riders lag behind. The city has failed to provide inhabitants with fast, comfortable, and economical mobility options. In this alarming situation, a rapid paradigm change is required to move people away from private vehicles and toward public transportation. Issues with Last Mile Choice can arise for a variety of reasons, including service reliability, waiting times, the lack of direct feeder bus routes, and cost-effective modal interchange options, as well as the quality and facilities available at transit nodes throughout the city. As a result, public transportation has been relegated to a second or even last choice of mode of transportation. As a result, the number of private vehicles on the road in the city has been steadily increasing.The purpose of this study towards investigate the barriers of last-mile connectivity in urban mobility towards decongestion around the globe to identify the mode preference behavior of passengers for first and last-mile travel to enhance public transportation and improve the physical environment for first-to-last-mile connectivity.

Keywords - Public transportation, Last mile connectivity, Urban Mobility, Vehicular congestion, Environment impact

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INTRODUCTION

Over the last decade, tremendous population growth has resulted from development and urbanization. Transportation has a variety of effects on the local and global environment, and the road transport industry is one of the most major contributors to environmental externalities for a number of pollutants. As a result, there has been a massive increase in the number of automobiles on the road, resulting in extremely high levels of air pollution. Around the world, vehicular emissions are becoming the most common source of air pollution.India currently ranks sixth among the world's largest vehicle manufacturers. India ranks in the center of the world in terms of per capita automobile ownership. As a result, any quick rise in income levels, along with the lack of an adequate public transit system, enhances India's automobile expansion. Traffic congestion, fossil fuel usage, and air pollution are all problems caused by the abrupt increase in vehicle traffic. The transportation sector is seen as a vital part of a country's economy. After China and the United States of America, India is the third largest emitter of greenhouse gases in the world. Because of its importance, the global transportation industry accounts for around 24% of worldwide CO2 emissions, with road transportation accounting for the majority of this. Transportation is one of the most significant factors to global warming. Because climate change is one of humanity's greatest threats, most transportation policy are based on it. Efforts are being made around the world to minimize emissions from all sources, including the transportation industry. The difficulties of congestion

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and pollution have intensified in Indian cities with growing urbanization with rising motorization. Both these externalities give rise to economic costs. Congestion imposes a time cost, fuel wastage cost as well as costs due to environmental impacts. Pollution entails the cost of health damage as well as environmental costs. As a result, there is an irresistible need to solve traffic and pollution issues in order to limit resource waste and stop environmental degradation. Congestion and pollution can be reduced using a variety of approaches and strategies. A modal shift to mass public road transportation, such as buses, is one essential strategy for addressing both concerns. The quantification of the costs of congestion (time and fuel costs) and pollution (health damage cost) is essential and so also the quantification of the cost reducing benefits of public transportation. The crisis has evolved to the point that it is thought that it will create long-term damage to our city fabric; these are the weak links that will have a ripple effect on the use of public transit vs private modes of transportation. Despite the commitments and targets, emissions have continued to rise, and the aim for reducing emissions has grown fivefold. In recent years, all countries have started numerous attempts to solve these concerns. These initiatives represent a transition away from traditional supply-centric policies and planning and toward demand-centric policies and planning. In this alarming situation, it is critical to make a rapid paradigm shift in order to shift people away from private vehicles and towards public transit. Commuters are discouraged from switching to public transportation due to a lack of sufficient or adequate final mile (LM) options.

MATERIAL AND METHODS

This study aims to make modes of transportation more appealing, low-cost, comfortable, non-motorized transportation, pleasurable walking experiences, and very easily accessible and comfortable mass transportation with easy, convenient, and comfortable intermodal transfers for last-mile connectivity. The objectives of the study are the parts of the study's methodology, which highlighted the major issues around the globe, these are(a) To examine and expose various transportation-related challenges and externalities in India and around the world. (b) To determine the issues and gaps in current transportation policies. (d) To suggest viable solutions to the problems at hand by navigating through the current hurdles.

ISSUES WITH TODAY'S TRANSPORTATION SYSTEM

Developed Economies: Growing vehicle ownership, traffic, accidents, air and noise pollution, and the depletion of fossil fuel resources were all consequences of increased urbanization and income levels. Cars are essential to the majority of wealthy economies. The US government, for example, invests heavily in public transit. Despite large subsidies, however, most US cities' public transportation system ridership is far below optimal. Due to reduced service hours and longer interchange times, this is the case. Furthermore, it is viewed as a social welfare programme rather than a crucial public utility by policymakers and the general public in the United States. Many industrialized economies, like the United States, rely heavily on automobiles. Although some countries have well-functioning public transportation systems, the expanding population and limited area make it difficult to build new infrastructure, resulting in traffic congestion and pollution. Germany, for example, has six times the number of annual public transit journeys as the United States. Nonetheless, Germany's high car ownership is one of the primary causes of traffic congestion and rising air pollution [1]. Due to the longest queues, Munich, one of Germany's largest cities, is known as the "traffic capital of Germany" [2]. In Hamburg and Berlin, a similar trend may be seen. Average travel times in other major European cities, such as Madrid, Rome, and Spain, are much shorter than average travel times due to congestion [3].To address these issues, efforts are being made to move people away from personal vehicles and enhance vehicle and fuel technologies. Mobility as a Service (MaaS) [4] is being introduced in industrialized countries to improve public transportation networks and introduce shared mobility services. Unrestricted use of any of these means of transportation, on the other hand, causes congestion and does not fix the problem. As a result, having a safe NMT infrastructure will slow down the rise of personal vehicles. As previously said, Germany has a fantastic public transit system as well as a high rate of automobile ownership. As a result, Germany's focus has moved to strengthening the NMT infrastructure. In Freiberg, for example, decades of investments in public transit and NMT resulted in lower car ownership [5]. Furthermore, shared bike programmes in Europe were initially successful in decreasing traffic and pollution. However, several claimed theft and damage instances resulted in the companies' bankruptcy [6]. Congestion and air pollution, for example, have become one of the most serious environmental challenges in China, endangering human health and the environment [7–11]. This is due to a variety of factors, including economic expansion, population growth, motorized vehicle growth, and topography [12].

SINGAPORE (A SMALL BUT DENSELY POPULATED COUNTRY)**:**

Singapore is one of the safest and most environmentally sustainable cities in the world when it comes to public transportation. The city, though, is

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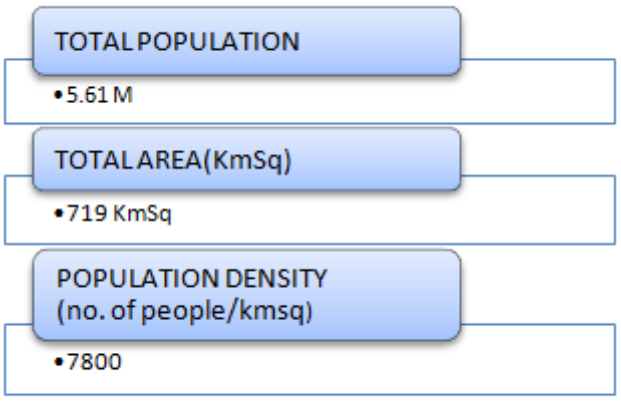
still changing. The government is improving the existing transportation network by building a new terminal and runway at Changi Airport, extending and improving the reliability of the MRT system, opening more cycling paths, and launching electric vehicle sharing and taxis, among other initiatives, as the population is expected to grow to more than six million people by 2030. Singapore has developed a world-class public transportation system that is both accessible and affordable. It is efficient, convenient, and sustainable.Singapore's public transportation system isknown for its efficiency. A major step toward affordability was made in 2013, when the fares were reviewed and new measures were introduced, including a 15 percent discount on adult fares for low-wage workers, free travel for children, and seven other concessions. The convenience and flexibility of the Singaporean ticketing system is another outstanding feature. The EZ-link card is the unified contactless stored-value card, acquaint with public transportation in 2002.



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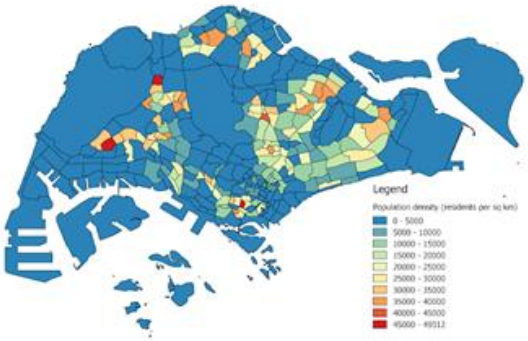

Source: Singstat (2016)

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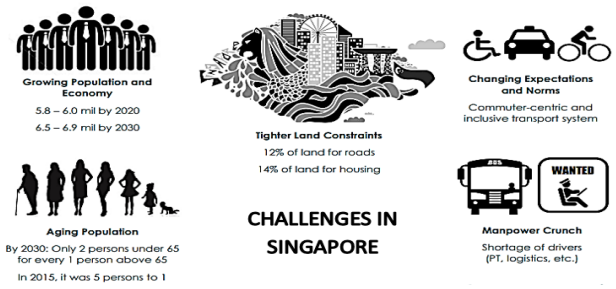
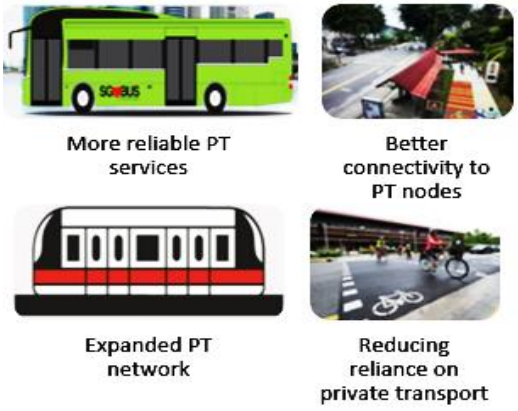


London: London has faced substantial population growth over the last decade, and expects an increase of more than a million over the next 20 years. Such rapid growth is a challenge to the London transportation system. The city is investing to manage the issue, spending around US$11.8 billion in 2015-16 to expand the transport network, and to create more capable and passenger-friendly. More changes are to follow— London is prioritizing public transportation, cycling, and walking, aiming to increase their share of usage to 80 percent by 2041.

Initiatives and policies to promote Public Transport (PT) as the choice mode:



London has well-developed private as well as public transport; it is more efficient, safe, and sustainable globally, and continues to evolve. The London transport system is highly efficient for private and

public vehicles. Ensuring reliability of public transport is one of the major priorities of Transport for London (TFL), regular maintenance, track renewal, and increasing numbers of trains at peak hours are just a few of TFL's recent initiatives. Efficiency of private vehicles is driven by advanced ITS that allows better monitoring and management of traffic, while congestion charges and high costs of parking help limit the number of cars in the city Centre.Safe transport is another of London's significant achievement. Having adopted Vision Zero, London has implemented a number of safety initiatives in recent years and has decreased fatal road accidents by 45 percent on average between 2005and2009. The city aims to completely eliminate deaths and serious injuries on the London transport system by 2041. London peoples are also satisfied with the recent changes, however to a lesser extent than their overall perceptions of the system.Londoners especially appreciate the recent changes in public transport fares, since the city is now aiming to make public transport more affordable. Ticketing is also among the features residents appreciate at most. Oyster card, which can be used across most of the transport services in London, makes payments more convenient by providing a wide range of online features. Despite the fact that London's public transportation system is one of the most environmentally friendly in the world.

India: India is one of the world's fastest growing economies and the second most populous country, with about 1.38 billion people in 2021. India's land area is around 3.5 times that of the United States and China combined. The population density, on the other hand, is 13 times that of the US and three times that of China [13]. In 1961, India's population density was 154 people per square kilometer, but by 2018 it had risen to 455 people per square kilometer [14]. Over a third of the world's population lives in cities, and due to population growth, more will be developed by 2050 [15]. The economic operations of a country cannot survive without a solid infrastructure foundation. Because of its significant infrastructural use, the transportation industry is vital to the economy [16].

BANGALORE: Connectivity to public transportation in the first and last mile is an important aspect of the public transportation travel experience. In Bengaluru, the connectivity to public transport varies across the localities, with certain areas in the city having either metro, bus or suburban connectivity. At present, there is no formal physical integration or information integration across the modes of transport in the city. To encourage people to use public transportation, this amount of integration is required. In the poll, 24 percent of respondents said they don't use public transportation because of a lack of first- and last-mile connectivity. A report published by the World Resources Institute in 2017 noted a shortage of inexpensive transportation to Bengaluru's metro and bus stations, as well as the fact that those who reside more than 5 kilometers from metro stations are unlikely to use public transportation.According to a survey performed by the Ola Mobility Institute in 2018, 70% of Bengaluru residents believe that first and last mile connectivity should be improved. The city's new age mobility service providers have been working on solutions to close the gap between the first and last mile. Currently, options for covering the first and last mile route include app-based bike taxi, bike rental, cycle rental, shared cabs, and carpooling, among others. However, parking facilities for app-based rental automobiles are not currently available at all public transport stations. Shared mobility, shared cabs, and shared vehicles are all viable options for getting people to and from public transportation. However, the state of Karnataka's current legislation limit mobility service providers from providing these services. In some regions of Bengaluru, shared driving services are effective in linking the city's interior with public transit terminals. Furthermore, the most preferred solution for closing the first and last mile gap is a shuttle service or a feeder bus system with a defined route covering the distance between residential neighborhoods and public transit stations. Bike taxis, E-rickshaws, and e-scooters are examples of mobility innovation that can help reduce the first and last mile gap. They provide greater first and last mile connection. In addition, a multi-modal integration of all public transportation modes in the city would allow service providers to develop solutions to close the first and last mile gap. The city's inadequate public transportation usage requires immediate action.

Issues of Urban Transport in Bengaluru: Bengaluru city has seen exponential growth over the last 50 years.The city's population crossed 5 million & last three decades, the vehicular population is growing at an average rate of 25% per annum.Resulted in traffic congestion and low vehicular speed &Various other factors like mixed type of traffic**,** no widening of the roads**,** no laying of new roads to accommodate newer vehicles,frequent traffic jams at road intersections are some of the major issues & also increase of Air Pollution in the City.

CHALLENGES AND GAPS

Addressing transportation concerns while preserving economic growth is a challenge for developing economies such as India. Rising vehicle ownership in India is a result of increased economic activity and massive population growth. It's important to realize that traffic congestion isn't just an issue in India and other developing countries; it's also a problem in many developed countries, many of which are still struggling with it now. It is vital to learn from lessons around the world in resolving difficulties and to keep best practices in mind while building a strategy to meet the city's needs. Traffic congestion plagues the majority of the world's fast-growing cities. This paper will examine the country's biggest cities, highlighting the major difficulties, providing a comparison to best practices around the world, and suggesting a road map for the cities to overcome traffic congestion challenges. In transportation, first- and last-mile

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connectivity refer to the end segments of a journey undertaken by public or mass transit, connecting origin and destination points to stations or stops on the transit network. An aspect that has been shown to have great potential to improve the quality and level of service of public and mass transit, the provision of economical and convenient for last-mile connectivity is nevertheless an area that has been greatly neglected in Indian cities [17]. The last-mile problem is more acute in developing countries, where mass transit systems often remain poorly integrated with other transport modes, compounded by a lack of robust pedestrian and bicycling infrastructure. The disproportionate time and cost implications of the first and last mile journeys are an indication of sub-optimal efficiencies, associated with unavailability of reliable connections, longer waiting times and high transfer penalties. Brons, et al. (2009) showed that high returns can be achieved by facilitating the development of convenient and safe access to transit facilities. By integrating with mass transit and offering reliable options of first- and last-mile connectivity, they strengthen the access of mobility as a service, reducing the need for vehicle ownership and promoting greater reliance on shared and public transit modes. However, there is a lack of sufficient data to understand the potential impacts of on-demand services on public transportation, or their viability in solving the last mile issue.

CONCLUSION

This paper emphasized on growth of public transport use, private transport remains significant and in some cities is the leading form of transportation. Moreover, motorization continues to grow in many cities, and private cars are the most visible part of the transportation system for residents. This is one of the reasons why people use private vehicles and away from the use of public transportation. With the help of Literature studies providing a comparison to best practices around the world, proposing a road map for the cities to overcome challenges and major difficulties like (connectivity, congestion, affordability, safety, and impact on environment) and the fundamental dilemma “howto get high-quality service at low cost?” is relevant for public transit as well, how to create dense, efficient and comfortable public transit and keep it affordable are the most important and painful barriers for residents. As cities face issues in improving public transportation alternatives to support urban activities, the first and last mile problem of public transportation is attracting more academic attention. Many communities around the world are adopting first and last mile technologies as a cost-effective and ecologically beneficial alternative.Last-mile options and traffic congestion plague the majority of the world's fast-growing cities. A big influx of migrants from all backgrounds, last-mile connectivity alternatives and issues, a lack of sufficient infrastructure to satisfy the demands of all people, and ineffective traffic management and enforcement procedures are all factors that contribute to traffic congestion. This study will look at the country's largest cities, identifying the major concerns, comparing them to best practices around the world, and recommending a road map for cities to overcome traffic congestion issues.

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