



PERCEIVED DETERRENCE OF METRO RAIL TRANSPORT IN ENHANCING THE URBAN MOBILITY; A STUDY IN KOCHI

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Abstract

The present study on the perceived deterrence of Kochi metro rail transport in enhancing the urban mobility is an attempt to focus more on the benefits of metro rail transport and also to shift from the usage of other mode of transportation. Urban mobility is a critical component of the city development. Using a mixed methods approach, this study combines quantitative surveys, interviews with the passengers of different category including the occasional users. The survey aims to capture a wide range of factors influencing metro usage, such as safety concerns, reliability, accessibility, convenience and overall satisfaction with the metro services. Preliminary findings show that while the Kochi metro is perceived positively in terms of reducing traffic congestion and offering a cleaner mode of transport. Key deterrents identified include limited stations, inadequate feeder services, crowded trains, relatively high cost of metro tickets compared to other mode of transport options etc. Based on these findings this study offers several recommendations to enhance the effectiveness of the Kochi metro system like increase the availability of feeder services, awareness campaigns to educate the public about the benefits of metro usage campaigns related with the environmental benefits highlighting the role in reducing traffic congestion, increase the time of opening and closing of metro, Provide awareness related with the Kochi1App for ticket booking, increase the train frequency during rush hours, implement fare subsidies or discounts for frequent low income groups etc. By understanding these recommendations it is easy to guide the policy makers and the concern authority to focus more on the needs of passengers and also the development in the urban mobility of the passengers.

Key words – Deterrence, Metro rail, Urban Mobility

1. Introduction

Transportation has undergone a drafting evolution in human history, adapting to the changing needs of societies and technological advancements. In the early period humans relied on their own mode of transportation like walking, by means of domestic animals to aid in transportation. Industrial revolution marked a transformation in transportation. Rail and roads connected different regions, fostering economic growth and cultural exchange. Due to the transformation in the field of transportation, terrestrial transportation becomes easier by the introduction of metro rails. The evolution of transportation has seen a remarkable transition from simple means to sophisticated systems with the metro representing a significant milestone in urban mobility.

The metro short for metropolitan or subway becomes a hallmark of urban transportation in the 20th century. A rapidly growing city makes ever-increasing demands on urban infrastructure in general and transportation amenities in particular. As the economy grows more and more people need to travel on a daily basis for work within the city. To address the need of the growing population, metro was proposed as the only solution. It all began in the 19th century when industrialization and population growth led to congested cities with increased demand for efficient mass transit.

Metro rail refers to an urban public transportation system using electric trains that operate on a fixed track and are typically underground or elevated. It's designed to efficiently transport large numbers of passengers within a city or metropolitan area. The primary purpose of a metro rail system is to alleviate traffic congestion, reduce travel time and provide a reliable mode of mass transit. Metro rail networks contribute significantly to environmental sustainability by promoting the use of public transportation over individual car travel. It helps in reduction of pollution, lowers carbon emissions and mitigates the overall environmental impact of transportation.

As urbanization continues the evolution of metro transportation remains dynamic, driven by a commitment to efficiency, sustainability and meeting the evolving needs of urban dwellers. In essence, the integration of metro transportation within urbanization efforts contributes to the creation of sustainable efficient and livable cities. It

addresses the challenges posed by population growth and urban sprawl laying the foundation for well-connected and environmentally conscious urban environments.

2. Historical Overview

The concept of metro rail dates back to the 19th century, gaining momentum as urbanization surged. The historical overview of metro rails reveals a fascinating evolution that mirrors the changing dynamics of society and technology. The first metro system, the London underground, opened in 1863, making the inception of underground urban rail transit. It was a response to the challenges posed by rapid population growth and congestion in the city. The Paris metro inaugurated in 1900 became an iconic example of early metro rail expansion, solidifying the idea of underground mass transit. The early to mid-20th century witnessed the global expansion of metro rail networks. New York City's subway system, inaugurated in 1904, became a symbol of efficiency and scale. The emergence of electric traction further enhanced the reliability and speed of metro systems. Cities like Tokyo, Moscow and Berlin developed extensive metro networks, reflecting the growing importance of efficient urban transportation in the face of increasing population density. The mid-20th century witnessed the innovations in metro rail design and technology. In the latter half of the century, rapid transit systems expanded in Asia, particularly in cities like Tokyo and Hong Kong, where population density and economic growth drove the need for efficient transportation solutions. The late 20th century and early 21st century witnessed a resurgence of interest in metro rail systems globally. Technological advancements such as magnetic levitation (maglev) technology, introduced new possibilities of metro rail systems. Shanghai's maglev train, inaugurated in 2004, showcased the potential for high-speed, futuristic metro travel. In recent years, smart technologies and data-driven solutions have transformed the passenger experience within metro rail systems. Mobile applications for real-time information, Contactless payment systems and predictive maintenance have become integral components, enhancing efficiency and convenience for commuters. As we look forward, the evolution of metro rail continues. Emerging technologies such as hyper loop systems and the integration of artificial intelligence are poised to redefine urban transportation. The historical trajectory of metro rail systems underscores their resilience and adaptability in addressing the evolving needs of growing, dynamic cities worldwide

3. Kochi Metro

Kochi metro being the newest metro line was designed and constructed for a fast transportation between important hubs in Kochi city. It became operations in June 2017 and is the first metro systems in Kerala. The metro network connects various important locations in the city, providing a convenient mode of transportation for residents and visitors. The project includes both elevated and underground sections, covering a total distance around 25.6 kilometers. The first phase of Kochi metro comprises 22 stations. Currently there are 25 stations. The metro system uses modern, air-conditioned trains, and it aims to promote environment friendly transportation in the city. The project has been a significant contribution to improved connectivity and urban mobility. As per 2023 report daily ridership of Kochi metro is about 82,000/day. Currently over 1 lakh people are travelling every day that operates at a frequency of 8 minutes. The daily timing of the travel were at 6:00 am to 10:30pm (Monday to Saturday) and 8:00 am to 10:30pm on Sunday.

The construction work was started in June 2013. The inauguration was done by the India's Prime Minister Narendra Modi on June 17, 2017. In 2014 a 1.92km eastward extension to Tripunithura from Petta was approved to be built as part of phase 1A (Petta-SN junction) and phase 1B (SN junction- Tripunithura Terminal) with 3 new elevated stations. Kochi metro's phase 2 project with an 11.2km line and 11 stations was approved by the Kerala government in July 2018 with an estimated cost of Rs 2,310 cr. Each train comprising three coaches runs at a maximum speed of 80km/h. the network is entirely above the ground, making it the only city in India with a completely elevated metro system. The Kochi metro offers different travel passes with the validity and fair prices for students, frequent travelers etc. The metro adds tourism through by connecting the major attractions of Ernakulam district such as museum of Kerala history near Pathadipalam, Lulu Mall and St George Forane church near Edapally, Jawaharlal Nehru Stadium at JLN Stadium, Rainbow hanging bridge and Managalvanam bird sanctuary near MG road. Kochi metro project was executed under the guidance of Delhi Metro Rail Corporation. Each station has solar panels and every sixth pillar has a vertical garden. It is the first metro in India to employ trans-genders. The specialty of this metro line is Almost 80% of its employees are women and the only metro in India to have USB charging ports inside trains.

4. Methodology

The present study related to the deterrence of metro rail transport in enhancing the urban mobility in the lives of Kochi metro. So, the study based on the primary data. Data are collected from the daily passengers of Kochi metro through a standardized questionnaire. In this study there exist 70 sample respondents. For collecting primary data, well-structured questionnaire was used. The 70 sample includes commuters in the metro like students,

working men and women, etc. Random sampling technique is used to collect primary data. Questionnaire was constructed in easy language to reduce risk.

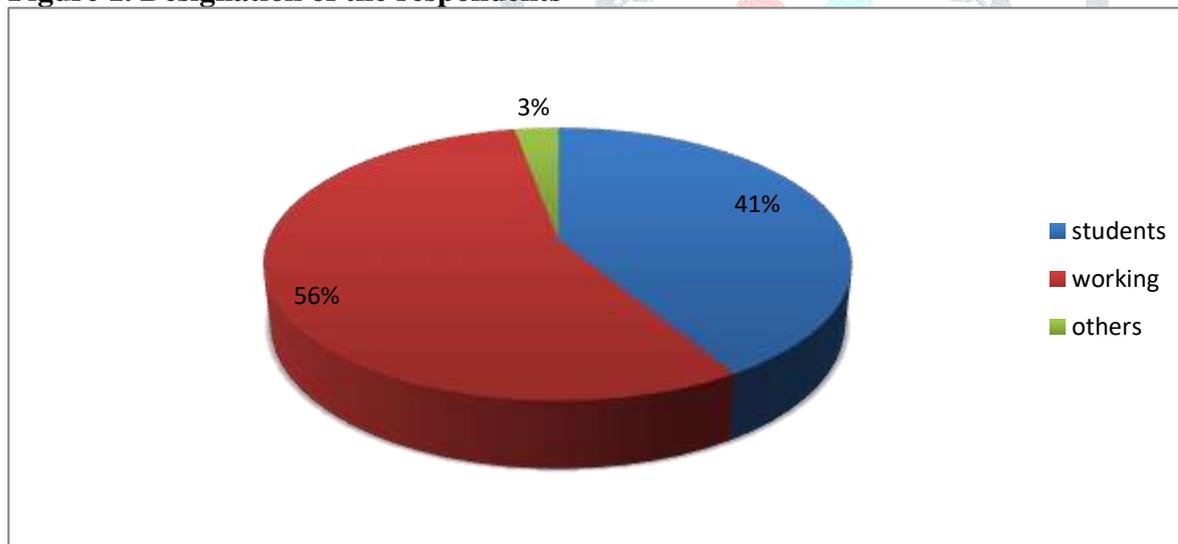
5. Significance of The Study

Kochi, being a rapidly growing urban hub, which has witnessed the implementation of its metro system as a key component of urban mobility infrastructure. It's a crucial role for the policy makers and local authorities to understand the factors influencing the public's perception on the Kochi metro. By identifying and addressing specific concerns related to safety, cost and accessibility in the context of Kochi, the study can contribute to optimizing the metro system's effectiveness in enhancing urban mobility. The Kochi metro serves as a model for sustainable transportation in a regional context. Positive public perception and increased ridership can stimulate economic activities, reduce traffic congestion and contribute to environmental sustainability. Examining the perceived deterrence of the Kochi metro in enhancing urban mobility not only benefits the local population directly but also contributes valuable knowledge that can be applied to urban planning and transportation strategies in other emerging urban centers.

6. Designation of the respondents

Three types of passenger respondents are depicted here for the study. They are Students, working people and other type of passengers. Figure.1. shows the designation position of the Metro passengers. 41% of the passengers fall under the category of students, 56% under the working people and 3% which are tourist, people who travel for specific purpose etc.

Figure 1. Designation of the respondents

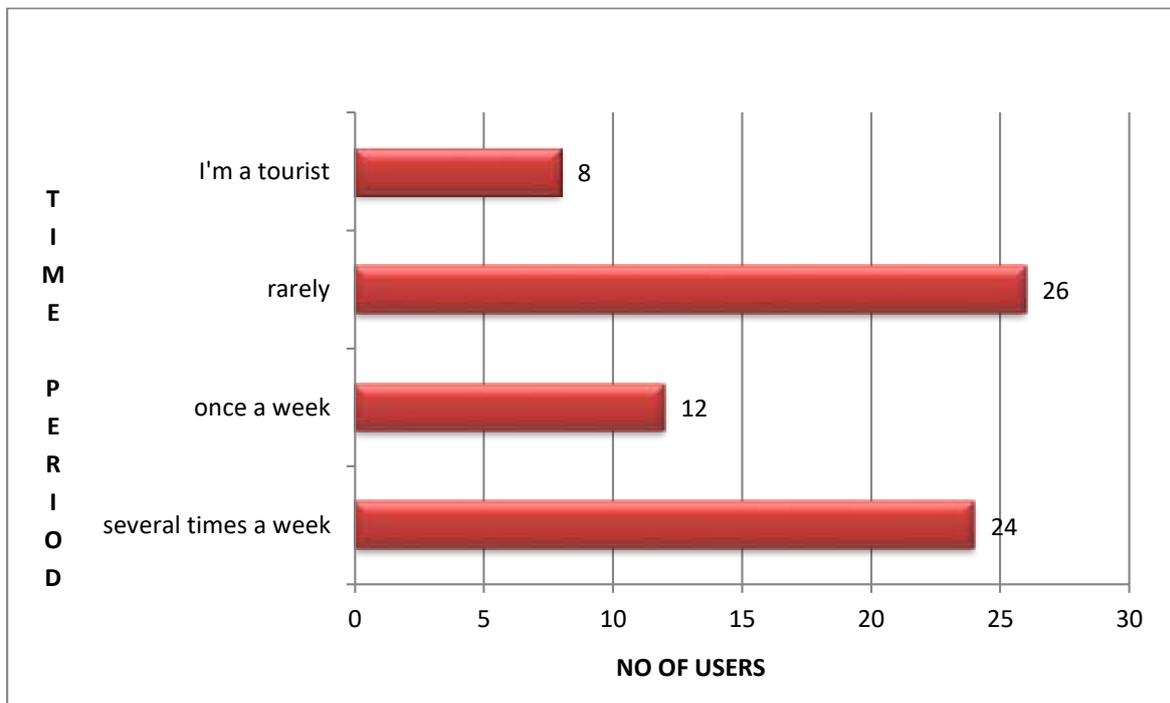


(Source: primary data)

7. Frequency of use of Kochi metro

There are four divisions according to their frequency of usage of Kochi metro by the respondents. They are classified as several times a week, once a week, rarely, and on the basis of as a tourist. it can be graphically presented in figure 2.

Figure 2. Frequency of usage of Kochi metro

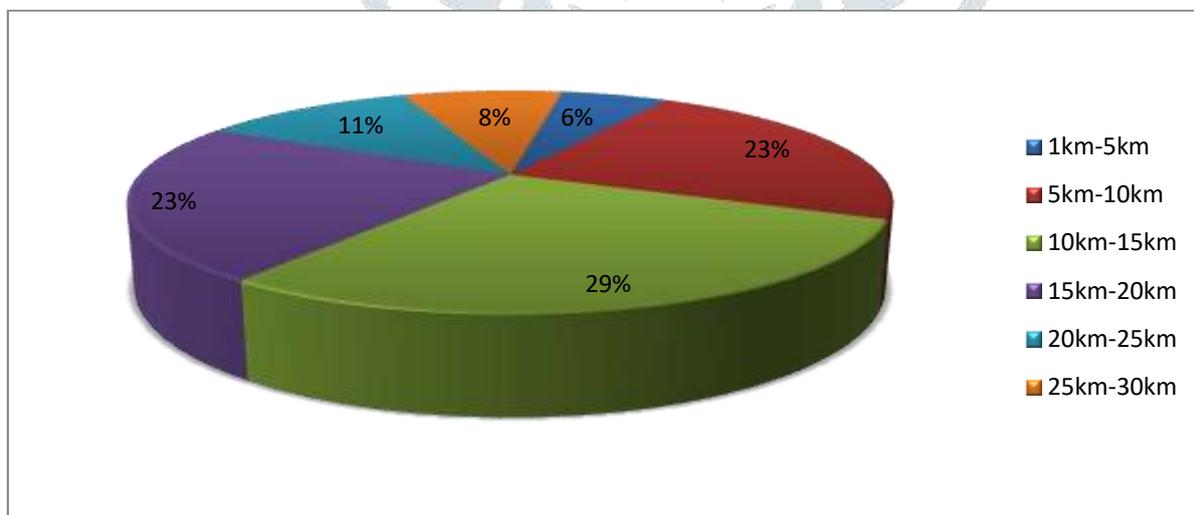


(Source: primary data)

8. Destination distance of the respondents (in km)

The geographical distance traveled by the passengers in a metro system is critical parameter for various aspects of metro rail project studies. Thus, it is relevant to understand the geographical distance travelled by the passengers. Figure 3. explains the geographical distance (in km) from the boarding place to the destination of the passengers. This piece of information will help us to know the maximum distance travelled by each passenger under the study.

Figure 3. Destination distance of the respondents

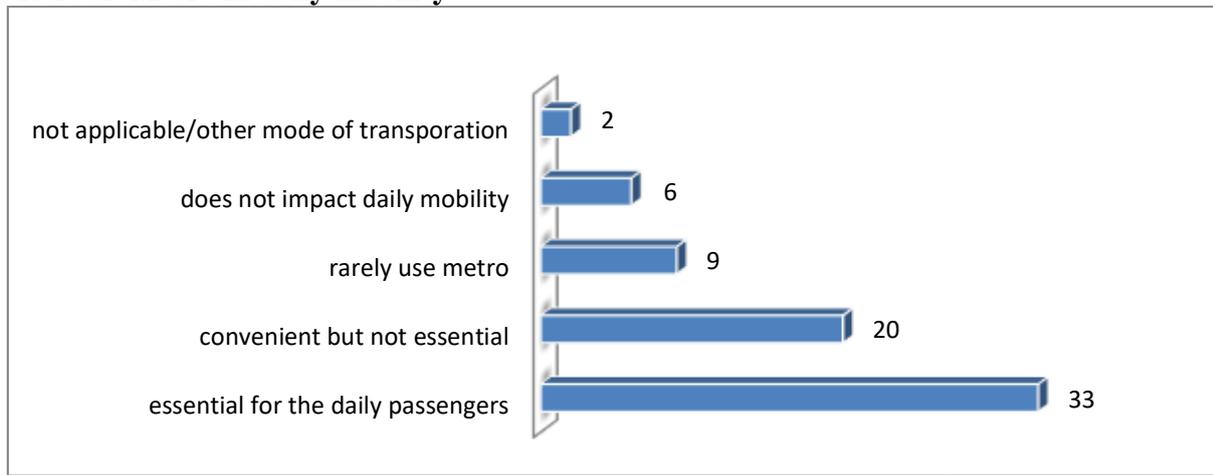


(Source: primary data)

8. Role of Kochi metro in daily mobility

The role of Kochi metro can be explained as, they are essential for the daily passenger, convenient but not essential, rarely usage, does not impact the daily mobility and not applicable/ other mode of transportation. The figure 4 explains that the 47% of the passengers advocate that metro is essential for the daily mobility, 28.5% are of opinion that it is convenient but not essential, 13% responds that it can be used in a rare case, 8.5% declares that it does not impact in the daily mobility and 3% out of 70 responses says that it is not applicable in the daily mobility.

Figure 4. Role of Metro in daily mobility

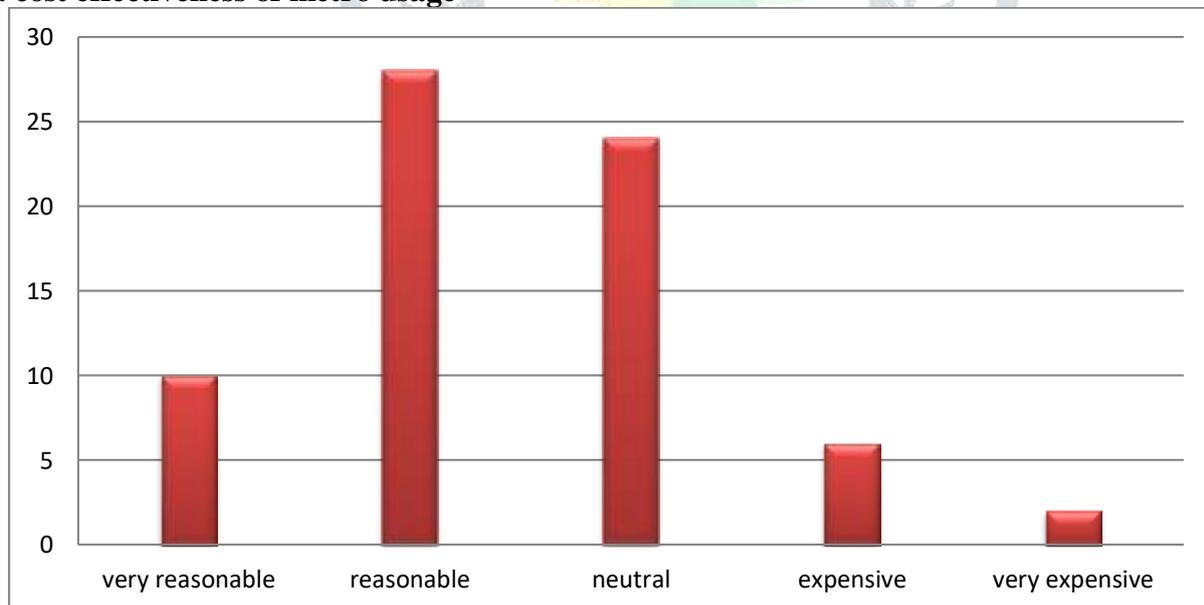


(Source: primary data)

9. Evaluating the cost effectiveness of metro usage

The figure 5. is based on the cost effectiveness of metro usage. It can be evaluated on the basis of 5 categories they are, very reasonable, reasonable, neutral, expensive and very expensive. Figure pinpoints that 28 out of 70 are saying that it is reasonable with the cost to travel along with the metro and 14% with very reasonable opinion, 34% with neutral. 6 people out of 70 are about expensive opinion and 3% with very expensive opinion, which means majority, were satisfied with the cost induced in metro. It can be graphically presented in figure given below;

Figure 5. cost effectiveness of metro usage



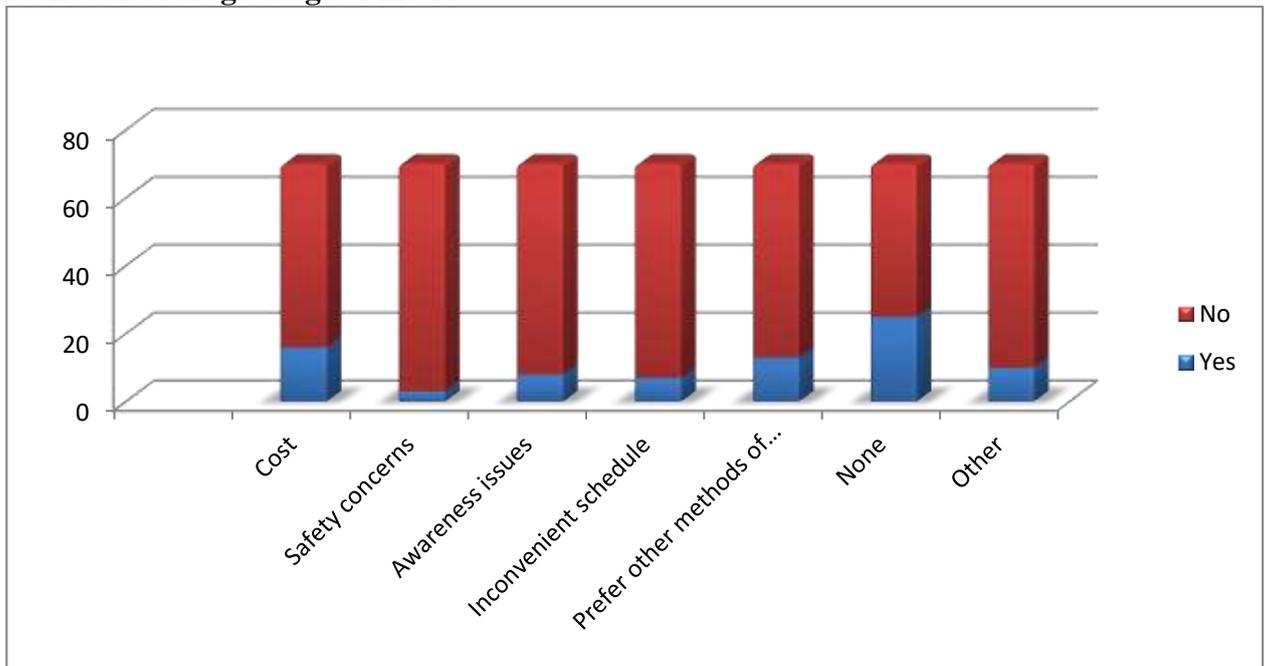
(Source: primary data)

10. Effectiveness of metro among the respondents

10.1 Factors that discourage from using metro

There are factors which discourage from using metro. They can be classified under seven heads they are cost, safety concerns, awareness issues, inconvenient schedule, other mode of transportation and others. The Figure.6. explains cost which is one of the factors which discouraged by 77% and agreed by 23%. Safety concerns which agreed by 4% and disagreed by 96%, awareness issues which is agreed by 3 out of 70 and 67 were disagreed, inconvenient schedule agreed by 10% and disagreed by 90%, other mode of transportation was agreed by 19% and disagreed by 81%, other reasons which discourage the usage of metro are agreed by 10 people and disagreed by 60 people out of 70.

Figure 6. factors that discourage usage of metro

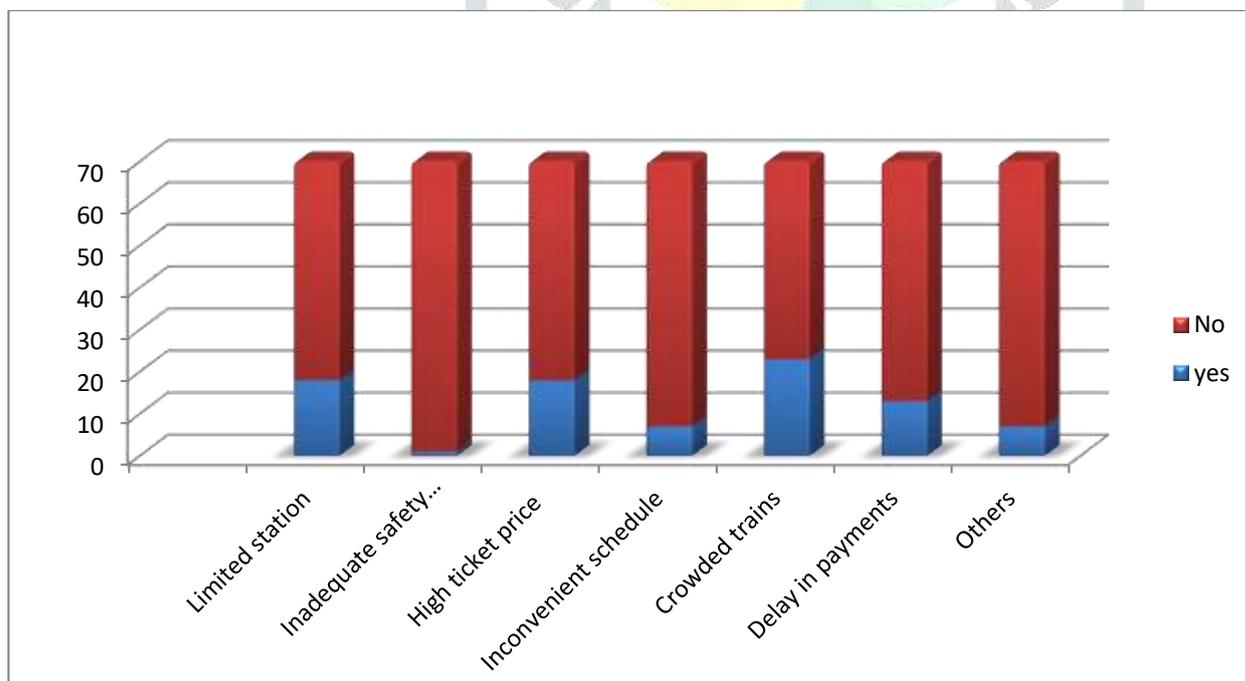


(Source: primary data)

10.2 Challenges or deterrents that encountered by the passengers

Challenges or deterrents which are encountered by the passengers are categorized under seven heads. They are limited station, inadequate safety measures, high ticket price, inconvenient schedule, crowded trains, delay in payments and others. Figure 7. explains that limited station is one of the challenges encountered by the passengers in metro. Around 26% of the respondents agreed upon it and disagreed by 74%.

Figure 7. Challenges encountered by the passengers



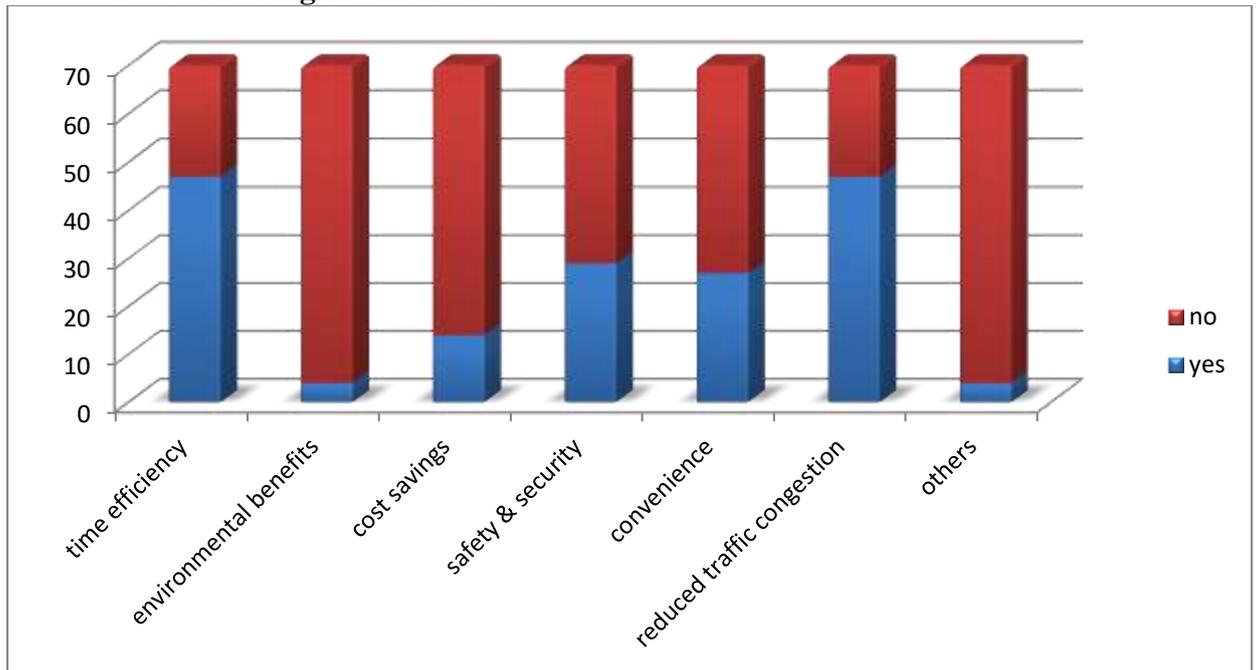
(Source: primary data)

10.3 Benefits associate with using Kochi metro

There are different types of benefits associated with using Kochi metro. There are five categories they are time efficiency, environmental benefits, cost savings, safety and security, convenience, reduced traffic congestion and others. Others which means stress reduction, reliability etc. The figure. 8. explains that time efficiency and reduced traffic congestion were agreed by 67% and disagreed by 23% which means that passengers are highly satisfied with these two factors. 94% passengers raised that environmental problem is not reduced to an extent. 80%

respondents declared that cost savings are not a benefit only 20% agreed this factor thus cost is an issue. Safety and security which is of neutral opinion among respondents which is agreed by 41% and disagreed by 59%. 39% agreed the factor 39% and disagreed by 61%. Other reasons were raised by 6% and disagreed by 94%.

Figure 8. Benefits associate with using Kochi metro



(Source: primary data)

10.4 Have the benefits met the expectation of the passengers/ is there any improvement?

The respondents explain the question of have the benefits met the expectations of the passengers/ is there any improvement? Around 44% are highly satisfied with their expectations. 3% of the respondents are not satisfied with the existing system and there is need for improvement.

11. Conclusion

In this present world importance of metro is a striking one. It helps in the reduction of pollution and helps in attaining the environmental benefits. The study on the perceived deterrence of metro rail transport in enhancing the urban mobility in Kochi reveals critical insights into the factors influencing public transportation adoption. Key deterrents identified include concerns over safety, reliability, accessibility and the overall user experience. Addressing these issues through targeted improvements which raises the urban mobility, reduce the challenges and boosting of Kochi1 App can significantly improve the public confidence and ridership. This study underscores to identify and solve the perceived deterrence or challenges that residents associate with using the metro and to understand how residents perceive the role of metro in their daily mobility and to foster a positive perception of metro rail transport for its success and the broader goal of sustainable urban development.

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