

Evaluating the Public Bicycle Sharing System (PBSS) for Sustainable Urban Mobility: A Case Study of Mysuru City

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Abstract: A key element of sustainable city design is urban transportation infrastructure, which tackles issues including air pollution, traffic jams, and the fast urbanization of cities. This paper offers a thorough analysis of Mysuru City, India's Trin Trin Public Bicycle Sharing System (PBSS), evaluating its potential to promote sustainable urban mobility. Using a mixed-methods approach, the study assesses the system's operational efficacy and spatial accessibility by combining Geographic Information System (GIS) approaches with user survey analysis. Network and proximity assessments based on GIS quantify how well-connected and integrated docking stations are with important urban features, such as transit hubs, neighbourhoods, and job centers. At the same time, performance bottlenecks and user perceptions are identified by analysing user demographics, usage patterns, and satisfaction levels obtained from primary survey data. The results show how the PBSS may significantly improve last-mile connectivity and encourage non-motorized transportation (NMT). They also highlight important issues, such as poor intermodal integration with public transportation, spatial gaps in station coverage, and user safety concerns, especially at night. The study's strategic recommendations for station site optimization, enhancing digital and physical connectivity with other modes of transportation, and putting safety measures in place to boost user engagement are presented in the conclusion. Finally, by highlighting the critical role that evidence-based planning plays in creating strong and efficient PBSS frameworks, this study provides policymakers in Mysuru and other cities with practical advice on how to match their transportation systems with more general sustainability objectives.

Keywords: Public Bicycle Sharing System (PBSS); Last-Mile Connectivity; Non-Motorized Transportation (NMT); Sustainable Urban Mobility (GIS); Urban Transportation Planning; Mysuru City.

Introduction

Urban mobility infrastructure is critical to city development because it allows people and products to move while also fostering economic growth, environmental sustainability, and social equality. As cities around the world grow in size, urbanization comes with it a slew of issues. Examples include traffic overcrowding, pollution of the environment and sounds, resource usage, and greenhouse gas emissions. As a result, legislators and urban planners are increasingly prioritizing sustainable transportation networks that reduce reliance on motorized vehicles while also promoting environmentally friendly and cost-effective commuting solutions.

Among these alternatives, Public Bicycle Sharing (PBS) systems have emerged as a widely accepted technique for improving urban mobility. PBS systems provide shared bicycles for public use, meeting short-distance commuting needs and closing last-mile connectivity gaps. These systems minimize vehicle dependency, increase accessibility, and contribute to environmental conservation by incorporating non-motorized transport (NMT) into urban transportation networks. Globally, cities that have implemented PBS systems have reported reduced traffic jams, better air hygiene, more promotion of a healthy lifestyle, establishing them as an essential component of sustainable urban design.

In India, the notion of PBS is relatively new but gaining traction as cities cope with rising urban mobility difficulties. Mysuru City, noted for its cultural heritage and planned infrastructure, is a pioneer in implementing PBS projects across the country. The city's PBS system, known as "Trin Trin," was created as part of its Smart City ambitions, with the goal of creating a modern and sustainable transportation ecology. Trin Trin, India's first completely automated bicycle sharing program, serves as an example for other cities. Its goal is to promote eco-friendly commuting, alleviate traffic congestion, and foster a riding culture among residents and visitors.

Despite the Trin Trin system's creative approach and potential, its implementation in Mysuru has encountered numerous hurdles. These include difficulties such as encroaching on PBS hubs, insufficient cycling infrastructure, a lack of bicycle safety, and restricted linkage to other forms of urban transportation. The system also suffers from operational inefficiencies, such as sporadic maintenance, limited user knowledge, and insufficient government support for long-term viability. Furthermore, the lack of protected riding lanes and competition for road space with motorized vehicles endanger cyclists, discouraging potential riders.

This study looks at the vital role of PBS systems in addressing urban mobility issues, with a particular emphasis on the Trin Trin system in Mysuru City. It assesses the PBS initiative's planning, execution, and operating dynamics, as well as its integration with Mysuru's urban transportation network and roadway infrastructure. The report also highlights the system's primary difficulties and evaluates its impact on city mobility patterns and environmental sustainability.

This article presents a complete examination of the PBS system using data from institutional stakeholders such as the City Municipal Council and City Development office, the Directorate of City Land Transport (DULT), and user input. The findings emphasize the current framework's strengths and weaknesses, as well as provide insights into options for increasing system efficiency and accessibility.

Finally, this study wants to add to the larger discussion on sustainable urban mobility in Indian cities. By making tangible ideas for improving the Trin Trin system, it hopes to integrate Mysuru's PBS program with the city's long-term urban development goals and global best practices in sustainable mobility. The report underlines the importance of strong legislative frameworks, community engagement, and infrastructure development in realizing PBS systems' full potential for revolutionizing urban transportation.

Review of Literature

In this study Increased bicycle use is critical for a sustainable transportation system. To enhance the modal share of bicycling, transportation and bicycle planning must address multiple concerns. The study found that the bicycle's attraction should be compared to that of the car. If motorized means of transportation are more appealing (e.g., parking rules, pricing, level of service), it may be difficult to persuade people to use bicycles instead of cars. Building proper infrastructure can lead to increased bicycle use. Hampus Ekblad et al (2016) According the study Even in the most bike-friendly communities, a completely separate cycling network from automotive traffic is unrealistic. Urban cycling requires navigating streets with varying levels of safety, convenience, and comfort around the world. To evaluate the quality of bicycle networks, examine many aspects and user preferences. Comprehensive approaches for assessing urban bicycle networks are crucial for modern municipal transportation planning. This paper introduces a multi-objective framework for evaluating and planning bicycle networks by assessing likeability between origin-destination locations and across the network. Homayoun Hamed Moghadam et al (2021) To assess the city's urban cyclability using Information regarding a bicycle rental service. This could enable comparisons of cyclability among cities. This approach can help allocate resources and optimize bicycle networks by describing an cycling of City area an serving as An helpful instrument in arranging and overseeing. Comparing these characteristics for distinct realities can reveal cyclability diversity based on spatial location, user habits, and cycling path management. Nicola-Berloco (2012) This study looks at the effectiveness of urban cycle lanes, focusing on their role in promoting sustainable travel. As cycling is recognized as a "climate-friendly transport mode" in European legislation, the presence of cycle lanes is regarded as an indicator of urban liveability. However, there is a need for a more comprehensive study of bike network quality. The study suggests a novel technique by detecting typological clusters of anomalies (dyscrasias) that prevent safe and enjoyable riding. It also introduces a method for determining the genuine effectiveness of urban cycle lanes, emphasizing their importance in promoting sustainable and healthy urban transportation. RomanoFistola et al (2020) This study investigates the role of cycling infrastructure in reducing vehicle dependence and boosting sustainable transportation. While bicycling rates rose across the board, new cycling infrastructure, such as painted lanes and cycle tracks, were found to notably attract regular cyclists to ride more, particularly for commuting. Streets without specific facilities had higher cycling numbers if they were connected to major attractions. According to the findings, improved cycling infrastructure can encourage cycling, reduce traffic congestion, improve public health, and contribute to a rising bicycle culture in cities and suburbs. Raktim Mitra (2021) This article introduces a revolutionary Bike-sharing the planning of services process that addresses strategic, tactical, and operational decision-making challenges. Prospective study approaches. For Several goal -steps difficulties in Sharing bikes service scheduling are proposed According to four categories: new diversity, realism, integrity, and technology or infrastructures, including Electric bicycles, riding roadways, the independent bikes. Incorporating cycling and other modes of transportation Within a holistic system might pose service planning challenges. Shared bicycles can complement or replace other means of transportation in a network based on their interactions. C.S.Shui et al .(2020) This study examines bicycle suitability criteria used in the United States, with a particular focus on Texas state highways. Suitability assessments normally take into account the most commonly utilized criteria, which are traffic volume (ADT) and the width of outer lanes or shoulders. Some states take into account high vehicle traffic (35%), pavement conditions (25%), and traffic speed or speed limits (15%). Many criteria necessitate additional information that is not typically found in urban transportation databases. The availability of statewide roadway inventory data is critical for determining and maintaining bicycle compatibility on Texas roads. Preliminary findings and recommendations are made to improve these criteria. , Shawn M. Turner et al (1997) This study examines the opportunities and hazards of bicycle use in India, based on recent literature. This study examines the impact of bicycles on livelihoods and the urban poor in India, as well as the trip characteristics of bicyclists, variations within cycling usage in India urban area and the prospective market for bicycles. Premjeet Das Gupta et al (2016) In this study an Urban transportation design has always prioritized motorized cars over greener modes of mobility like cycling. Public policymakers aim a highlight bicycling is an environmentally friendly form of travel due to issues related to ecological pollution, traffic jams, and wellness. risks associated with sedentary lifestyles. G Pesshana et al (2020) Cycling is a low-cost, health-promoting, and ecologically friendly means of transportation that has recently gained popularity in response to rising worries about climate change, pollution, traffic congestion, and obesity. Many cities have implemented policies to promote cycling. More than half of Preveza people use bicycles to go around, noting their affordability. Many people support government incentives for bicycle purchasing. While two-thirds of people believe the bicycle infrastructure is acceptable, they are concerned about safety, particularly among young bikers who may disregard traffic regulations. Adult cyclists stated that automobiles frequently fail to respect them on the road. This study identifies important problems in encouraging cycling, which may be applicable to other cities with similar characteristics. Paraskevi Karanikola et al (2017) In developing countries, bicycles face complex interactions with different types of cars on roads with diverse traffic patterns. A reliable bicycle level of service (BLOS) model is needed to quantify

bicyclists' operational conditions in such situations. This study analyses urban riding settings on 74 street segments and identifies 8 contributing variables, including geometry, traffic, and built environment. New factors include frequent stoppages of public transit and heavy traffic flow on driveways. Modelling revealed a high correlation between identified variables and perceived BLOS ratings based on perception questionnaires. Kumar Beura et al (2017)

Bicycling is an efficient and ecological means of transportation for short commutes. Nations of the European such as those of the Netherlands, Germany and Denmark. lead the Global a bicycling While travelling. It accomplished that by establishing Reliable an cheap bicycle technology is obsolete time. Bicycling has a falling modal share in India. In India, bicycles are primarily used by low-income individuals and students. Developing and improving bicycle-friendly infrastructure is crucial for promoting cycling. Promoting bicycling for shorter commutes in with a growing nation such India, which relies significantly on imported fossil fuels for transportation, can have a long-term economic impact. Samyajit Basua and Vinod Vasudevanb, (2013) The Cycling is a popular form of physical activity and a sustainable mode of transportation. It also has environmental benefits like reducing air pollution and traffic congestion. Built environment factors have been linked to its popularity, and a meta-analysis was conducted to estimate their effects. Yiyang Yang et al (2017) Promoting public transportation and cycling can help reduce air pollution, traffic congestion, and carbon emissions. Shared bicycle systems are excellent at increasing cycling in metropolitan areas, especially when combined with public transportation. We model a shared bike system and analyze its impact on public transport travel time. Our findings suggest that bicycle sharing systems can enhance the competitiveness and appeal of sustainable modes of urban transportation, promoting sustainable daily mobility in cities. Sakari Jäppinen et al (2013) The Using bicycles for public transit promotes sustainable urban mobility and enhances quality of life. This study aims to create a technique for evaluating the "best" cycling routes that interact with public transportation, taking into account individual cyclist preferences. The proposed method was validated using a case study from Mussurunga Station in Salvador, Bahia, Brazil. The study revealed that cyclists prioritize safety while choosing their paths. Silva Ana et al (2014) The public bicycle sharing system (PBSS) is a popular urban transportation option that reduces Contamination with congestion. The following study analyzes a Bike Servies with There are two sorts of platforms. The initial subcategory includes Docking Platform of Bike where customer able hire and Deliver to the bikes. A new user can rent either bike. upon arrival.an second type includes Docking Stations close commercial areas, archaeological sites, an another destinations where wherever customers as well as holidaymakers are able to rest and visit. These points of interest allow users to park their rented bicycles for a limited time before returning them to their destination stations. Behzad Maleki Vishkaei et al (2020) Public bicycle systems, as an alternative to established modes of transportation, require efficient management and a focus on sustainability. A approach is proposed to model the perceived quality of systems by users, taking into account systematic fluctuations. Ordered Probit models measure how adjustments to specific attributes affect overall service quality perception. Improving these two parameters has the biggest impact on the perceived quality of public bike riders. Safety and Information. Maria Bordagaray et al (2012) The Bicycling is the most efficient, environmentally friendly, and sustainable means of travelling for short journeys.

Cities with low bicycling rates are Encourage bicycling is an option means modes of travel. Bicycle sharing a gaining popularity as people see the value of active, non-motorized ways of transportation. The Public Bicycle Sharing (PBS) system provides flexible public transportation options. Roshniben K. Pate (2021) Cycling provides various advantages, including less traffic congestion, lower carbon emissions, and better physical health by battling sedentary lifestyle disorders such as diabetes. Public Bicycle Share Schemes (PBSS) are rapidly increasing in many places to encourage cycling. However, the rapid expansion of PBSS has made it difficult to properly examine and measure their broad consequences. To ensure the success of these schemes, it is critical to create an evaluation system that identifies key success criteria and allows for fair comparisons across different programs and time frames. This would aid in the effective understanding of PBSS's role in urban transportation networks. Fishman et al (2011) To encourage bicycling, cities all over the world have created public bicycle sharing schemes. The effect Bike system on Cycling among people. We used a internet a group to survey A based on populations survey involving Vancouver's inhabitants has been obtained multiple times. Vancouver et al (2018) The Fast development of Bike system has led to Incomplete reviews. of their effects on riding Population-level. This raises questions about Should such System are available result in Gross improvements in health or simply Encourage them who They usually bike that were energetically engaged. Thus study aimed to see if PBSPs led to increased Bicycling to Urban throughout the Canada and America. Kata Hosford et al (2019) This paper provides a the past Background of the Community Bike Rental Scheme, beginning in Amsterdam in 1965 and progressing to new generation of technologies are present in nations that are both developed and developing. The PBS initiative has been implemented in the majority of Indian cities as part of the smart city mission. The performance evaluation of existing PBS systems on standards of excellence. provides valuable study insights Bike in India City. Thus, Threshold study Omnibus can assist Designers along with Scholars in identifying futures opportunities in the context of Changes in the environment. In conclusion, this study provides valuable insights into the PBS system for transportation planners. Samir Patel (2019) The concept of biker as a road user was introduced very lately in the Municipal Traffic Regulations. Perhaps the correct cycling infrastructure could help with safety, crime, and economic development. Six Morelia groups ranked and commented on images of bicycle surroundings in bicycle-friendly countries to determine the finest infrastructure. Bike lanes with solid barriers are related with increased safety, lower crime rates, and economic development. Ines Alvenao et al (2017) Recent sustainability research indicates that the Product-Service System (PSS) model can assist reduce environmental consequences by dematerializing the business. Mobility, particularly in metropolitan settings, is an important factor in improving citizens' quality of life and lowering pollution. This study looks at Public Use Bicycle (PUB) systems in six European nations via a PSS lens, concentrating on the integration of products, services, and business models. The findings show that PUB systems can enhance public transportation usage while reducing the environmental impact of personal mobility. The design of

sustainable PUB systems is dependent on how products, services, and business environments are blended and structured. Izmir et al (2008) This study investigated the integration of bicycles an transportation systems in Brazilian Greater cities, with an emphasis on Belem, Recife, Salvador, and Belo Horizonte. The study used structured questionnaires and surveys with cyclists, commuters, and homes to better understand why, who, and how to incorporate bicycles into public transportation systems. The results showed that the majority of respondents are willing to utilize bicycles as a feeder mode to buses or rail, though Belo Horizonte had less prospective consumers. Common hurdles highlighted in cities include a lack of bike infrastructure, parking facilities, road safety, security, and inadequate road maintenance. These difficulties must be addressed in public transportation policies to promote bicycle use. Maisa S. G et al (2012) The Bike-sharing systems (BSSs) provide an environmentally benign, low-carbon mode of transportation, making them perfect for short excursions in cities. These technologies assist minimize traffic congestion, air pollution, and noise, resulting in greener cities. However, issues like as station placement planning, system simulation, user demand forecasts, and bicycle relocation have been extensively studied. This Special Issue addresses these difficulties by offering fresh research on both traditional and innovative BSSs, with the goal of improving their efficiency and attractiveness. Thirteen selected papers are summarized, with a focus on increasing competitiveness and promoting sustainable mobility through enhanced BSS management. Leonardo Caggiani, and Rosalia Camporeale,(2021).

Public Bicycle Sharing in Mysore City

The Mysore City a world-renowned history city, the cleanest city in India, and the cultural centre of Karnataka in southern India, offers a public bike share system. Mysore is uniquely qualified to benefit from such a system because to its lifestyle, history, geography, and environmentally friendly nature.

public bike share system is a Karnataka Govt initiative. partially backed up by the Global Fund.

under the International Environmental Agency Award. The Directorate of Urban Land Transport and Mysore City Corporation are responsible for project planning and implementation. A civic government and its collaborators own and operate bicycles for short-term rental to both local inhabitants and visitors. The system allows riders to borrow bicycles from any 'docking station' in the city and return them at their convenience

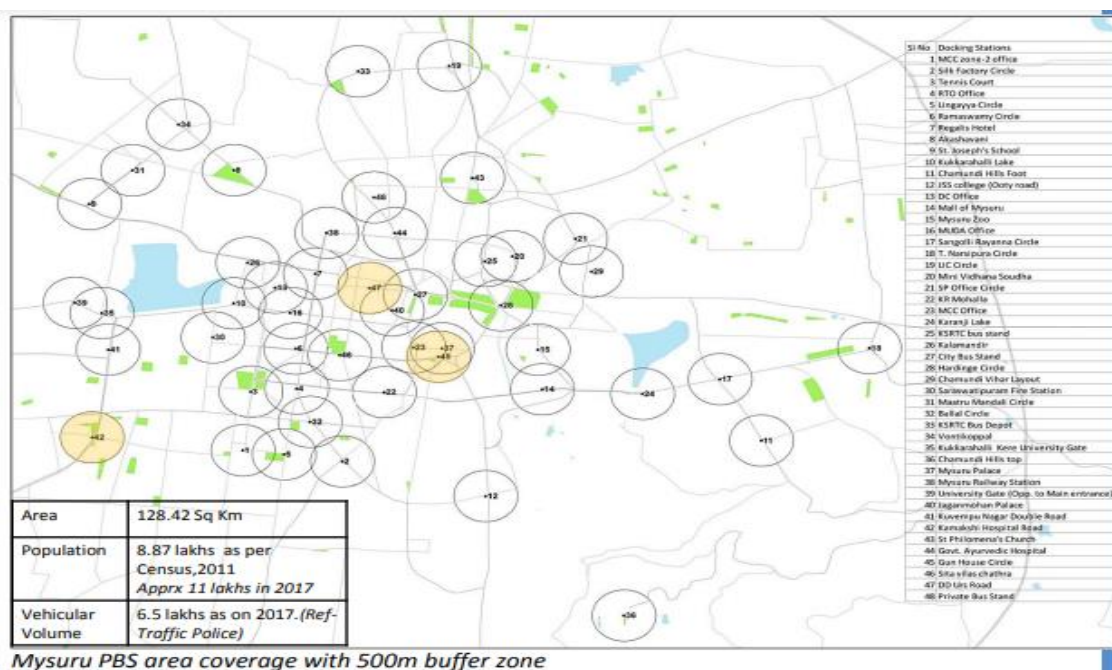
Green Wheel Ride, a Mysuru-based firm that manufactures eco-friendly battery-operated bicycles and promotes cycling culture, will implement and Mysuru's PBS Bike. The Mysore city is largest Town in State, is a historic city with various palaces and old monuments.

Tourism is a major source of revenue for the city.

In 2010, Mysore received 3.15 million tourists. The Mysore Palace, located in the middle of the city, is a popular tourist destination in India. Mysore Dasara, a 10-day celebration, is one of the most popular in India. The festival concludes with an extravagant procession through the city centre, attracting a global audience. The Department of City Transport by Land, State of Karnataka India has conducted a feasibility study for a public bicycle plan in Mysore, an important metropolis for the state. The Bicycle sharing is a popular tool for promoting cycling in cities. Bike distributing, also called rental bikes, bicycle rental, or public Bike program, allows people to ride bicycles on-demand without owning one. Bike sharing is a sustainable mode of public transportation that offers short-term access to bicycles (Shaheen, S. et al. 2010). Bikes are typically rented or borrowed from specified locations in cities.

Depending on the system, bikes can be used and returned to a predetermined location. Bicycle sharing has been operating for 35 years and has spread across four continents: Europe, Australasia, North America, and South America. Currently, 100 bike sharing programs operate in 125 cities worldwide, with over 139,300 bicycles on four continents. Bicycle sharing schemes have evolved through three generations, according to the literature. In the 1960s, the first-generation system offered free bicycles to be used once and then returned to the next user. Unfortunately, this led to widespread bicycle theft. During the beginning of the 1990s, it was launched of dedicated bicycle stations an coin-deposit locks improved the reliability of bike sharing systems.

This strategy was effective and led to the latest version of bike-sharing services sees more robberies that before. addressed the challenges of previous programs. Success is attributed to technological advancements such as GPS tracking, improved bicycle locking, electronic booking, and automated payment methods, as well as enhanced management and organizational structures. There's a regulation. and papers accessible Regarding developing operations implementing Bike program, together globally and a India. ITDP released an outline to designing bicycle sharing networks. The Sustainability City Mobility within the Ministry of Housing and, has released standards on Transport -Oriented Growth, the use of NMT and Bike system the Ministry of Housing and has produced an toolset for bike program in India town.



Source MCC: Docking Stations Map 1

Definition of Bike share Scheme

A Bike share scheme A public bicycle system (PBS) is a shared transportation service that provides persons with bicycles for short-term use, either an fee cheap and Bicycle share typically able users rent a bicycle via one "dock" then replace its contents. other within an program. Docks are unique racks for bikes that secure the bicycle and can within be released with Computerized monitoring. The person using it submits Purchase knowledge, then the system enters. The Bicycle. To return a Bicycle, place the ship is situated on the docking Station and lock Its already position. Certain systems are dockless. a lot cities, including Dubai, New York, Montreal, and Barcelona, now offer both mechanical and electric bike share systems. As defined by the International Resource Institute (WRI), PBS is a versatile public transportation service that necessitates the establishment of a dense network of cycle rental stations. A study can assist cities improve the performance of their PBS systems by addressing existing difficulties. This study can help new cities adopt PBS successfully by learning from the experiences of other cities and identifying best practices.

Objectives of the Research

This study is guided by the following specific objectives:

1. To evaluate how the Public Bicycle Sharing System (PBSS) in Mysuru contributes to sustainable urban mobility.
2. The PBSS's operational efficacy and user satisfaction will be assessed.
3. To evaluate the geographical distribution and accessibility of PBS stations using Geographic Information System (GIS) methodologies.
4. To determine the obstacles and difficulties in incorporating the PBSS with other public transit options currently in use.
5. To suggest tactical ways to improve overall system performance and PBS station placement.
6. To provide an approach to PBSS enhancement that supports and adheres to sustainable urban planning concepts.

Need for Study

1. To promoting the notion and culture of cycling in Mysuru city.
2. With modern vehicles consuming fossil fuels and emitting pollutants into the environment, public transportation is essential for improving health and promoting clean air.
3. Using a bicycle for transportation can promote weight loss and general wellness.
4. Bicycling is the most effective technique to enhance physical health and reduce obesity risk. Bicycles provide numerous benefits to humans. Cycling appears to be a safer, healthier, and more convenient alternative to driving.

5. Bicycles are a convenient and environmentally beneficial means of transportation.
6. Bicycles decrease traffic jams and do not emit any pollutants. Bicycles have essentially no maintenance costs. Bicycling is the most environmentally friendly way of transportation.

Bicycles are an effective mode of transportation for combating traffic and reducing environmental damage. As the number of private cars and other modes of transportation increases, many cities are experiencing traffic jams.

Bicycle sharing created operating for more than 35 years and had spread to 4th continents: South America and Europe, Australia, North Currently, there are almost 100 bike sharing programs in 125 locations worldwide, with over 139,300 bicycles across four continents and 45 initiatives planned in 22 countries by 2010.

Methodology

The Trin Trin Public Bicycle Sharing System (PBSS) operational region was the main subject of this study, which was carried out under the authority of the Mysore City Corporation (MCC). The first city in India to adopt a PBSS was Mysuru, a cultural and historic city in the state of Karnataka. 52 docking stations and 450 bicycles make up the present system, which is positioned to service important monuments, transportation hubs, and mixed-use zones.

Data Collection

Used both primary and secondary data sources, a mixed-methods approach was used. Primary Data Collection: To collect information on user demographics and travel habits, a user survey was created. Google Forms was used to administer the survey digitally in order to guarantee a large audience and effective data collection. The research approach also included personal visits to each of the 52 docking stations for on-ground observation and survey promotion in order to ensure thorough spatial coverage and engage users with different levels of digital access.

Sample Size: The initial goal of 200 samples was surpassed by the 250 responses that were gathered. Sampling Method: A mix of convenience and stratified sampling was applied. The stratification was based on the placement of each docking station to guarantee that every part of the city was covered. Users were contacted in a convenient manner to complete the survey at each site. Secondary Data Collection: In order to do spatial analysis and put the study in perspective, secondary data was essential.

Among the principal sources were:

MUDA, the Mysore Urban Development Authority: for spatial data and planned plans pertaining to the locations of PBSS hubs.

Mysore City Corporation (MCC) and ULT Urban Land Transportation: For studies evaluating the Trin Trin system, city conurbation statistics, and municipal standards. MUDA, ULT, and MCC: For the most recent geographic information on road networks, transit nodes, and other transportation-related infrastructure.

Methods of Spatial Analysis: The effectiveness and reach of the docking stations were assessed using Geographic Information System (GIS) techniques.

Buffer Analysis: To evaluate walking accessibility and pinpoint coverage gaps close to significant landmarks, catchment areas of 300 and 500 meters were created around each station. Service Area Model: This model took into consideration barriers and connection while calculating actual service areas based on walking and bicycling travel times using the city's road network.

Analysis of Networks: This method was applied to study the network's overall distribution, calculate the quickest routes to important destinations, and look at station connection. Identification of Landmarks: Within the GIS context, significant activity centers, transportation hubs, educational institutions, and tourism attractions were located and geotagged. Assessing the PBSS network's accessibility and proximity to important trip generators and attractions across Mysuru City was crucial.

Research Method

A mixed-methods research methodology is used in this study to thoroughly examine how the Public Bicycle Sharing System (PBSS) is integrated into Mysuru's urban transportation system. With an emphasis on the system's function in fostering sustainable mobility, operational efficiency, and spatial accessibility, the study aims to produce both quantitative and qualitative insights. The main objective is to assess how Trin Trin, the PBSS, meets short-trip mobility needs and helps to improve multi-modal connectivity, reduce traffic congestion, and cut carbon emissions. The project intends to promote Mysuru's sustainable urban development goals by creating evidence-based methods for system optimization and seamless integration with other forms of transportation.

The goal of this Research is to investigate the integration of Public Bike Share (PBS) services with current transportation services and roadway infrastructure in Mysore City, with a special emphasis on how PBS can address short-trip mobility needs and contribute to sustainable urban transportation. The study's goal is to assess the role of PBS in reducing traffic congestion, lowering carbon emissions, and increasing overall mobility, as well as to determine how well the system can be integrated into Mysore's transportation network, which includes public transportation, private vehicle movements, and pedestrian infrastructure.

Data was acquired from a variety of government agencies, including Mysore City Municipality and Mysore City Development Office, Urban Land Transport, RTO (Regional Transport Office), Public Bicycle Offices, and Traffic Offices. These sources shed light on contemporary urban transportation trends, such as the location of PBS hubs, the effectiveness and safety of bicycle routes, and the overall integration of PBS into the city's infrastructure.

This study examines various aspects, including the proximity and accessibility of PBS cycling hubs to significant public transportation connections, the quantity of bicycle-friendly roadway infrastructure, and the total percentage of PBS utilization by residents and visitors. The data is used to evaluate the PBS system's present difficulties, such as infrastructure shortages, safety concerns, and poor utilization rates. The study will give ideas for boosting PBS service consumption and correcting identified concerns by studying city public transportation operations, private car movements, and pedestrian routes. This will address potential strategies for integrating PBS with other forms of transportation, optimizing the location of PBS hubs, improving biker safety, and marketing PBS as a viable short-distance commuting option.

The overarching goal is to develop a more accessible, safe, and convenient PBS system that supports Mysore City's aspirations for sustainable urban mobility while reducing reliance on private vehicles. The end findings will provide practical ideas to improve PBS services, with the potential to reduce carbon emissions, traffic congestion, and provide more sustainable transportation options in Mysore.

Research Question

1. How often do you utilize the PBS Trin Trin system?
2. What is your main way of getting around on a daily basis?
3. What is the approximate distance between your home and the closest PBS hub?
4. Using the PBS, how far have you ever traveled in a single trip?
5. How quickly did you start riding the bikes on a regular basis after registering?
6. How easy is it for you to rent, return, and pay using the Trin Trin system?
7. How simple was it for you to learn how to use the PBS system?
8. How would you rank the smart card system's dependability and efficiency?
9. In your opinion, is it safe to use the PBS system after dark?
10. What difficulties have you encountered when riding a bicycle in the city?
11. How likely are you to use PBS for first/last-mile connectivity on days when you take public transportation?
12. What kind of payment schedule do you follow?
13. How much do you favor the PBS system's installation and growth in Mysuru?

Problems Statement

The Public Bike Share (PBS) system in Mysuru City confronts various problems that limit its efficacy and potential growth. The encroachment of PBS hubs and unauthorized parking by motor vehicles impede bicycles' accessibility. Additionally, poor surface quality, insufficient maintenance of cycle tracks, and a lack of consistency in cycling infrastructure make riding unpleasant and dangerous. Low levels of street illumination around the hubs further jeopardize safety, particularly at night. The system also has software connectivity concerns, making it difficult for users to find bicycles during busy hours. Many PBS hubs are not conveniently positioned near public transportation stops, which limits their usefulness as a last-mile connectivity option.

Poor infrastructure at the hubs, such as a lack of shelter and insufficient upkeep, exacerbates the situation. Furthermore, numerous hubs are located on small roads, posing increased safety risks. The absence of safe cycling conditions around the city, as well as a dearth of creative cycling schemes, such as enhanced bicycle-sharing programs, stifle cycling culture's growth. Social beliefs that favor motorized vehicles over cycling contribute to the reduction in PBS use. Addressing these issues is vital to the continued existence of such PBS system and the promotion of cycling as a sustainable method of transportation in Mysuru City.

Study Area

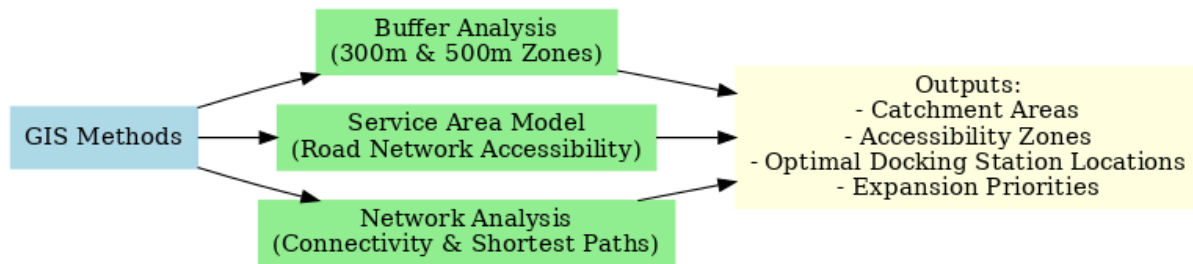
According to a 2010 survey, Mysore City, located in Karnataka, is the second cleanest in India. Mysore City served as the capital of the former princely state of Mysore. Mysore City is the 2nd biggest town in the state and serves as the headquarters for the Mysore district. It is located in the southernmost direction. The state is located 130 km south-west of Bangalore and has good rail and road connectivity. The research area for the PBS public in Mysore city and its inner ring road.

Locating Mysuru City's Public Bicycle Sharing Stations Using GIS Techniques A study was carried out to assess the Trin Trin Public Bicycle Sharing System's (PBSS) coverage and placement inside the boundaries of Mysore City Corporation. Utilizing spatial analytical techniques based on Geographic Information System (GIS), the study evaluated the effectiveness of the current network of 450 bicycles and 52 docking stations, which are positioned to service important landmarks, transportation hubs, and mixed-use areas.

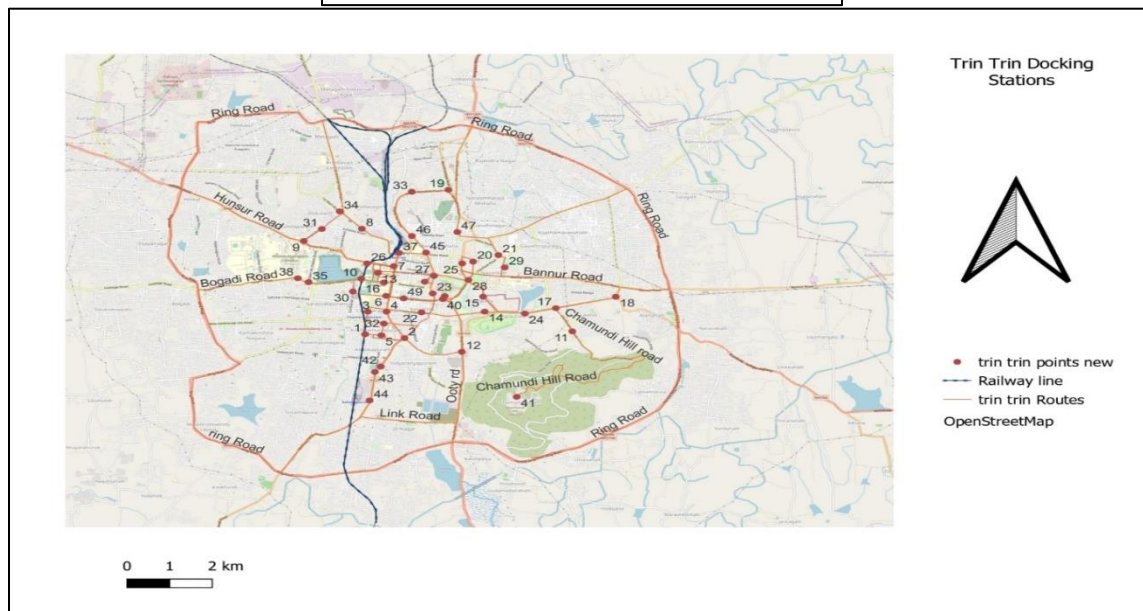
Three essential GIS techniques were used in the analysis:

1. Analysis of Buffers: To identify walking catchment areas, fixed-distance zones (300 and 500 meters) were created around each station. This made it easier to spot service gaps and assess how close important locations were, such as marketplaces, schools, and transit hubs.
2. Model of the Service Area: Compared to simple buffers, this model provided a more accurate assessment of accessibility by utilizing the city's road network. It determined the region accessible from each station within a given walking or bike time by taking into consideration actual connections, obstacles, and routes.
3. Analysis of Networks: This approach looked at the network's overall efficiency and connectivity across all docking stations. In order to provide insights for the best hub location and future expansion, it required determining the shortest routes between stations, determining which stations were closest to significant landmarks, and analyzing the overall distribution.

The combined results verified that Mysuru's main activity zones and heritage core are adequately covered by the current PBSS distribution. To increase fairness and system coverage, a staged expansion into outlying neighbourhoods is necessary, as the investigation also identified underserved areas with restricted access.



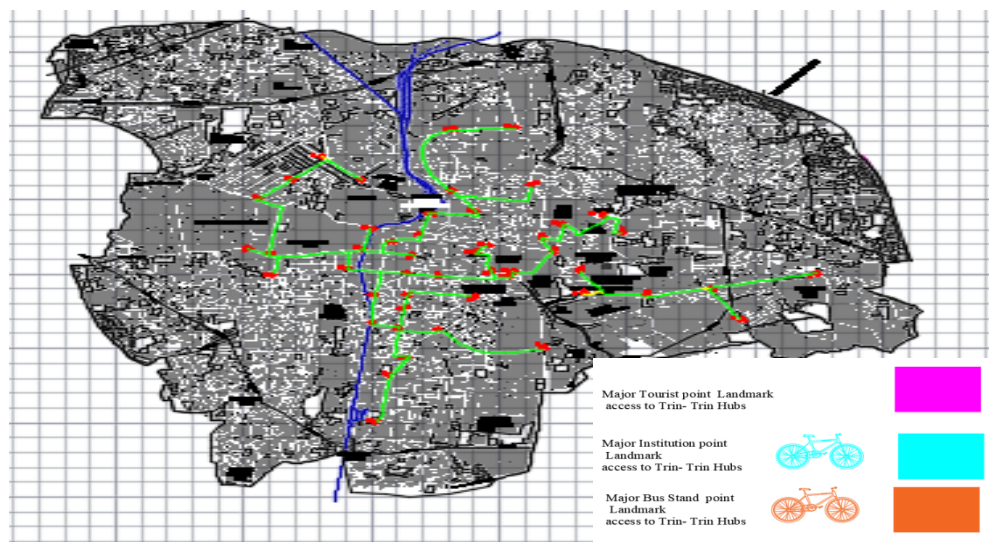
Source: Author's study flowchart



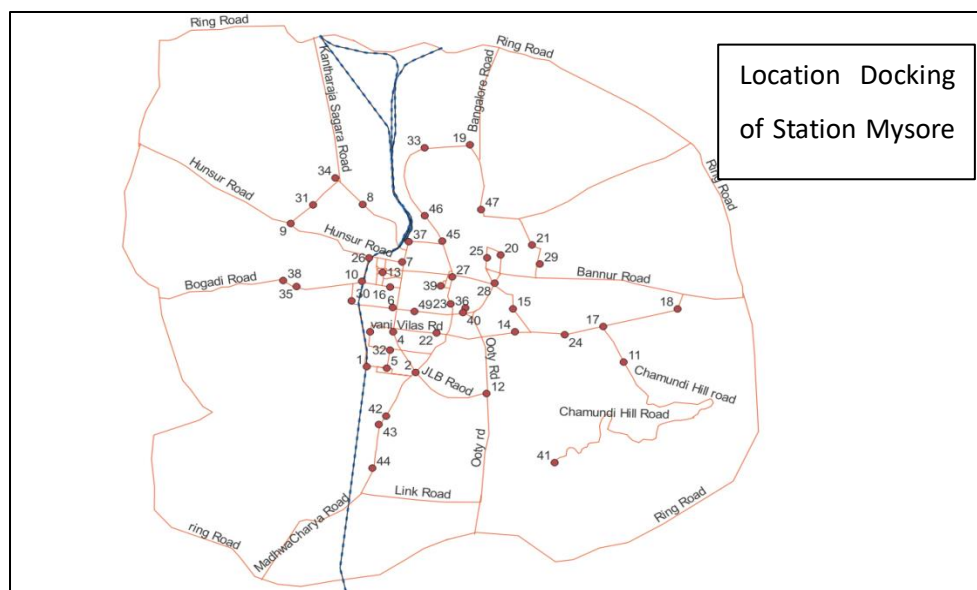
Source: Author's, Field Survey for study area and GIS Mapping of Docking Station Map 2

Station locations of PBS in the City of Mysore

Installations ought to be situated nearby major sites for travel, including transportation routers, places of interest, library resources, educational institutions, marketplaces, and retail centres, as well as in crucial residential neighbourhoods. In the lack of a single major structure, stations should be located near junctions to serve origins and destinations in many directions. The implementing agency ought to additionally plan and design the coverage area and station placements, utilizing aid from external specialists. In addition to using field poll responses to determine potential station locations, the planning team might seek user suggestions.



Source: Author's Study, Docking Station of PBS Map 4

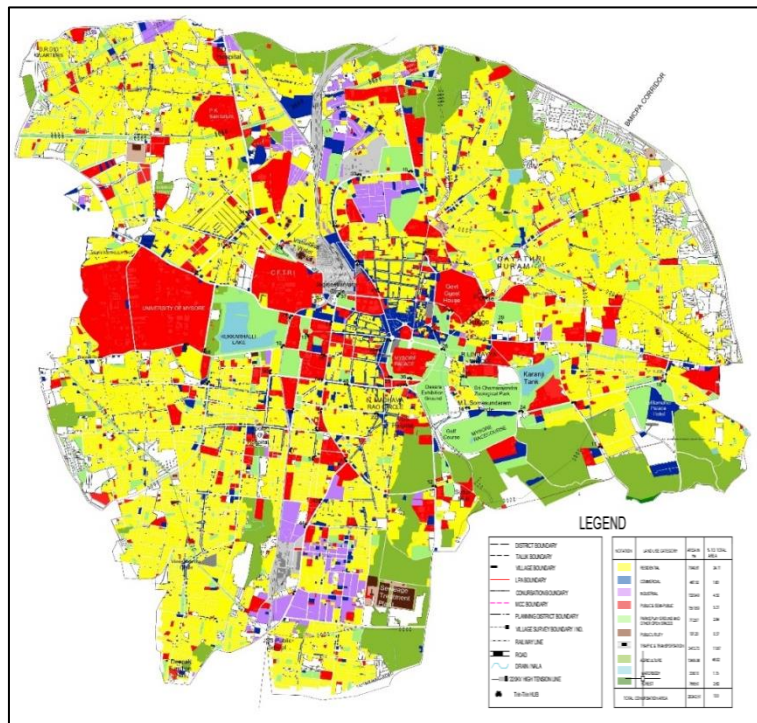


Source: Author's Study, Docking Station of PBS Map

Sl. No.	Location	Sl. No.	Location	Sl. No.	Location
1	St. Philomena's Church	21	Infosys	41	Govt. Ayurvedic Hospital
2	Mysore Zoo	22	Near GRS Ring Road Circle	42	Private Bus Stand
3	Race Course	23	GRS	43	KSRTC Bus Depot
4	Mall of Mysore	24	St. Joseph's School	44	LIC Circle
5	Mysore Railway Station	25	Adichunchanagiri School	45	Police Academy
6	Railway Museum	26	ISKON	46	Chamundi Vihar Layout
7	Lalith Mahal Hotel	27	Ganesha Sachinanda Ashram	47	Sandesh The Prince
8	Kukkarahalli Lake	28	Chamundi Hills (Foot)	48	KR Mohalla
9	Kalamandir	29	Chamundi Hills (Top)	49	Court Road Park
10	Karanji Lake	30	Nandi Temple	50	KG Koppal Circle
11	Wax Museum	31	Hardlinge Circle	51	Saraswatipuram Fire Station
12	Jagmohan Palace	32	Directorate of Tourism	52	Ramaswamy Circle
13	Crawford Hall	33	Dalavay Lake		
14	KSRTC Bus Stand	34	Mysore Airport		
15	City Bus Stand	35	Brindavan		
16	Mysore Palace	36	Balmuri		
17	Indira Gandhi Museum	37	Ranganathittu Bird Sanctuary		
18	Regalis Hotel	38	Shrirangapatna Temple		
19	Vontikoppal	39	Tippu Summer Palace		
20	Akashvani	40	Sangam		

Source MCC: List of Docking Stations Map in the city

Major Important Landmark Docking Station of Pbs



Major Tourist point Landmark
access to Trin- Trin Hubs



Major Institution point
Landmark
access to Trin- Trin Hubs



Major Bus Stand point
Landmark
access to Trin- Trin Hubs



Major Tourist point Landmark access Trin- Trin Hubs:

36.Mysuru Palace,37.
Kukkarahalli Lake Gate,15.Mysuru Zoo,13.DC
Office,8.Akashvani,29.Chamundi Vihar Stadium,47.St.
Philomena's Church,17.Sangolli Rayanna Circle,24.Karanji Lake
43.Sandal wood factory

Major Institution point Landmark access to Trin- Trin Hubs:

35.University Campus Road,38.Gangotri Main
Gate,6.Ramaswamy Circle,16.MUDA Office,30.Fire
Station,48.Seetha Vilas Chatra,42.N.I.E College

Major Bus Stand point Landmark access to Trin- Trin Hubs:

25.KSRTC Bus Stand,27.City Bus Stand (K.R
Circle),30.Fire Station,6.Ramaswamy Circle,19.LIC
Circle,38.Gangotri Main Gate,46.Private Bus Stand

Source: Author's Study, Docking Station of PBS at Major Important Landmark Map 5

The components of Bike

All Bike systems have specific parts that must be connected in order for Bike to function properly, several of the most essential elements of Bike Sharing System are listed below:



Source: Author's Study, Docking Station (Figure 1)

1. Bicycles
2. Bicycle docking station
3. Redistribution vehicles
4. Maintenance depot
5. Benefits of PBS System

Key features of PBS:

Mysuru City's Public Bicycle Sharing (PBS) system is developed with numerous essential characteristics to assure accessibility, security, and efficiency. It consists of a dense network of stations that are deliberately spaced around 300 meters apart, allowing users to easily access the coverage area. To deter theft, the bicycles are outfitted with carefully designed parts and sizes that make them less appealing to unlawful usage. The system also uses completely automated docking stations with innovative locking mechanisms, allowing customers to check bikes in and out without the need for on-site workers. Each bicycle is equipped with electronic tags that trace its movement and record where it is picked up and returned. This feature is tied to the user's identification, which increases accountability and security. To assure availability, a redistribution mechanism distributes bicycles and empty docking spots equitably throughout stations. Advanced IT systems provide real-time monitoring by tracking station occupancy rates and providing live updates to users via a variety of platforms including mobile applications, internet, and on-site terminals. The PBS system uses a price structure that encourages short journeys, maximizing the number of trips per bicycle each day and increasing operational efficiency. The proposed scheme contains 456 bicycles scattered over at least 48 stations to promote non-polluting and health-conscious commuting options. The PBS system connects smoothly with other modes of urban transportation by addressing last-mile connectivity issues, contributing to a more sustainable and efficient urban mobility framework. Through these features, the PBS system provides a practical and environmentally beneficial answer for Mysuru City's mobility demands.

Bicycle systems had to developed and providing without Charge bikes to offering technology- prompted rentals. The system's primary goal remains the same: to pick up, use, and return a bicycle. Bike sharing provides a point-to-multi means an transportation. Bike rental is an inexpensive and environmentally friendly option and environmentally pleasant means an transportation that allows commuters to use modern bikes. PBS docking stations are typically near existing bus stops or Moderate visible transportation improve the final kilometres connection. Bike sharing is a crucial component a cities' effort to promote sustainable mobility. Bicycle The bicycle sharing system promotes sustainable transportation, reducing traffic congestion, emissions, and parking demand. Additionally, the framework would educate fresh

customer on the well-being and wellness advantages of biking. Modern can help create safer and more comfortable streets for pedestrians and cyclists. Stations near key monuments will prioritize advertisement, culturally, academic managerial, homes as well as tourism destinations at the town. Bike Sharing provides both physical and tangible advantages. on an Personal and the community level. A excellent craftsmanship and inexpensive bike system, together a complementary the concept of NMT network, can provide sustainable mobility mood to in every aspect for society. Prospective results are categorized into mobility, environmental, social, and economical benefits.

Payment plan of Bike Sharing System on a monthly basis or once a quarter, and annual pass

Consumers may decide to sign up to the system and become members. Not all registered users must become members. Members have a limitless number of bike rental for trips of halves an hour or shorter during the duration of their participation. The system provides the following types of passes.

Plan Name	Monthly Member Plan
Validity	30 Days
Security Fee	250 Rs
Processing Fee	50 Rs
Usage Fee	60 Rs
Description	Membership requires visit to registration centres to complete the registration. Access to cycles is through smart cards.
Long Term	Pay Now
Plan Name	Quarterly Plan
Validity	90 Days
Security Fee	250 Rs
Processing Fee	50 Rs
Usage Fee	180 Rs
Description	Membership requires visit to registration centres to complete the registration. Access to cycles is through smart cards.

Mobility Benefits

1. PBS improves first and last mile connection, extending the city's transportation infrastructure from transit stations to destinations. PBS improves Accessibility along with are linked. cost-effective Invest to the cities in contrast to expanding accessible transportation or offer auxiliary supplies.
2. Minimize Insufficient space on Regional Mobility: Bike provides Another option for cutting excursions which could possibly necessitate transportation.
3. Increase area effectiveness: Bikes are small and lightweight, taking a shorter a tenth of the space of a single car, reducing parking issues in cities.
4. Increase biking mode-share: PBS provides a simple entry point for those who are hesitant to acquire a Bike Because of protection concerns like A crime violence as well as limited area options.
5. Replace motorized transportation with non-motorized transportation (NMT) options, such as public bus service (PBS), for short excursions that would otherwise require private automobiles

Environmental Benefits

1. Bicycles are a non-polluting, energy-efficient, and fuel-free means of transportation that contributes to a cleaner urban environment. Bicycle sharing provides an alternate means of conveyance for short travel. Two-stroke automobiles idle in congestion. motors, low fuel economy vehicles, and diesel buses all contribute to health concerns, World Environmental Change, and poor quality of the air in the urban area.
2. Decrease overcrowding and enhance the Quality of air: PBS schemes reduce traffic congestion, leading to better air quality in the city. Bicycling has significant environmental benefits by reducing the use of fossil fuels and pollution.

Social Benefits

1. Enhance public space quality by replacing motorized vehicles with bicycles. This creates more room for parks, encourages social interaction, and fosters a sense of community.
2. Improve people's health: Bicycle sharing not only reduces pollution but also promotes longevity, reduces obesity and heart disease, and improves fitness.
3. PBS systems can shift the perception of bicycle as a low-income mode of transportation through effective branding and awareness efforts in cities.

Financial Benefits

1. Bicycle sharing reduces transportation costs for families by eliminating expenses such as fuel consumption, maintenance, parking, and license registration.
2. Affordability: PBS provides cost-effective independent travel options compared to other specialized vehicles. Bicycle share systems typically need a membership fee and provide free use to bicycles for short trips of up to 30 minutes.

3. Job Creation: Bicycle sharing schemes provide full-time jobs locally by requiring workers to maintain and redistribute bicycles, as well as manage the central computer network.

Advantages of Bicycle Sharing Schemes

Bike sharing is part of the city's promotion of cycling, therefore the benefits of both are likely to overlap.

1. Bike sharing programs provide a clean and low-carbon transportation system in cities, leading to cleaner air, a healthier lifestyle, and potential modal change.
2. PBS The reason Bike sharing systems offer greater cost-effectiveness and flexibility than traditional urban transportation assets such as building extra highways, flyovers, and parking lots, resulting in increased road space for vehicles.
3. Compared to other motorized feeder systems such as shuttles, bike sharing has reduced implementation and operational costs. Additionally, it can promote Transit services usage by operate equally successful providers.
4. The PBS Promotes low-carbon transportation for short excursions, particularly in developing cities.
5. Additional benefits include increased personal wellness, decreased transportation Congestion, consumption of fuel, pollution of the environment and noise, and Town space preservation.

Conclusion

The Public bicycle sharing systems (PBS) offer numerous benefits, including improved health, less pollution, and reduced traffic congestion in Mysore. It indicates a high level of public interest. The current study confirms that universities may promote active communication by upgrading bicycle infrastructure and programs. Promoting cycling. Promoting cycling to university through PBS may be an effective public health approach for improving physical activity and minimizing weight gain among both male and female students. As environmental concerns grow, sharing systems are becoming increasingly popular. The study workies techniques are deployed globally to analyse and optimize bicycle stations using service placement models, specifically the Services Area Model.

Furthermore, cutting-edge techniques to optimize system operations and design enable the global expansion of PBSS. Cities can determine the best places for docking stations by using methods like Geographic Information System (GIS)-based spatial analysis and service placement models, especially the Service Area Model. By placing stations in close proximity to residential areas, business centers, and public transportation hubs, these strategies increase accessibility, reduce operating expenses, and boost customer happiness.

The report does, however, also draw attention to some of Mysuru's PBSS's current drawbacks, such as its sparse station coverage, poor integration with public transit, and safety issues with its bicycle infrastructure. In order to overcome these obstacles, urban planners, local government representatives, and transportation organizations must work together to increase coverage, improve intermodal connectivity, and put in place all-encompassing safety measures like bike lanes and traffic-calming techniques.

In conclusion, other Indian cities looking to adopt inclusive and sustainable mobility solutions can learn a lot from Mysuru's PBSS. PBSS can develop into a standard part of urban transportation systems by fusing technology, community involvement, and governmental backing. Achieving climate resilience, lowering reliance on fossil fuels, and creating healthier and more habitable cities will all depend on the incorporation of such systems into long-term urban planning frameworks.

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