

Analyzing TOD Framework Parameter to Achieve Last Mile Connectivity of IT Park Corridor in the Case of Hinjewadi Area

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Abstract: - The abstract should provide a brief overview of the contents of your paper, with sufficient detail to help readers decide this study focuses on evaluating the transit-oriented development (TOD) parameters and addressing the crucial aspect of last-mile connectivity in the IT park corridor. Last-mile connectivity plays a pivotal role in facilitating seamless and efficient travel from metro transit stations to final destinations. By assessing the TOD framework parameters and their impact on last-mile connectivity in the context of the IT area, this study proposes strategies to implement effective transit-oriented development approaches to mitigate traffic challenges in the rapidly expanding IT park corridor. Inadequate public transportation services have resulted in a shift towards private vehicle usage, which adversely affects urban mobility. To address this issue, the study suggests enhancing public transportation services and developing last-mile connectivity options to improve accessibility within the Hinjewadi area of Pune, India. The study uses surveys, authority interviews, and spatial analysis techniques to collect and analyse relevant data, contributing to the overall research findings. The primary objective is to study the existing transit facilities in the selected IT park area and propose a comprehensive last-mile connectivity framework within the study area. Furthermore, the study aims to provide recommendations and a suitable plan for achieving effective last-mile connectivity, taking the unique requirements of the IT area.

Key Words: — *Last mile connectivity, IT area, TOD Parameter's, Feeder system, public transport.*

I. INTRODUCTION

Urban regions across the world are experiencing rapid urbanization and, consequently, facing numerous challenges due to the growing population. One of the critical areas affected by this urbanization is transportation infrastructure and services. The development of urban areas heavily relies on transportation, and government entities are introducing various transportation options to enhance connectivity between origins and destinations.

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These options include bus rapid transit (BRT), metro systems, transportation hubs, bus facilities, and integrated public transport networks that encompass feeder routes. This research paper focuses on the crucial aspect of first- and last-mile connectivity in the metro feeder system, which plays a significant role in facilitating convenient travel for commuters. While authorities often propose and integrate alternative transport modes into existing infrastructure, there is a need to go beyond mere integration and focus on improving the infrastructure itself.

Importance of effective last-mile connectivity in transportation systems, especially in emerging urban centers. Focus on expanding public transportation reach but neglecting passenger accessibility and seamless station connections. Three main modes of accessing stations: walking, buses, and paratransit. Integrating modes for the comprehensive transportation system, addressing traffic congestion, and promoting public transportation. Feeder services like buses are crucial for transporting passengers to transfer points. Planning requires an

understanding of origin-destination, network connections, transfer convenience, fare structure, and route planning. Integration of buses with feeder services improves accessibility. Insufficient government connectivity leads to congestion and increased spending. Explore solutions for successful TOD: Last mile connectivity projects and meeting the population's needs.

II. BACKGROUND STUDY

The migration of people from Pune metropolitan regions to periurban areas, such as Chakan, Alandi, Wagholi, Hinjewadi, Talegaon, and others, highlights the rising livability and potential for growth in these industrial locations. The Pune Metropolitan Region Development Authority (PMRDA) has identified these areas as growth centers in its regional plan. While the PMRDA has planned development schemes for some areas as industrial hubs, there is still potential for these growth centers to flourish further by becoming cultural and industrial centers, attracting more migration and floating population with employment opportunities. This research paper aims to address the importance of first- and last-mile connectivity in the metro feeder system, emphasizing the need for comprehensive integration of mass transit, enhancing passenger accessibility, and ensuring seamless station connections. By focusing on improving transportation infrastructure and services, we can alleviate traffic congestion, promote public transportation usage, and create sustainable urban environments

This research aims to enhance last-mile connectivity and the transportation system in the IT area by developing a feeder system for upcoming metro stations. The approach involves analyzing the existing transit network, evaluating transportation options, assessing travel behavior, and considering Transit-Oriented Development guidelines to establish a framework for the metro feeder system. The study focuses on the forthcoming metro corridor from Hinjewadi to Wakad, catering specifically to the IT area, and provides planning recommendations for the metro corridor. However, it is important to note that the research is limited to the planning stage until the completion of the metro stations. The emphasis is on improving accessibility to public transportation rather than accessibility by public transportation. The overall objective is to address the challenges and gaps in last-mile connectivity within the metro system and contribute to the development of a comprehensive and efficient transportation system that encourages the use of public transport and reduces reliance on private cars.

III. LITERATURE REVIEW

The process of creating a research strategy involves systematically identifying gaps from various sources like newspapers, publications, and blogs. It is essential to adopt a systematic approach and conduct a comprehensive literature review to address the research gap. The literature review should include relevant documents, articles, guidelines, frameworks, laws, and policies. Verifying the research gap requires accessing topic-related data through research papers or consulting with experts. The choice of data collection techniques is crucial in guiding the research process and aligning it with the established goals.

The provided flowchart outlines the stages to achieve the research objectives. Stage I involves setting objectives and conducting a literature review to identify gaps. Stage II focuses on finalizing the research gap components and selecting site conditions for delineation. In Stage III, data collection methods are adapted to the site conditions, involving surveys and site visits to gather primary and secondary data. Stage IV emphasizes designing the last mile connection method, providing processes and parameters. Stage V is the final step, where data is processed, findings are applied, and outcome aspects are listed. A research strategy entails a systematic approach, literature review, appropriate data collection techniques, and effective analysis methods to address the research gap and achieve the desired objectives.

To address challenges with urban mobility, different cities have used various strategies. Public policies frequently place a priority on enhancing public transportation and road infrastructure. A typical response is to construct new highways, flyovers, and enlarge existing roads. Conversely, additional road space encourages the use of private vehicles, which has little long-term influence on congestion, particularly in large cities (Martens & Golub, 2021). Few cities have effectively implemented Transportation demand management (TDM) strategies including parking limitations, congestion pricing, and car quota schemes (Martens & Golub, 2021).

Yet, implementing restricted TDMs was politically challenging in the majority of cities. To ease public discontent of these restrictive laws and facilitate the smooth deployment of TDMs, public transportation must also be improved (Gao & Zhu, 2022) Various cities have experimented with a variety of technology-enabled programs to boost the number of private vehicles on the road, including ride-sharing and high-occupancy vehicle (HOV) lanes. Yet, it can be challenging to

scale up these projects, and their effectiveness may be limited (Gao & Zhu, 2022).

Long-term solutions to enhance mobility in urban areas have been employed widely, including the development of effective mass public transportation and the promotion of non-mechanized modes like walking and bicycling (Rastogi, 2011). But, public transportation must work to offer commuters a door-to-door service if it is to successfully compete with automobiles and motorcycles. Yet, poor connectivity between a person's house or place of business and mass transit stations may discourage them from using public transportation (Kanuri et al., 2019).

IV. RESEARCH METHODOLOGY

The research methodology used in this study involves a systematic approach to address the research objectives and the research gap. It utilizes the KOBO survey format to assess the inclination of users in the Hinjewadi region to switch to metro transit from private vehicles & other modes. The survey questions were developed by referring to previous toolkits, documents, and expert opinions to gather comprehensive insights from the respondents. The questionnaire includes background questions about daily transportation habits, local transportation issues, and satisfaction with existing transport facilities. The collected survey data will be analyzed to gain valuable insights into the preferences and perceptions of the respondents regarding metro transit. This analysis will involve identifying patterns and trends in the responses to understand the respondents' views better.

The Cochran's formula is commonly used to calculate the sample size required for a reliable and representative survey. It considers factors such as the desired level of confidence, margin of error, and population size. The survey aims to gather information on Origin-Destination patterns, commuters' willingness to shift to metro rail, peak hour travel patterns, and the assessment of existing transport infrastructure. Parameters like Transit-Oriented Development guidelines, Public Bicycle Sharing programs, transit station spacing, and transit capacity within a 2 km distance are taken into account. By incorporating these parameters, the study aims to collect comprehensive data on commuter preferences, travel behavior, and perceptions of the metro rail system. The insights obtained will contribute to decision-making, infrastructure planning, and policy development for improving the metro rail network. The survey framework will be adjusted and refined based on the findings from the data analysis. This iterative process ensures that the

survey instrument effectively captures the necessary information.

Additionally, a comprehensive literature review is conducted to support the research objectives. Relevant documents, articles, guidelines, frameworks, laws, and policies related to transit-oriented development, transportation infrastructure, and last-mile connectivity are reviewed to gain a deeper understanding of the research topic and address the research gap.

By combining the analysis of survey data and insights from the literature review, this research aims to provide meaningful findings and recommendations for improving first- and last-mile connectivity in the metro feeder system, specifically focusing on the Hinjewadi area.

The survey assesses residents' willingness to switch to metro transit, while the literature review provides a broader context and understanding of the research topic.

V. RESULTS/ FINDINGS & DISCUSSIONS

This research paper addresses three key questions related to the IT Park metro corridor feeder system. Firstly, it examines the factors to consider when evaluating the feeder system, including connectivity, accessibility, efficiency, and reliability. Secondly, it focuses on the implementation of the feeder system within the industrial influence zone, assessing parameters like proximity, demand, capacity, and feasibility. Lastly, the research explores strategies to enhance connectivity between the IT Park area and the paratransit station, aiming to shift private ridership to public transportation. By improving accessibility, convenience, and attractiveness of public transportation options, this research aims to reduce congestion and promote sustainability. Overall, it contributes to understanding the feeder system and provides recommendations for enhancing connectivity and the effectiveness of public transportation in the area.

The study identified the catchment area for transit-supportive development and defined station area typologies. A SWOT analysis provided insights into the current state and potential of the transit system. Problems identified include insufficient carriageway capacity, lack of pedestrian infrastructure, and inefficient bus stop location. The proposed transit plan focuses on reducing congestion, improving pedestrian infrastructure, and providing dedicated bus parking. Separate routes for buses and strategic bus stop placement are recommended. Last-mile connectivity measures align with guidelines. Implementation of these recommendations can improve transit, traffic flow, and pedestrian safety in Hinjewadi.

VI. CONCLUSIONS / RECOMMENDATIONS

In research paper, focused on the significance of last-mile connectivity in the IT Park metro corridor feeder system. Analysis emphasized the need for last mile connectivity effectively and ensuring smooth connections between stations to improve passenger accessibility. Identified challenges, including insufficient public transportation services and a rise in private vehicle usage, resulting in traffic congestion. To tackle these issues, proposed enhancing public transportation services and creating additional options for last-mile connectivity. Through surveys, interviews, and spatial analysis, collected and analyzed data to support our findings and developed a comprehensive framework for addressing last-mile connectivity.

Key Findings:

- Last-mile connectivity is crucial for effective transit-oriented development and improving transportation infrastructure.
- Inadequate public transportation services contribute to increased private vehicle usage and traffic congestion.
- Integration of various modes of accessing transit stations, such as walking, buses, and paratransit services, is essential for seamless connectivity.

The IT Park area in Pune faces specific challenges related to last-mile connectivity, requiring solutions. Research highlights the importance of a comprehensive and transportation system that prioritizes last-mile connectivity to alleviate traffic congestion and promote safe environments. It offers valuable insights for researchers and practitioners by addressing the challenges of urban mobility and enhancing the overall urban living experience. By emphasizing the significance of last-mile connectivity, the research provides a comprehensive approach to transportation planning that considers infrastructure and services. Policymakers and urban planners can benefit from the research's recommendations in developing transportation systems. For future research, it is recommended to conduct studies that assess the implementation and effectiveness of the proposed strategies and recommendations. Long-term investigations can evaluate how improved last-mile connectivity impacts commuter behavior, traffic congestion, and overall transportation system performance. Additionally, exploring innovative technologies and solutions for enhancing last-mile connectivity should be a focal point for further research.

In conclusion, this research emphasizes the significance of last-mile connectivity in the IT Park metro corridor feeder system.

It provides valuable insights, recommendations, and a comprehensive framework for enhancing transportation infrastructure and services. The findings contribute to the field of urban mobility and hold relevance for researchers and practitioners involved in transportation and urban planning.

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