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Sustainable and Active Mobility through Walking and Public Transit System

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A B S T R A C T

This paper explores the concept of sustainable and active mobility through walking and public transit systems in urban cities. The fostering of walking and the use of public transportation as main modes of urban mobility is essential for reducing car usage and reducing carbon emissions. The paper digs in the benefits of promoting walking and public transit, such as enhanced air quality, reduced traffic congestion, improved public health, and the creation of more livable and sustainable urban spaces. Additionally, it evaluates the challenges and opportunities associated with implementing pedestrian infrastructure and public transit systems to encourage sustainable and active mobility. It can be concluded by highlighting the importance of integrating walking and public transit into urban transportation planning to gain environmentally friendly, equitable, and efficient urban mobility systems.

Keywords: Active Mobility, Walking, Public Transit System

INTRODUCTION

According to the Mayor of Bogota, a developed nation is not one where the impoverished own vehicles but rather one where the wealthy take public transport. The creation of public transport systems and sustainable urban mobility leads to a significant improvement in the standard of living for inhabitants. Access to markets and employment possibilities, education, recreation, health care services, and other necessities of daily living is improved; people who utilise public transportation walk more. Walking increases physical fitness, which benefits citizens' health and eases the strain on the healthcare system. Journey times also have an impact on one's quality of life. In several cities commuters often travel more than two hours to and from work. This is time lost in their life. The encouragement of sustainable and active mobility through walking and public transit systems has emerged as a condemnatory focus in urban transportation planning. Promoting walking and the use of public transportation offers a multifaceted approach to reducing car dependence, alleviating traffic congestion, and curbing carbon emissions in urban environments. By analyzing the benefits, challenges, and opportunities associated with these modes of transportation, this paper seeks to underscore their potential to enhance public health, improve air quality, and contribute to the creation of more livable and environmentally sustainable urban spaces. Figure 1. Shows the different aspects of sustainable mobility. The sustainability should be economic viable, environmentally friendly, and socially equitable.

Figure 1. Different aspects of sustainable mobility (source: author)

LITERATURE REVIEW

The promotion of sustainable and active mobility through walking and public transit systems has garnered significant attention in urban transportation literature. This section gives an overview of key studies and findings related to the benefits, challenges, and opportunities associated with fostering walking and public transit as main components of sustainable urban mobility. The simple explanation of interconnectivity among parameters of transportation system is given in figure 2.
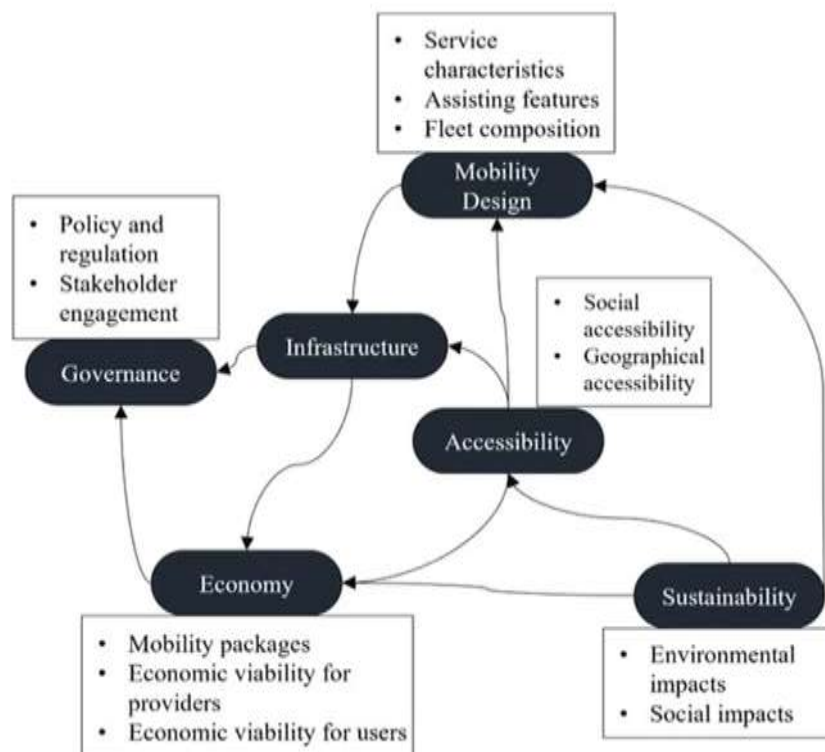

Figure 2. Interconnectivity among parameters of transportation system (source: author)

Yuan et al. introduced a novel approach to assess walkability in historic Asian cities, exemplified by Xi'an, China, and Kyoto, Japan. Their method integrates macro and micro aspects of the built environment to identify factors influencing the walking environment. They developed the Walkability Evaluation Score (WES) based on Nagata et al.'s work, which includes objective and perceived walkability indicators at the street level. Using deep learning-based image segmentation, they calculated the proportion of sidewalk, vegetation, pedestrian flow, and vehicle traffic for objective walkability. For perceived walkability, six indicators were evaluated virtually by trained auditors. The aggregated WES scores revealed differing walkability findings between Xi'an and Kyoto, suggesting areas for improvement in both cities.

Hayauchi et al. presented a case study from Japan, focusing on the impact of topography on active travel and the implementation of a new public transport service in a hillside district in Yokohama. They found that the burden from uphill walking reduces the appeal of walking and cycling, while some residents may be accustomed to steep slopes. The study highlights the need to develop methodologies for incorporating topography into public transport planning. By utilizing travel behavior survey results from a suburban hillside residential district, the authors developed a multinomial logit model to calculate utility-based accessibilities, including the topographical impact on travel mode choice, and to assess the improvements brought about by the new public transport service. The findings indicate that topography had a negative impact on walking and bus egress trips, and the model provides utility-based accessibility data for each area in the studied district, facilitating the assessment of accessibility improvement with the introduction of the new mobility service.

The study by Kopal and Witkowsky discusses the impact of the built environment characteristics and functionality on individual mobility patterns to identify the factors responsible for promoting healthy mobility behaviour and improving the quality of life. They conducted a multidisciplinary empirical survey (n = 500) in Essen, Germany. The survey was based on the "Triad" model, which included aspects from urban planning, mobility planning, and health sciences. They proclaimed that more integrated approaches to mobility and urban planning and for promoting health are required because the transportation sector is still responsible for the largest share of pollutant emissions; moreover, a car-oriented lifestyle was found to guide to immobility. Their study identified many determinants, ranging from the level of pollutant emissions to infrastructure for helping active modes, have the potential to improve or impair health. These determinants lead to behaviours related to travel patterns. The multiple regression model indicates that factors like the satisfaction of walking, the accessibility to public transport, and the reduction in air pollution contribute to healthy mobility behaviour.

The review paper by Zhu et al. Presents bibliometric investigation on spatial accessibility research from 1999 to 2022 using publications. The authors unveil a considerable increase in the number of papers published in the last 23 years (20 in 1999; 1090 in 2022), and spatial accessibility research is expected to increase further with the increased availability of data sources and new methods, tools, and technology. High levels of spatial accessibility via effective public transport systems and walking facilities, and measures to reduce traffic congestion can enhance people's proximity to their destinations, thus contributing to the reduction in car dependency. The theme of spatial accessibility is also applied for the goal of creating inclusive systems that enable more equitable participation for everyone. As a future research agenda, the authors stress upon the importance of exploring the ways of incorporating new data sources as well as integrating new analytical methods. Furthermore, the influence of emerging technologies such as autonomous vehicles, and e-commence on spatial accessibility patterns need to be considered. They point out that these analyses should be carried out at separate spatial scales.

Finally, the paper by Alquthani emphasizes the importance of improving pedestrian infrastructure from the view of both macro and micro levels. According to them, while much attention is paid to micro-level involvements on pedestrian infrastructure, macro-level planning solutions are lacking. Their research argues the stakeholder engagement in fostering pedestrian access for children between their homes and schools. Overall, the literature review demonstrates a growing body of evidence supporting the importance of sustainable and active mobility through walking and public transit systems in urban environments. While acknowledging the challenges, the literature underscores the potential for these modes of transportation to contribute to environmental sustainability, public health, and the creation of more livable and equitable urban spaces. This literature review provides a snapshot of existing research on sustainable and active mobility through walking and public transit systems, highlighting the key findings and insights from relevant studies in the field of urban transportation planning.

INTERVENTIONS OPTIONS

The quality and extent of pedestrian infrastructure, including sidewalks, crosswalks, pedestrian bridges, and street lighting, directly impact the walkability of urban areas. Variables related to pedestrian infrastructure may include sidewalk width, presence of dedicated pedestrian paths, accessibility features, and safety measures.

The accessibility and reliability of public transit services play a crucial role in promoting public transit usage. Variables related to public transit accessibility may encompass transit stop density, proximity to transit stops, frequency of service, transit network coverage, and connectivity to key destinations. Figure 3 shows overview of sustainable transportation solutions.

The design of urban spaces and land use patterns influence the feasibility and attractiveness of walking and public transit. Variables related to urban design and land use could include population density, mixed land uses, proximity of amenities to residential areas, transit-oriented development, and pedestrian-oriented zoning regulations. Figure 3 shows the overview of sustainable transportation solutions.

Figure 3. Overview of sustainable transportation solutions (source: author)

Demographic variables such as population density, age distribution, income levels, and employment patterns can provide insights into the potential demand for sustainable mobility options. Understanding the demographic composition of an area is essential for tailoring sustainable mobility initiatives to the needs of diverse communities. Variables related to safety and security encompass factors such as crime rates, traffic accident data, perception of safety among pedestrians and public transit users, and the presence of safety measures such as pedestrian crossings, traffic calming measures, and well-lit pathways. Understanding community preferences and engagement with sustainable mobility options is crucial. Variables related to community engagement may include survey responses on travel behaviour, attitudes towards walking and public transit, willingness to use alternative transportation modes, and preferences for neighbourhood amenities.

CONCLUSION

To promote sustainable and active mobility, the following measures can be considered:

Implement targeted improvements in walkability based on the specific findings for each city, such as enhancing pedestrian infrastructure, promoting green spaces, and reducing vehicle traffic in areas identified as needing improvement. Develop and implement public transport services tailored to topographical features, particularly in hilly areas, to address the negative impact of topography on walking and cycling, and to provide alternative transportation options for residents. Integrate built environment characteristics and functionality into urban planning to promote healthy mobility behavior, such as designing pedestrian-friendly streets, creating safe cycling infrastructure, and ensuring access to public transportation. Invest in research and development of new data sources and analytical methods to better understand and address spatial accessibility patterns, considering the influence of emerging technologies on mobility. Engage stakeholders, including local communities, policymakers, and urban planners, in the process of improving pedestrian infrastructure at both macro and micro levels, with a focus on promoting pedestrian access for children between their homes and schools. To advance sustainable and active mobility initiatives, it is imperative for urban planners, policymakers, and community stakeholders to collaborate in addressing the identified challenges while capitalizing on the identified opportunities. This involves prioritizing investments in pedestrian infrastructure, enhancing public transit accessibility, and implementing policies that promote multi-modal transportation choices. Moreover, fostering community engagement and participatory planning processes can ensure that sustainable mobility initiatives align with the diverse needs and preferences of urban residents.

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