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Research on London's Sustainable Transport Transformation from a Micro Perspective

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Abstract: With an anticipated population of 10.8 million and daily travel reaching approximately 330 million trips by 2041, London's transport strategy aims to achieve 80% of all journeys through walking, cycling, and public transport, with a commitment to net-zero carbon emissions by 2050. This paper examines London's sustainable transport transformation from a micro perspective, focusing on three core aspects: Healthy Streets, enhanced public transport experiences, and housing support with job growth. By analyzing the implementation outcomes and challenges of these strategies, the study aims to provide insights and lessons for other cities embarking on similar sustainable transport initiatives. The findings reveal that the Healthy Streets approach effectively promotes green travel by encouraging active mobility and improving pedestrian-friendly environments. Enhanced public transport experiences have strengthened the appeal of public transport by improving service quality and accessibility. The housing and job growth strategy has supported the city's virtuous growth by optimizing the alignment between the transport system and residential-employment patterns.

1. Introduction

As one of the world's most influential cities, London is grappling with the challenges of population growth and escalating transport demands. To address these challenges, London has crafted an ambitious transport strategy aimed at reducing reliance on motor vehicles through the promotion of walking, cycling, and public transport, and achieving net-zero carbon emissions for the transport system. This paper aims to analyze the key strategies of London's sustainable transport transformation from a micro perspective, including Healthy Streets, enhanced public transport experiences, and housing support with job growth. By delving into the implementation details and outcomes of these strategies, the paper seeks to provide practical experiences and policy recommendations for other cities.

2. London's Current Transport Situation and Challenges

London, a city where history intertwines with modernity, is facing unprecedented transport challenges. With a continuous population growth, it is projected that by 2041, London's population will reach 10.8 million, and daily trips will surge to approximately 330 million. Behind these numbers lies the immense pressure on the city's transport system and the urgent need for sustainable transport solutions.

Firstly, London's transport system is a complex network comprising various modes of travel, including the underground, buses, taxis, private cars, bicycles, and walking. Among these, the underground and bus systems serve as the backbone of city transport, carrying a significant portion of daily commuting needs. However, with the acceleration of urbanization and the increase in population density, these traditional transport modes are facing issues of insufficient capacity and inefficiency[1]. Congestion on subway lines, delays in public transport vehicles, and increasing traffic congestion have all become pain points in the daily travel of citizens.

Secondly, London's transport system is also grappling with serious environmental pollution and energy consumption challenges. Statistics show that more than half of the major air pollutants come from road transport emissions, with the widespread use of private cars being the main cause of this problem[5]. Vehicle exhaust emissions not only exacerbate urban air pollution but also pose a threat to the health of citizens. Additionally, the energy consumption and carbon emissions of the transport system are a significant obstacle to achieving the city's sustainable development goals.

In this context, London's transport strategy has set clear transformation goals: by 2041, 80% of all trips will be made by walking, cycling, and public transport, with a commitment to achieving net-zero carbon emissions for the transport system by 2050[6]. Achieving these goals requires a profound transformation of the existing transport system.

The Healthy Streets strategy is a crucial part of this transformation. Facing the "inactivity" crisis, London has proposed the concept of Healthy Streets to reduce the use of motor vehicles and encourage active travel[2]. This strategy not only focuses on improving infrastructure such as pedestrian-friendly environments and convenient crossings but also emphasizes the promotion of green travel methods. By enhancing the quality of street environments, it aims to stimulate citizens' interest in walking and cycling, thereby reducing traffic congestion and improving air quality[7].

The strategy for enhanced public transport experiences focuses on improving the service quality and accessibility of the public transport system. By ensuring the safety, reliability, and affordability of public transport, reducing delays caused by traffic congestion, and improving overall travel efficiency, it strengthens the connection between public transport facilities and slow-moving systems, optimizes the spatial allocation of resources, especially in areas with scarce public transport resources in outer London, and enhances the reliability, comfort, and appeal of rail travel, making rail the preferred mode of long-distance travel.

The housing support and job growth strategy takes a macro perspective on urban development, providing new employment opportunities and housing supply to support the city's virtuous growth. This strategy emphasizes principles such as public transport accessibility, high-density mixed-use development, and green low-carbon travel to achieve a high degree of alignment between the transport system and residential-employment patterns. In major growth nodes, by reducing the dominant role of motor traffic and enhancing the construction of pedestrian and bicycle infrastructure networks, it achieves efficient transfers between different green travel modes.

In summary, London's current transport situation is fraught with challenges, but it also presents opportunities for transformation. Through the implementation of strategies such as Healthy Streets, enhanced public transport experiences, and housing support with job growth, London is steadily moving towards the goal of sustainable transport transformation. This transformation will not only

improve citizens' travel experiences and reduce environmental pollution but also lay a solid foundation for the city's long-term sustainable development[8].

3. London's Sustainable Transport Transformation Policy Framework

London's sustainable transport transformation policy framework is a multidimensional strategic system designed to reshape the city's transportation landscape through a series of meticulously crafted strategies. The core of this framework lies in enhancing the healthiness of streets, the accessibility and service capacity of public transport, and promoting green travel through refined management.

In the Healthy Streets strategy, London emphasizes the importance of streets as public spaces and proposes people-centric development principles. Streets occupy 80% of London's public space, and therefore, improving street quality is seen as the foundation for the city's effective operation. The strategy uses ten people-centric indicators to reflect spatial experiences, such as user-friendliness, easy crossing, shaded rest areas, and more, aiming to make street spaces greener and more pleasant[3]. The implementation of this strategy will help improve citizens' travel environment, encourage more walking and cycling activities, thereby reducing the use of motor vehicles.

The strategy for ensuring public transport accessibility and service capacity focuses on enhancing the overall performance of the public transport system. By preserving and ensuring new spaces for public transport, walking, and cycling, as well as ensuring necessary line connectivity and accessibility, London aims to enable the public transport system to accommodate an additional 5 million daily trips by 2041. The implementation of this strategy will strengthen the appeal of public transport and reduce reliance on private cars[9-10].

The comprehensive transport impact assessment strategy embeds the principles of Healthy Streets into the transport impact evaluation, ensuring that the impact on road network capacity, traffic organization schemes, parking design and management schemes, logistics, and distribution schemes are fully assessed at the project proposal stage[11]. For facilities or locations with adverse transport impacts, the strategy requires improvements to surrounding public transport, slow-moving facilities, and road infrastructure, or the payment of impact fees, to mitigate their negative effects on the transport system.

The convenient bicycle transport strategy is aimed at promoting and encouraging cycling by constructing new cycling routes and high-quality related facilities, supporting the realization of a city-wide cycling network. At the same time, the strategy proposes minimum standards for bicycle parking facilities for different levels of areas, ensuring sufficient and convenient bicycle parking facilities[12].

The refined motor vehicle parking management strategy aims to reduce habitual private car travel by restricting the development of motor vehicle parking lots, promoting the transformation of the travel structure towards green methods[4]. The strategy encourages car-free areas in regions with well-developed public transport networks and follows the principle of providing the minimum necessary parking spaces in other areas. In addition, the strategy encourages each administrative district to adopt stricter enforcement standards on top of the upper limit construction standards proposed in the "London Plan 2021" to further promote green travel[13].

The green-oriented logistics distribution strategy promotes the sustainable development of the distribution and logistics industry by reducing road freight volumes at regional and inter-regional levels, improving road safety, and reducing noise and exhaust emissions. The strategy supports the provision of hydrogen refueling stations and electric vehicle fast charging points for logistics and industrial sites and encourages off-peak distribution to reduce additional freight caused by failed deliveries[14].

The environmentally-prioritized aviation development strategy supports and maximizes the role of airports in urban space growth, especially in opportunity areas with good public transport connectivity to airports and the capacity to accommodate a large number of new homes and jobs. However, the strategy also emphasizes the recognition of the environmental and health impacts of airport development, opposing the expansion of Heathrow International Airport in principle, unless its development plan can prove not to increase noise and reduce air quality, and the benefits obtained through relevant regulatory and technological means can be fairly distributed to the affected communities.

In summary, London's sustainable transport transformation policy framework is a comprehensive and meticulous strategic system. Through strategies such as Healthy Streets, public transport accessibility and service capacity, comprehensive transport impact assessment, convenient bicycle transport, refined motor vehicle parking management, green-oriented logistics distribution, and environmentally-prioritized aviation development, it aims to achieve green travel and sustainable development for the city. The implementation of this framework will not only improve citizens' travel experience but also lay a solid foundation for London's long-term prosperity and environmental protection.

4. Micro Perspective Analysis of Transformation Mechanisms in Sustainable Transport

From a micro perspective, the mechanism analysis of London's sustainable transport transformation reveals the nuanced aspects of policy implementation, which involve various components of the city's transport system, from street design to public transport services, to changes in individual travel behavior. This analysis not only focuses on the technical details of the policies but also delves into how these details can drive the entire city's culture of green travel.

Firstly, the implementation of the Healthy Streets strategy is not merely a redistribution of physical space but also a transformation of culture and social behavior. By enhancing the friendliness and comfort of streets, the strategy encourages citizens to walk and cycle more, thereby reducing reliance on motor vehicles. This shift requires active participation and habit changes from citizens, as well as continuous efforts from city managers to ensure the sustained improvement and maintenance of street environments.

Secondly, the implementation of the strategy for ensuring public transport accessibility and service capacity involves optimizing and expanding the existing transport network. This includes adding new bus routes and stops, improving service frequency and reliability, and enhancing passenger experience. These measures require precise data analysis and planning to ensure the effective use of resources and the maximization of services. It also demands close cooperation between public transport operators and urban planners to achieve overall system optimization.

Furthermore, the implementation of the comprehensive transport impact assessment strategy requires a full transport impact evaluation at the early stage of project development. This helps identify potential traffic bottlenecks and conflict points and ensures that new development projects are aligned with the overall goals of the city's transport system. This forward-looking planning approach helps avoid future traffic issues and promotes the long-term healthy development of the city's transport system.

Additionally, the implementation of the convenient bicycle transport strategy involves significant investment and construction in bicycle infrastructure. This includes new bike lanes, improved bicycle parking facilities, and the promotion of bike-sharing systems. These measures require financial and technical support, as well as acceptance and use by citizens. Therefore, the successful implementation of the strategy depends on effective publicity and educational activities, as well as the cultivation and promotion of bicycle culture.

Lastly, the implementation of the refined motor vehicle parking management strategy and the green-oriented logistics distribution strategy involves profound changes to existing transport modes. These strategies aim to reduce traffic congestion and environmental pollution by limiting motor vehicle use and promoting green logistics. This transformation not only requires policy support and strict regulatory enforcement but also active response and participation from citizens and businesses. Therefore, the successful implementation of the strategy depends on extensive public education and participation, as well as the continuous promotion of green travel and logistics modes.

In summary, the micro perspective mechanism analysis reveals the complexity and multi-dimensionality of London's sustainable transport transformation strategies. The implementation of these strategies requires not only technical innovation and shrewd planning but also cultural transformation and public active participation. Through these meticulous and comprehensive measures, London is gradually achieving its ambitious goals of sustainable transport transformation, providing valuable experience and inspiration for cities worldwide.

5. Conclusions

London's sustainable transport transformation strategy demonstrates how cities can navigate the context of population growth and increased transport demands by adopting innovative and integrated strategies to achieve green travel and net-zero carbon emissions. The three core aspects of the strategy—Healthy Streets, enhanced public transport experiences, and housing support with job growth—have not only improved citizens' travel experiences but also effectively reduced traffic congestion and air pollution. The successful implementation of these strategies offers valuable experiences and insights for other cities, particularly in balancing urban development with environmental protection and leveraging policy guidance and market mechanisms to promote sustainable transport transformation. As technology advances and public awareness increases, the exploration of sustainable transport in London and other cities will continue to deepen, contributing to the global sustainable development of cities.

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