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Editorial

Towards Green and Smart Cities: Urban Transport and Land Use

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Over the past 60 years, global urbanization and the widespread adoption of motorization have significantly altered urban land use patterns and transport system structure [1,2]. The interplay between these changes, as highlighted by [3], has become central to achieving sustainable development in the urban and transport sectors.

The land use transport model stands out as a pivotal tool in related studies. It serves as a planning instrument, enabling the modeling and analysis of interactions between land use patterns and transport systems within specific spatial boundaries. This model finds extensive application in forecasting traffic demand, evaluating the efficiency and viability of transport infrastructure, optimizing urban land use configurations, and assessing various urban planning scenarios. Its utilization of diverse datasets contributes significantly to informed decision-making in urban and regional planning, investments in transport infrastructure, zoning regulations, the development of public transit, and the formulation of policies aimed at fostering sustainable and vibrant communities.

Since the 1960s, researchers have introduced various mathematical planning models aiming to integrate land use and transport planning [4]. These models seek to optimize travel, location, land use patterns, land value, and economic output by internalizing the interactions between land use and transport.

Yim et al. (2011) categorized land use transport models into two main approaches [2]: the planned allocation approach [5] and the market simulation approach [6]. The former focuses on optimizing land use activities and has been exemplified in works [7–9]. In contrast, the latter, notably outlined by Lowry (1964) [6], segmented land use activities into basic and service industries alongside the housing sector. This approach positioned housing and service industries based on travel costs and potential attraction [9–11]. Moreover, the market simulation approach has gained extensive application in simulating land use patterns due to its effectiveness in modeling traveler responses to various land use policies [12–14].

Since the 1980s, concurrent with the rapid rise in motorization, researchers have progressively integrated road congestion, as an external factor, into land use and transport models [15]. They aimed to depict road congestion and the network equilibrium comprehensively by accounting for both traffic demand and transport supply, thus rectifying the limitations of the traditional four-step forecasting model [16]. During this era, scholars began exploring topics such as the allocation of land use activities, taking congestion into account [17], and studying the influence of traffic congestion on housing prices [18]. Subsequently, researchers delved into factors like the spatial distribution of the population during different times of the day, traffic demand patterns, and their reciprocal interactions. This led to the development of discrete or continuous network design models aimed at optimizing network capacity [2,19].

In the 21st century, urban transport continues to contribute significantly to carbon emissions [20]. The configuration of land use patterns and transport infrastructure holds substantial influence over the emissions within cities [21]. Consequently, the evolution of the land use transport model has expanded into a comprehensive framework, integrating land use, transport, and emission considerations [22]. This model's primary focus is on

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effecting substantial reductions in transport-related emissions through strategic land use planning and the encouragement of shifts in travel modalities [23].

Researchers utilizing these models began assessing how different urban forms and land use policies impacted travel demand and transport-related emissions. This exploration aimed to elucidate the intricate relationship between location, travel behaviors, emissions, and economic factors. During this period, numerous theories and methodologies emerged, including gravity and entropy models, stochastic utility theory [24], and input–output analysis. These approaches became pivotal tools for investigating land use and environmentally sustainable transport issues.

The escalating concern regarding substantial carbon emissions in cities spurred the concept of transit-oriented development. This approach integrates urban development with transport, ensuring the optimal utilization and comprehensive development of urban land through the cohesive planning of both land use and transport. Additionally, it emphasizes the construction of robust public transit systems.

In recent times, urban renewal and quality transport concepts have ushered in the era of smart cities and green transport as progressive urban development paradigms. Smart cities embody eco-friendly design, renewable energy adoption, and efficient resource management to curtail ecological impacts. Meanwhile, green transport systems, encompassing electric vehicles and enhanced public transit, prioritize emission reduction while offering safer and more efficient travel options for both passengers and goods.

As Guest Editors, we have spearheaded the organization of the **Special Issue titled 'Towards Green and Smart Cities: Urban Transport and Land Use' in the *Sustainability* Journal**. This initiative aims to make substantial contributions to the sustainability of city growth. Our goal is to inspire experts in urban planning and transport to engage in profound research, focusing on urban development, contemporary urban transport system planning, and management in this new era. We aim to cultivate updated models for both land use and transport.

The objective is to fortify the construction of green transport and smart cities in alignment with the dual carbon goals. This endeavor seeks to enhance transport service capacity and elevate the quality of life for urban residents. This Special Issue encompasses several key research areas, including shared transport, traffic demand forecasting, facility location and travel behavior analysis, public transit planning and operations, parking supply and management, modal shift analyses, transit-oriented development, and the concept of the compact city.

This SI includes 11 papers, with the first 5 focusing on shared transport and public transit. Among them, "Impact of Carpooling under Mobile Internet on Travel Mode Choices and Urban Traffic Volume: The Case of China" explores how carpooling, facilitated by mobile internet advancements in China, influences travel choices and urban traffic. It discusses the benefits of mobile internet-enabled carpooling, such as cost-effectiveness compared to taxis and a superior user experience over buses, and investigates the effects of regulations like the Interim Measures for the Management of Online Carpooling Operation and Service, as well as changes in safety and insurance qualifications for e-hailing drivers, on travel mode preferences and road traffic volume. "Optimizing On-Demand Bus Services for Remote Areas" addresses the challenge of providing efficient public transit in remote areas of mega cities with low population density and limited travel demand. This paper introduces an on-demand bus model. Specifically designed for far suburbs, the model considers the spatial and temporal distribution of travel demand and accounts for travelers' willingness to pay for flexible and efficient transport services. The proposal optimizes bus departure frequency and ticket prices for on-demand services to minimize both operational costs and traveler time costs. "An Evolutionary Game Analysis of Shared Private Charging Pile Behavior in Low-Carbon Urban Traffic" focuses on CO_2 emission concerns and the energy crisis. It tackles the challenge of inadequate charging infrastructure for electric vehicles and proposes private charging pile sharing as a solution to efficiently utilize idle charging resources, enhance the economic efficiency of private charging piles, and develop a low-carbon urban transport system. Through private pile sharing, the study demonstrates the ability to support more cars using the same resources. "Total Cost of Ownership Analysis of Fuel Cell Electric Bus with Different Hydrogen Supply Alternatives" examines, encompassing both sensitivity and probabilistic analyses, the total cost for a holding cell electric bus fleet, the capital of expenses for hydrogen supply infrastructure, and operational and maintenance costs for both buses and infrastructure. Various hydrogen supply options have been considered. Two distinct case studies, one involving a current small bus fleet of five buses and another focusing on a larger fleet set to launch in 2028, have been conducted to show that for the small fleet, the off-site gray hydrogen purchase with a gaseous delivery option is the most cost-effective, but it still incurs a 26.97% greater cost than diesel buses. Meanwhile, in the case of the 2028 fleet, the steam methane-reforming method without carbon capture will be the most likely option. "Recovery Strategies for Urban Rail Transit Network Based on Comprehensive Resilience" analyzes the need for resilient urban rail transit networks in densely populated areas. It introduces an approach to enhance network resilience using a set of evaluation indexes considering network topology and passenger travel path selection, and it examines various recovery strategies across different interference scenarios to analyze the sequence of station recovery in each scenario including random recovery, node importance-based recovery, and comprehensive toughness-based recovery.

The other four papers address traffic demand management as a means to achieve energy savings and emission reduction in transport through changes in land use planning. "Optimizing the Location of Virtual-Shopping-Experience Stores based on the Minimum Impact on Urban Traffic" introduces virtual-shopping-experience stores and develops a model to optimize their placement. The model considers factors like the selection of virtual-reality devices and the likelihood of consumers choosing between online and offline shopping. The objective is to maximize social welfare by reducing car trips for offline shopping. The case studies suggest that these stores can notably decrease the frequency, distance, and time spent on car trips for offline shopping. "Modeling Impact of Transport Infrastructure-based Accessibility on the Development of Mixed Land Use Using Deep Neural Networks: Evidence from Jiang'an District City of Wuhan, China" delves into the role of mixed land use (MLU) in sustainable urban development. This paper employs deep neural networks to explore how transport infrastructure-based accessibility influences MLU patterns, and it observes significant expansions in mixed commercial–residential and commercial districts near areas with high transit accessibility. Meanwhile, "Ecological Quality Status Evaluation of Port Sea Areas Based on EW-GRA-TOPSIS Model" focuses on the environmental challenges faced by port sea areas due to rapid economic growth and increased human activity. It emphasizes the fragility of port sea ecosystems and the importance of monitoring and evaluating their ecological quality for sustainable marine economic development. Lastly, "Spatial-Temporal Evolution of Coupling Coordination Development between Regional Highway Transport and New Urbanization: A Case Study of Heilongjiang, China" investigates the relationship between regional highway transport and new urbanization for regional sustainability. This paper introduces an index system and an integrated method for measuring coupling coordination, and it presents models for coupling degree and coupling coordination degree based on data from Heilongjiang Province, China, spanning 2011 to 2017. The evaluation index system comprises two hierarchies, six aspects, and 19 indexes, weighted using the entropy weight method.

From the microscopic view, another paper—"A Signal Coordination Model for Long Arterials Considering Link Traffic Flow Characteristics" zeroes in on enhancing traffic system efficiency by coordinating signals to alleviate road congestion and emissions. It prioritizes two main objectives, maximizing green bandwidth and enhancing overall traffic performance, and delves into utilizing full sample trajectory data to establish relationships between release patterns at upstream intersections and arrival patterns at downstream intersections. It also explores models that minimize delays based on cell-transmission representations of traffic dynamics. On the other hand, the paper "Simulation Study of the

Effect of Atmospheric Stratification on Aircraft Wake Vortex Encounter" investigates aircraft wake vortex evolution under different atmospheric conditions. While it is a compelling study in aviation safety and airport operation enhancement by reducing wake separation, it might diverge too far from the central theme of this Special Issue.

Overall, each of these studies contributes significantly to the broader goal of constructing green transport and smart cities within the framework of the dual-carbon goal. By addressing traffic management, land use planning, ecological evaluations, signal coordination, and aviation safety, they collectively aid in improving transport service capacity and enhancing urban residents' quality of life. Moreover, these studies serve as valuable building blocks toward a more comprehensive understanding of sustainability. They foster initiatives and practical applications of sustainability-based measures and activities within urban environments. Through their insights into reducing emissions, optimizing traffic flow, evaluating ecological impacts, and enhancing safety, they pave the way for implementing strategies that align with sustainability objectives.

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