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## THE ROLE OF THE "15-MINUTE CITY" CONCEPT IN CREATING AN ACCESSIBLE URBAN ENVIRONMENT

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Accessibility and proximity are fundamental principles of the 15-minute city concept, which has gained widespread popularity in contemporary urban planning as a response to the challenges of globalization, urbanization, and the decline in the quality of life in cities [1]. The core idea of this concept is to create an urban environment where residents can meet their daily needs within a 15-minute walk or bike ride. This includes access to essential social functions: housing, work, supplies (shops and services), care (healthcare), education, and recreation [2]. This approach not only optimizes residents' use of time but also significantly reduces dependence on motor vehicles, which has a positive impact on the environmental situation and the overall comfort of the urban environment.

An important aspect of implementing this concept is breaking down each of these functions into specific subcategories and linking them to particular activities, types of development, and infrastructure. For example, the "supply" function may include grocery stores, pharmacies, and household services, while "enjoyment" encompasses parks, cultural institutions, and sports facilities. Such a breakdown allows for a more accurate assessment of the extent to which the area is equipped with the necessary elements of the urban environment.

With the growing popularity of the 15-minute city concept, research aimed at developing methods to assess its effectiveness has intensified significantly [2]. Today,

there are numerous approaches to measuring the accessibility of urban areas, which differ both in the set of indicators and in the methodology used to calculate them. The main differences concern the selection of types of urban amenities, the consideration of various modes of transport (walking, cycling, public transit), and the use of different travel speed parameters. Despite these differences, most studies agree that the key criterion is ensuring a high quality of life through spatial proximity to necessary services, environmental sustainability, and consideration of residents' individual needs.

One of the key assessment tools is the accessibility index, which helps determine how quickly and easily residents can reach specific destinations within the city's transportation network. This index takes into account traffic conditions, the structure of the road network, the availability of alternative routes, and other factors that affect the population's mobility [3].

Walkability and bicycle accessibility indices play a key role in the context of sustainable mobility. Walkability is defined as the degree to which an urban environment is suitable for walking and serves as an important indicator of the quality of urban space. It depends on many factors, including: the quality of sidewalks, traffic safety, the presence of green spaces, building density, and the diversity of land uses. A high level of walkability not only increases mobility but also improves public health by encouraging physical activity [4].

Recent studies have shown that cities with well-developed pedestrian infrastructure are characterized by higher levels of resident satisfaction, stronger social ties, and more balanced urban development [5]. At the same time, many modern cities, especially those that developed under the dominance of automobile transport, do not meet the requirements for pedestrian accessibility [6]. This creates a need to rethink approaches to urban planning and implement new models of spatial organization.

Similar to walkability, an important indicator is bicycle accessibility, which characterizes the suitability of the urban environment for cycling. It takes into account the availability of bicycle infrastructure (bike lanes, parking facilities), topographical features, safety levels, and integration with other modes of transportation. Additionally, environmental indicators may be considered, particularly air pollution levels, which

affect the comfort of cycling [6].

The development of bicycle infrastructure is an important step toward reducing traffic congestion, lowering emissions, and creating a more environmentally sustainable urban environment [5]. In many cities around the world, bicycles are becoming a viable alternative to cars for daily commutes, confirming the effectiveness of investments in this area.

Most studies on walkability and bicycle accessibility have been conducted in cities in North America and Australia, where the problem of car dependency is particularly acute. However, these approaches are being actively adapted in European cities, which have a different historical structure and a more complex spatial organization. European cities are characterized by high building density, mixed land use, and historically formed centers, which complicates the application of standard assessment methods [8].

In this regard, there is a need to improve methods for assessing accessibility, taking regional characteristics into account. Recent studies propose new approaches that allow for a more accurate reflection of the actual conditions of the urban environment, taking into account geographical, social, and economic factors.

The scientific literature devotes particular attention to the classification of walkability indicators [9]. Three main groups are distinguished: indicators based on geographic information systems (GIS), environmental perception indicators, and indicators derived from direct observations. The most common are GIS indices, such as Walkability 3Ds and Walk Score, which allow for a quantitative assessment of walkability based on spatial data.

The Walk Score, for example, is widely used to assess the accessibility of urban amenities in different neighborhoods, while the 3Ds Walkability Index takes into account the density, diversity, and design of the urban environment. Studies have shown that these indices are highly correlated with actual levels of pedestrian activity among the population [10].

Similar approaches are also used to assess bicycle accessibility, although this area of research is less developed. At the same time, there is growing interest in integrating

various indicators into comprehensive models for assessing sustainable mobility.

Despite a significant body of research, the practical application of walkability and bicycle accessibility indices in urban development planning remains understudied. There is a need to develop tools that will not only assess the current state but also predict the impact of future changes in the urban environment.

This is particularly relevant for Ukraine, where cities have their own specific development characteristics linked to historical, economic, and social factors. Most existing assessment models were developed for other regions and do not fully account for the Ukrainian context.

Thus, the literature review confirms that the concept of the 15-minute city represents a promising direction for the development of modern cities, based on the principles of accessibility, proximity, and sustainability. Walkability and bicycle accessibility indices serve as key tools for assessing the quality of the urban environment and the level of sustainable mobility development.

At the same time, there is a significant need for further research aimed at adapting these tools to the conditions of Ukrainian cities, developing new assessment methods, and formulating practical recommendations for urban planning. This will improve the effectiveness of urban development management and ensure a higher quality of life for the population.

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## MODES OF TRANSPORT IN LOGISTICS SYSTEMS, SELECTION CRITERIA AND EFFICIENCY

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The article examines theoretical and practical aspects of different modes of transport functioning within logistics systems. A classification of the main transport modes is carried out, and their advantages and disadvantages are identified. Special attention is paid to the criteria for choosing the optimal mode of transport under current conditions. A methodology for calculating the economic efficiency of logistics decision-making is proposed. The current state of transport logistics in Ukraine, challenges related to port blockades, and prospects for the development of intermodal transportation are analyzed. The research was conducted within the framework of the scientific work of the Department of Transport Technologies at Kharkiv National Automobile and Highway University [3].