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### ПЕРСПЕКТИВИ РОЗВИТКУ МІСЬКОГО ТРАНСПОРТУ КИЄВА : КОНТЕКСТ ЗВ'ЯЗНОСТІ СТОЛИЧНОГО РЕГІОНУ

*Метою* статті є встановлення особливостей містобудівного освоєння Києва та Столичного регіону через формування комплексного підходу до просторового забезпечення розвитку міського транспорту в інтересах підвищення транспортної зв'язності столиці України та її субурбії.

*Методика.* Здійснена оцінка планувальних особливостей Вишневого та прилеглих до нього територіальних громад у Київській субурбії та Києва через вивчення основних планувальних документів, польового дослідження, опитування населення. Результати оцінювання слугували даними для формування просторового підходу та пропозицій з удосконалення .

*Результати.* Оцінено сформовану систему транспортної зв'язності Столичного регіону на ділянці масштабного перевезення вантажів та пасажирів між Києвом та містом-супутником Вишневим і прилеглими до нього територіальними громадами у Київській субурбії, як продукту радянського містобудування та сформованого у його рамках концепту "місто-супутник". Досліджено контекст просторових перетворень у м. Вишневому та їх визначеність загальним розвитком Столичного регіону, його просторовим трансформаціями у постсоціалістичний період, їх вплив на розвиток міського транспорту. Аналізується зміна транспортного забезпечення Столичного регіону в умовах інтенсифікації містобудівного освоєння території, стрімкої урбанізації, автомобілізації, зміни суспільного запиту на комфорт міського транспорту, та недостатнього проектного та документального забезпечення розвитку Столичного регіону.

*Наукова новизна.* Запропоновано підхід із забезпечення просторового впорядкування транспортної зв'язності у Столичному регіоні. Встановлено, що незважаючи на управлінські та містобудівні прорахунки щодо розвитку Києва у радянський час місто і його субурбія розвиваються співзвучно та потребують оптимізації розвитку міського транспорту та підвищення зв'язності.

*Практична значимість.* Запропонована методика та отримані результати можуть бути використані при плануванні й організації міського транспорту у контексті підвищення зв'язності Києва і його субурбії. Транспортна зв'язність залишиться нагальним завданням для Столичного регіону України та потребує осмислення негативного досвіду та залучення кращих практик.

*Ключові слова:* міський транспорт, Столичний регіон, Київ, субурбія Києва, транспортна зв'язність регіону.

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### PROSPECTS OF URBAN TRANSPORT DEVELOPMENT IN KYIV: CONTEXT OF CONNECTIVITY OF THE CAPITAL REGION

*The purpose* of the article is to establish the features of urban development of Kyiv and the Capital Region through the formation of a comprehensive approach to spatial provision of urban transport development in the interests of increasing transport connectivity of the Capital of Ukraine and its suburbs.

*Methodology.* The planning features of Vyshneve and adjacent territorial communities in the Kyiv suburbs and Kyiv were assessed through the study of basic planning documents, field research, and population surveys. The assessment results served as data for the formation of a spatial approach and proposals for improvement.

*Results.* The formed transport connectivity system of the Capital Region on the section of large-scale transportation of goods and passengers between Kyiv and the satellite city of Vyshneve and adjacent territorial communities in the Kyiv suburbs was assessed as a product of Soviet urban planning and the concept of a "satellite city" formed within its framework. The context of spatial transformations in the city of Vyshneve and their

determination by the general development of the Capital Region, its spatial transformations in the post-socialist period, and their impact on the development of urban transport were investigated. The change in the transport provision of the Capital Region is analysed in the context of intensification of urban development, rapid urbanisation, motorisation, changes in public demand for the comfort of urban transport, and insufficient design and documentary support for the development of the Capital Region.

*Scientific novelty.* An approach to ensuring spatial organisation of transport connectivity in the Capital Region is proposed. It is established that despite the managerial and urban planning miscalculations regarding the development of Kyiv in Soviet times, the city and its suburbs are developing in harmony and require optimisation of the development of urban transport and increased connectivity.

*Practical significance.* The proposed methodology and the results obtained can be used in planning and organising urban transport in the context of increasing the connectivity of Kyiv and its suburbs. Transport connectivity will remain an urgent task for the Capital Region of Ukraine and requires understanding of negative experiences and attracting best practices.

*Keywords:* urban transport, Capital Region, Kyiv, suburbs of Kyiv, transport connectivity of the region.

*Introduction.* In this article, we analysed the transport connectivity of Kyiv and its suburbs. The analysis of urban transport development and its role in the communication of a large city and its suburbs remains a hotly debated issue in geographical studies, because urban transport depends not only on engineering support, technological shifts in rolling stock associated with technological transitions, combination of ownership forms, compliance with increasing environmental requirements for vehicles, but also on geographical factors of metropolitan development (J. Speck et al, 2000). Quite a few scientific publications reveal various aspects of the formation and development of the Kyiv region. In particular, these studies provide a starting point and in-depth analysis for understanding the transport connectivity of Kyiv and its suburbs, and the development of urban transport in Kyiv in general. Kyiv's urban transport is a complex system that has a long history of formation and is associated with technological progress in Europe and the formation and changes in the demand of the population of a large city in different historical epochs (I. Kolotukha, 2016, S. Mashkevych, 2018). The development of all components of the transport system of Kyiv and its suburbs is interconnected. This applies to both urban and mainline transport (I. Savchuk, 2020) and their individual types. Many types of urban transport, along with ensuring the connectivity of individual districts of Kyiv, have played a significant role in connecting the city with the suburbs. For Kyiv, minibuses play a special role here, but electric urban transport, primarily trams, has a long history as well (S. Mashkevych, 2012).

In general, urban transport is largely a consequence and manifestation of the development of the metropolitan region as a whole. In particular, this is relevant for the analysis of the interconnectedness of satellite cities and central core cities, which is largely expressed by the development of urban transport (O. Zavalnyi, A. Pankeieva, 2017; K. Mezentsev, 2013). In the scientific literature, the Kyiv region is described as polycentric with significant internal differences in development (H. Pidgrushnyi et al., 2020, 2023), which significantly affects its transport connectivity through the formation of a demand for passenger transport and coordination with the infrastructure network. This is most evident in the analysis of the region's configuration (G. Pidgrushnyi et al., 2021) and its spatial organisation (G. Pidgrushnyi et al., 2019). One of the main problems in the development of the Kyiv region is its administrative fragmentation and the low level of planning coherence in the development of the capital and its suburbs (H. Pidgrushnyi et al., 2019). This significantly limits the management potential and opportunities for planning the development of the region, which is the basic problem of ensuring the transport connectivity of the region. At the same time, the structuring of the space of a metropolitan region mainly depends on the functioning and development of the metropolis (O. Denysenko, 2008), which has the expert, financial and investment resources to lead in planning and managing the development of the region as a whole, to lead in the dialogue on development and to unite the efforts of communities.

The population of Kyiv and its suburbs was growing rapidly before the large-scale invasion of Russian occupation forces in February 2022. Its northern part was destroyed, more than 1,346 civilians were killed, and another 300 are missing [1]. By the end of March 2022, the Kyiv region was liberated from the occupiers. The population began to rapidly return to the capital and its suburbs, and a large number of internally displaced persons also moved to the Capital Region. According to the International Organisation for Migration, the Kyiv region is one of those that has become a refuge for the largest number of IDPs. With more than 670,000 IDPs, it exceeds all other regions of Ukraine in terms of the number of hosted IDPs [2]. This has brought back and further exacerbated the region's "old" problems - the balance between the densification of residential development in the metropolis and the actual (though not legal) growth of the capital's area and the absorption of nearby settlements [3]. Kyiv's suburbia is not

a homogeneous environment. In particular, the study of the transport connectivity of Kyiv and its satellite cities in comparison with other cities and other settlements of the suburb and its coordination with the change in the planning structure of the Capital Region deserves attention.

*The main part.* The city of Vyshneve is located on the south-western vector of active development of the suburban area of the capital and is its distinct core. Studying the impact of urban transport on its development allows us to obtain more data to answer the question of what balance can be maintained between the possibilities of existence of Vyshneve as a suburban satellite city (using Kyiv's infrastructure, but retaining the attractiveness and advantages of a small scale of population life and accessibility of services) and the residential area of the capital. Vyshneve has a significant difference from other cities and towns in the suburban area. It is the town closest to the Kyiv city limits. Its main feature is the rapid population growth and limited territory. While neighbouring settlements are growing in population due to the development of former agricultural land and high-rise buildings, Vyshneve is facing a very high competition for construction sites. In particular, this determines the importance and difficulties of its transport connectivity with Kyiv.

The city was planned as a satellite of Kyiv around the Zhuliany railway station. The rulers failed to solve several problems: disproportion (the swampy southern part did not allow for its development in terms of housing), failure to reliably communicate the northern and southern parts separated by the railway (their connections to Kyiv are more stable than to each other), poor administration at the district level (the administration of the Kyiv-Svyatoshyn district was located in Kyiv), and the fact that most of the population was connected to Kyiv by train.

The problem of Vyshneve, the closest satellite town to Kyiv, is its small boundaries (the town's area is 25.20 km<sup>2</sup>), defined in Soviet times with a small planned number of residents - in 1971, when the town received the status of a city, there were 17.5 thousand inhabitants, now there are 50.5 thousand. Each meter of the city's territory is expensive for the developer solely to create housing and commercial infrastructure, which has led to the collapse of its social security and transport connectivity with the centre of the Capital Region.

In general, we can talk about three stages of the city's development that led to changes in the functioning of Kyiv's urban transport as a key component of its connectivity. The first was the development of the satellite city in the Soviet period, the second was the commercialisation of the city's territory in the 1990s until the 2010s, and the current one is the rapid development of housing construction.

The clearly understood planning concept of Soviet-era urban planners (the central built-up area is surrounded by a wide strip of green space; parks and an industrial zone separated the city from busy roads in the east and north) has been violated.

The commercialisation phase was marked by rapid population growth not only in Vyshneve, but also in the surrounding countryside. This led to the formation of new bus routes and destinations.

The current development of the urban area is determined by the perimeter surrounding the city with newly built residential areas that have locked it into the old boundaries and the collapse of the main transport infrastructure and connectivity with Kyiv. The city of 50-70 thousand people has no hospitals, inadequate clinic facilities, and a lack of schools and kindergartens. In these circumstances, there are more and more supporters among the residents of Vyshneve for the incorporation of the city into Kyiv.

At different stages, the connectivity of Vyshneve and Kyiv by public transport had its differences. Initially, it was planned to be provided primarily by rail - a city train. The satellite city was built on the basis of an existing railway station. At this stage, in addition to trains, there was a bus route Kyiv - Vyshneve No. 82 from ATP No. 3 Electronmash to Municipal Dairy Plant No. 3 in Vyshneve. Such transport connectivity was low, and the industrial, social, and cultural ties between the core city and the satellite city were very complicated, requiring transfers from one mode of transport to another, sometimes with several transfers and changes of public transport.

At the second stage, the sharp increase in passenger traffic between Kyiv and its suburbs leads to a decrease in the role of bus services (in 2010, bus route 82 ceased to exist), the development of route services and the preservation of the role of suburban train services. Minibuses began to play a major role. At this stage, they connected the northern part of Vyshneve (divided by railway tracks) with Halytska Square (in 1952-2023, Victory Square) via Beresteysky Avenue. At the time, taxis connected the northern part of the city with Akademmistechko, Sviatoshyn and other metro stations on Beresteysky Avenue. The southern part of the city was connected by a shuttle bus to the Lybidska metro station. Thus, the routes of the taxis were not convenient for the long, winding, narrow streets of the villages - Sofiyivska

Borshchahivka for the routes of the northern part of Vyshneve and the villages of Kriukivshchyna, Hatne for the route 723.

After 2010, the population of Vyshneve and the surrounding villages experienced unprecedented growth. The large industrial zone of Vyshneve, which had been in decline at the previous stage, is rapidly modernising and growing, becoming a significant part of the Kyiv industrial zone, where electricity transmission, concrete production and the development of warehousing and the logistics hub as a whole are playing a leading role. There is a need to find new formats for the development of urban transport. The almost complete loss of the role of suburban trains for transporting passengers to and from Kyiv and the nearby suburbs and the reformatting of the directions of communication are distinctive features compared to the previous period. Thus, the southern part of the city is now connected to the Vystavkovyi Tsentr metro station not only through villages but also by a quick exit of route 732 along Vyacheslav Chornovil Street in Vyshneve and Velyka Okruzhna Road in Kyiv. This significantly reduced the time and increased the possibility of increasing passenger traffic. The situation has changed even more dramatically in the main northern part of Vyshneve, where the main exit to Velyka Okruzhna Road has also been reduced and reoriented to Kyivska Street. It is worth noting that Kyivska and Vyacheslav Chornovil streets are being used even more actively by taxis to connect the villages adjacent to Vyshneve with Kyiv.

Despite the increased capacity to cope with growing passenger traffic and shorter travel times between final stops, suburban transport in this part of the Capital Region is characterised by a number of sharply negative features. First and foremost, it is the use of fixed-route taxis as the main mode of urban transport, which has resulted in very congested traffic during peak hours and low quality of service and passenger comfort.

The problem of urban transport development in terms of connecting Vyshneve, its adjacent settlements and Kyiv is known and a number of urban planning decisions, mainly of a medium and long-term nature, are being considered for solution in the main urban planning documentation developed for Kyiv [5]. These decisions mostly relate to plans for the development and further expansion of the Kyiv metro. The key decision here is the decision to build the Podilsko-Vyhurivska line (27.0 km, 21 stations) of the subway, in particular the Okruzhna doroga station near the Zhulianskyi overpass, which will allow the construction of metro stations along the Velyka Okruzhna doroga section from the Akademistechko metro station to the Hippodrome metro station in the next twenty years.

These ideas are very productive for solving the problem of increasing the connectivity of Kyiv and its suburbs, but their main differences are the very long implementation time, which effectively deprives an entire generation of access to convenient public transport. There are threats of changes in the situation regarding the boundaries of Kyiv, excessive density of development in its near suburbs, which will offset the positive effects. We do not find any radical solutions for other modes of transport to solve the problem of connectivity between Kyiv and Vyshneve in the main urban planning documents. They are discussed on different discussion platforms and at different times. These include the idea of launching a trolleybus route from Kyiv Airport to Vyshneve, building a subway in the Kyiv suburb with a possible connection to the Kyiv metro, etc. Much attention is also paid to expensive solutions for the development of road and transport infrastructure.

In our opinion, such measures and intentions to remedy the actual transport collapse in this area of Kyiv's suburb are not enough and do not meet the challenges posed by the unforeseen rapid population growth and unreasonably fast high-rise residential development. Measures to accelerate the development of urban transport cannot be separated from the general conditions and peculiarities of the development of the Capital Region and the urban transport system in Ukraine, which determine the financial, organisational, managerial, demographic, consumer and other principles of transformation not only of urban transport in the context of ensuring the connectivity of Kyiv and its suburbs, but also in the general dimension. First of all, the legal formation of the Capital Region will fundamentally change the conditions for the development of urban transport, which will lead to rational planning and organisational and managerial support for development, and the maximum rejection of state and municipal ownership of key transport companies in Ukraine and Kyiv, which will improve the quality of urban transport services and unlock modern mechanisms for financial support for large-scale projects. We would like to add the following to the above discourse on the development of urban transport in Kyiv. We propose to abandon the idea of building a suburban metro separately or in cooperation with the main Kyiv metro. In our opinion, the idea of a large-scale, costly reconstruction and development of the Kyiv metro as a privately owned structure with lines, engineering infrastructure and new stations in the suburbs may be more productive. As for Vyshneve, we do not see the need for a metro station in this satellite city of Kyiv. It is

important for it to build new stations in the suburb adjacent to Odesa highway (Odesa metro station is planned) and Velyka Okruzhna road (Okruzhna road metro station is planned). The idea of providing transport connectivity between Vyshneve and Kyiv by electric urban transport is a productive one. We support the idea of creating a trolleybus route from Kyiv-Zhulyany airport to Vyshneve railway station. However, it may be more productive to plan not one, but several routes and use both of the new main channels of transport connectivity between Vyshneve and Kyiv - Kyivska and Viacheslav Chornovil streets.

Not only should the trolleybus route Kyiv-Zhuliany Airport - Vyshneve railway station be launched along Vyacheslav Chornovil Street, but also the trolleybus route Vystavkovyi Tsentr - Vyshneve railway station. Two more trolleybus routes should be launched from Kyiv to the main southern part of Vyshneve - Vystavochny Tsentr metro station - Vyshneve Polyclinic and Akademmistechko metro station - Vyshneve Polyclinic.

We propose to shift the focus of infrastructure development for the development of the subway and trolleybus urban transport to increase the transport connectivity of Kyiv and its suburbs to the change and development of electric urban and suburban rail transport. The experience of European cities such as Munich shows how productive suburban electric transport can be when combined with the subway. The connection planned during the construction of Kyiv's satellite city of Vyshneve was originally intended to be connected to Kyiv via suburban trains. This idea has never been implemented in a quality manner in terms of meeting the needs of the user, but this is not a problem of the idea, but a problem of planning and organisational capacity. We believe that the creation of a private railway transport concern could become the basis for providing transportation of residents of Vyshneve and adjacent settlements of the Kyiv suburb to Kyiv by modern suburban trains, such as those that run in the direction of Kyiv-Boryspil, as the main mode of transport. This, in combination with the development of the subway and trolleybus service, can provide high-quality transport for the passenger flow of the studied part of the Kyiv suburb and become an effective model for other parts of the Kyiv suburb. All the proposed measures should be implemented in the short term and in a comprehensive manner. The attraction of significant funds for the post-war reconstruction of Ukraine creates the conditions for financing such large and costly projects.

*Conclusions.* The unsatisfactory state of transport connectivity in Kyiv and its suburbs has a number of dimensions. Most of the planned transport measures in the main documentation for decades have not been implemented, and existing urban planning solutions are not being implemented within the specified timeframe. These deadlines make it impossible to improve the situation in the perspective of a human generation and are not enough. This leads to the fact that the majority of users are limited to using mostly fixed-route taxis and private transport, which complicates traffic, reduces the quality of service, and makes it difficult to effectively adapt to climate change. Addressing the transport connectivity of Kyiv and its suburbs requires comprehensive political, administrative, economic and organisational solutions. first and foremost, it is the creation of the Capital Region of Kyiv with a unified planning and management system, and improving the economy and management through privatisation of companies that operate public transport and infrastructure. The main conclusion is the need to return the leading role in passenger transport to suburban electric trains in parts of the suburbia where the railway infrastructure runs. Vyshneve, divided by railway tracks and streams into two poorly connected fragments, gains nothing from its railway location, while the main idea of building a hub city was based on the concept of benefits from such a location. Restoring the leading role of suburban electric trains will have a strong planning, economic, social and environmental effect and is in line with the principles of integrated regional development.

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