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VISUAL AND AESTHETIC EVALUATION OF THE TRACE HIGHWAYS IN THE LANDSCAPE

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Abstract: The article substantiates the relevance and considered methodological approaches to the architectural and landscape organization of road space as a set of measures aimed at improving its visual and aesthetic characteristics.

Key words: highways, architectural and landscape organization of the road environment, visual and aesthetic characteristics of the road space.

Problem statement

Highways belong to large territorial objects and are one of the components of the anthropogenic landscape, characterized by their dynamic development. According to the law of Ukraine "On highways", public roads are divided into state and local roads. State highways are divided into international, national, and regional ones. (In Ukraine, the length of international highways is 9311.2 km; the length of national highways is 7175.2 km; the length of regional highways is 8492.6 km; the total length of state highways is 46640 km). Local highways are divided into territorial, regional, and district roads (the total length of territorial roads is 21.661 km) (Postanova Kabinetu ministriv Ukrainy. "On approval of the list of public roads of state significance", 2019).

The constant growth of motorization in Ukraine (as of 2019, its level reached 232 cars/1000 people) and the volume of road traffic set new requirements for the development of the automobile road network (Three facts about the Ukrainian fleet in 2019: infographic, 2019). The State Building Regulations for

urban planning (DBN B. 2.2.-12:2018) provide for a higher level of motorization (280 cars/1000 people), which is almost half the same indicator for Western European countries (DBN B.2.2-12:2019 "Planning and development of territories", 2019).

Since the beginning of March 2020, the national project "Big Construction" has been launched in Ukraine, within the framework of which it is planned to carry out major repairs and build 6,500 km of roads from scratch by the end of 2020 (Tymoshenko K. 2020). The program provides for the construction of the Kyiv bypass road with a so-called semicircle with a total length of almost 150 km. It will have six sections and connect seven routes of international and national significance. A bridge with approaches over 25 km long across the Dnipro river will also be built. Since drivers often use Kyiv as a transport corridor for travelling between different parts of the state, the bypass road will help reduce their travel time by 40–60 minutes.

A similar transport situation has developed in Lviv, where trucks are moving along the existing Lviv bypass, which is already overloaded with public transport. In this regard, traffic jams form at the exit from the city, and transport moves at speeds of up to 30 km/h. To solve the problem, it is planned to build a bypass road exclusively for freight transport and transit cars, which will move to the international checkpoints "Shegyni", "Krakovets", "Grushiv", "Rava-Ruska" and to neighbouring regions. The new ring will connect four state roads at a distance of 20–25 km from Lviv (Krystoforov V. 2020).

In the Lviv region, one of the first roads under the Big Construction Program – Lviv – Pustomyty – Medenychi – was opened. The 47.5 km long road is the shortest route to the resort town of Truskavets and the village of Skhidnytsia, and also connects Lviv city with Pustomytivskyi, Mykolaivsky and Drohobych districts. The repaired road is an alternative to a busy M-06 Kyiv-Chop on the Lviv-Stryi segment and allows to unload the international highway by 35 %. In the region in 2020, it is planned to update another 250 km of roads (Ukravtodor opened the first road of the "Large construction" program, 2020). In Transcarpathia, it is planned to build and repair 370 km of state roads **(***Large road construction*, 2020**)** this year**.**

In terms of technical characteristics, roads in Ukraine mostly still do not meet international norms and standards, which generally negatively affects the socio-economic development of territories. The experience of developed countries shows the importance of coordinating technical issues of road construction with the problems of traffic safety, sanitary and hygienic protection and environmental protection, as well as with architectural, landscape and information aesthetic tasks: a harmonious combination of the road with the surrounding landscape, identifying natural features of the area, masking unsightly elements of the environment, improving the architectural and artistic qualities of roadside structures, etc. The road, as a component of the territory, should not only keep its integrity and picturesqueness but also, on the contrary, reveal and enhance the visual perception of natural and cultural features.

Accordingly, the study of architectural and landscape issues of road construction, taking into account the large amount of work, is relevant for Ukraine, since the quality of roads is primarily determined by the harmonious interrelationships of their functional, technical, artistic and aesthetic characteristics. In Ukraine, when designing roads, the main attention is mainly focused on engineering, technical and economic issues, but visual and aesthetic issues of road environment formation are practically not considered, although during construction such components of the natural landscape as terrain, vegetation, water mirrors, etc. are subject to changes. Earthen embankments, recesses, bridge structures, and anti-noise screens become active components of the landscape of both the road itself and the environment, forming a new type of cultural landscape at all its spatial levels (local, regional, and country). In this area, only the first steps have been taken from the point of view of landscape planning, which will allow developing certain areas in specific landscape design (*Landscape planning in Ukraine*, 2014).

Analysis of research and publications

Methods and principles of architectural and landscape design of new and reconstruction of existing roads are considered in scientific researches of V. Babkov, A. Kosarevsky, I. Morozov, Yu. Zapolsky, A. Sardarov, I. Rodichkin, O. Krzhizhanivska. The authors' works emphasize on the importance of integrated consideration

of functional, technical, architectural and landscape factors in the design of roads and an ensemble approach to the visual and aesthetic solution of highways and their surroundings.

Purpose of the article

The purpose of the article is to determine the basic principles and means of architectural and landscape organization of new and improving the aesthetic qualities of existing highways.

Research and discussion

The methodology of the landscape design of highways is widely covered in foreign and domestic literature. These issues have long been studied in the United States and Western European countries. At the end of the nineteenth century, new principles of road design were introduced in the United States, developed with the participation of landscape architects K. Wo and F. Olmsted, who developed the concept of "park roads". Such roads were conceived as "alleys of landscapes**"** for driving. After the spread of new principles of road construction in the United States, they became popular in Western Europe in the 1920s and 1930s (***Road design and protection of the character and visual features of the landscape***, 2020).

In the mid of the twentieth century, the theorist and practitioner of American landscape architecture, Dzh. Simonds wrote: "The freeway will be built based on scientific data, a diverse volume in shape, expanding and narrowing, with which the driver can move quickly, safely and freely, enjoying the landscape formed in such a way as to maintain vigour and not weaken vigilance" (Saimods Dzh. 1965).

Polish landscape architects generally rely on the theory of the so-called "internal spaces of the landscape" by Ya. Bohdanovsky and consider the highway as a kind of chain of such spaces (*Road design and protection of the character and visual features of the landscape*, 2020).

Urban researchers in the post-Soviet space at the turn of the 1980s and 1990s noted the predominant emphasis on the technical aspects of the problem in their countries, and in the early 1990s, they began to pay attention to the landscape aspects of highway tracing. Yu. Zapolsky notes that in Russian urban planning science, external transport systems are usually studied from the functional and economic side. He offers the concept of "landscape space of a highway", which allows us to consider the road as "a single architectural space in relation to the landscape and all structures serving it, both from the point of view of function and technology and from the point of view of architectural aesthetics" (Zapolsky Yu. Y., 1993). Belarusian scientist A. Sardarov suggests the concept of "road environment", considering that highways have spatial significance since their physical parameters occupy a certain space in the environment. Besides, the communication nature of a highway is that a person moving along the road continuously receives information about the environment within the visual accessibility of the route. A. Sardarov also believes that one of the tasks of landscape architecture is the harmonious inclusion of anthropogenic objects in the natural environment and names three goals: – maximum preservation of natural forms, – a harmonious combination of the road with the natural landscape, – disclosure of the natural advantages of the natural environment in the spatial corridor of the highway (Sardarov A. S., 1993).

Among Ukrainian landscape architecture theorists, this concept finds application in the principle of constructing an elongated landscape composition, divided into sections that have a certain independent meaning and are called "architectural basins" (Rodychkyn Y. D., 1990; Krzhyzhanovskaia O. H., 2015). An architectural and landscape basin is understood as a section of terrain characterized by the unity of landscape features. The boundaries of an architectural basin can include terrain fractures that limit visibility; borders of various landscapes that coincide with the borders of localities, large bridge crossings, and forest edges. Each architectural pool must have main axes or centres of architectural compositions. The main axis can be lines of the main landforms, river valleys, or a road. The centres of architectural compositions are objects that stand out from other elements of the landscape and give the pool its originality and individuality (such objects are called dominants). Localities, individual large buildings, hills, water surfaces, as well as objects and buildings of roadside complexes, structures on mountain roads, bridge crossings, and decorative landscaping groups are

dominant. Each pool should have no more than one dominant, in some cases, for example, in a monotonous open area, the dominant can visually distinguish between architectural basins. Architectural basins on the same road should be diverse (while maintaining the unity of the road style over quite long distances), which reduces the monotony of traffic. In the course of the research, the style of each architectural pool and all elements of the route are clarified. For each architectural basin, a common background (it can be created, for example, using landscaping) and dominants are provided. The missing dominants or delineations are identified, and the missing ones should be created using road architecture tools.

Architectural and landscape design of roads is subject to several requirements and recommendations aimed at preserving and improving the existing landscape, historical and cultural monuments, improving traffic safety, reducing fatigue of drivers and passengers, minimizing the harmful impact of the road on the environment. At the same time, the main principle of architectural and landscape design is to create a single architectural ensemble from all elements of the road landscape – the roadway, roadbed, linear buildings, plantings, design and equipment of the road, – and coordinate it with the landscape. These goals are achieved by comprehensively solving the following tasks:

– fitting the road into the landscape to improve traffic convenience, reveal the characteristic features of the local landscape, and prevent the highway from disturbing the local landscape;

– addition and improvement of the natural landscape through landscaping, planning and drainage earthworks, road equipment with technical and public service facilities;

– spatial tracing of the road, that is, compliance with the requirements for connecting elements of the route in space, ensuring its smoothness and clarity of direction;

– visual orientation, that is, the creation of a system of such visual landmarks that allow drivers to anticipate changes in the direction of the road and road conditions over a long distance, and thereby choose a safe driving mode.

At a time of strong investment pressure on the landscape, before designing and building, it is necessary to assess the visual impact of investments, especially large-scale ones, in particular, highways, which has led to an interest in landscape research methods. The European landscape convention since 2000, ratified by Ukraine in 2006, obliges the conduct of relevant pre-project studies (*the European Landscape Convention*, 2006).

In the United States, the VRM (*Visual Resource Management*) system was developed in 1980 and updated in 2011, which allowed it to be used in Europe. The VRM system is designed for inventory and visual analysis of landscapes of large territories before starting the design of energy, transport facilities or deforestation activities.

Inventorisation of visual qualities of a landscape aims to show landscapes of certain areas, the distance between them, and the level of visual perception. Based on these three characteristics, landscape sections are classified into four categories (I–II – highest rating, III – average, and IV – low), which later serve as source materials for design.

Assessment of visual quality begins with the beauty of the landscape by taking into account seven factors: topography, vegetation, reservoirs, colouristic, adjacent landscapes, uniqueness, and anthropogenic changes. Landscapes belong to three groups: A – the highest, B – the middle, and C – the low. At the same time, it is assumed that all territories accessible to the public have the beauty of the landscape; the highest rating belongs to landscapes with the greatest heterogeneity of components and harmonious spatial composition.

Assessment of the level of visual perception of a landscape is carried out by evaluating indicators of the method of using the territory, the degree of anthropogenic impact, public interest, the method of using neighbouring territories, the definition of special plots, and so on.

Visual perception zones are divided into three groups:

– the zone of the first and middle plan (*foreground-middleground*) is an area that is visible from each road from a distance of 5-8 km (here you can see in detail any economic activity);

– background area (*background*);

– the rest of the territory that is visible from each road at a distance of up to 24 km, a zone (*seldom-seen*) that rarely comes into view (Orzechowska-Szajda J., Podolska A. 2013).

Using of the results of the study following the described VRM technique allows to maintain the attractiveness of landscapes in the zone of visual perception of the highway and thereby improve the visual and aesthetic characteristics of its spatial environment.

Conclusions

The processes of road construction and repair in Ukraine usually considered as construction and engineering measures, practically without taking into account the visual and aesthetic characteristics of the road space and their impact on the perception of surrounding landscapes. During the implementation of major road construction and repair programs, it is significant to pay attention to the preservation of landscapes and increase their artistic and aesthetic appeal.

Architectural and landscape design should cover all stages of road formation: a feasibility study of the architectural solution of the road; pre-project analysis; development of the general scheme of the architectural solution; survey and tracing of the road; development of the project of landscaping, recreation areas, small architectural forms and elements of external landscaping. At the stage of pre-project research, it is advisable to study landscape corridors of highways (primarily of international importance) from the point of view of their visual impact on the tracing and functioning of the road, using theoretical provisions and research methods common in foreign practice.

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ВІЗУАЛЬНА ТА ЕСТЕТИЧНА ОЦІНКА ТРАСОВИХ ШОСІВ НА ПЕЙЗАЖІ

Анотація: *В статті обґрунтовується актуальність та розглянуті методичні підходи до архітектурно-ландшафтної організації простору автомобільних доріг як комплексу заходів, спрямованих на вдосконалення його візуально-естетичних характеристик.*

Автомобільні дороги є великими територіальними об'єктами і складовими елементами антропогенного ландшафту. В Україні зростання рівня автомобілізації і обсягів автотранспортних перевезень ставлять нові вимоги до розвитку автомобільної дорожньої мережі. З березня 2020 року в країні започаткований і реалізується національний проект "Велике будівництво". В рамках цього проекту планується зробити капітальний ремонт і побудувати 6500 км доріг до кінця 2020 року.

Досвід розвинутих країн свідчить про важливість узгодження інженерно-технічних питань дорожнього будівництва з архітектурно-ландшафтними та інформаційно-естетичними задачами. Передусім – це гармонійне поєднання дороги з навколишнім середовищем та виявлення природних і культурних особливостей ландшафту місцевості й її трасування. З огляду на великий обсяг спорудження автодоріг, дослідження архітектурно-ландшафтних питань, формування дорожнього простору є актуальними для України.

Такі питання тривалий час досліджуються в США та західноєвропейських країнах. У 1980 році в США була створена, а в 2011 році оновлена система VRM (Visual Resource Management), що дозволило використовувати її і в Європі. Система VRM призначена для інвентаризації та візуального аналізу краєвидів великих територій перед початком проектування об'єктів енергетики, транспорту та заходів з вирубування лісів. Європейська Конвенція Ландшафтів, ратифікована Україною у 2006 році, зобов'язує проведення відповідних досліджень.

Проводячи великі програми будівництва і ремонт автошляхів, необхідно надавати належну увагу збереженню ландшафтів і збільшенню їх візуально-естетичної привабливості. З цією метою доцільно використовувати теоретичні положення та методики досліджень, що використовуються в зарубіжній практиці.

Ключові слова: *автомобільні дороги, архітектурно-ландшафтна організація середовища автодоріг, візуально-естетичні характеристики дорожнього простору.*