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METHODOLOGICAL APPROACH TO SUBSTANTIATING ECONOMICALLY FEASIBLE VOLUMES OF WORK IN THE ROAD SECTOR

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Abstract: This paper presents the results of a study aimed at developing methodological bases for selecting the most rational management decisions in the current economic situation to improve the transport and operational condition of individual sections of roads and the development of the national road network. The relevance of road infrastructure modernization as a system of measures aimed at improving it and improving consumer qualities is proved. In this regard, the theoretical substantiation of the content of the concept "modernization of highways" and the characteristics of the types of work performed in this case are presented.

Key words: Highways, road management, modernization, planning, reconstruction, service life.

Introduction.

Because road development is a priority in our country, the law "On Highways" was passed on October 2, 2007. The law specifies 30 points for highway design, construction, reconstruction, and operation. [1]

Road transport accounts for 96.6 percent of all passengers and 81.3 percent of all freight in the country. As a result, road transportation is critical to our country's economy. The overall length of the country's road network is around 184,000 kilometers. [1]

In support of these efforts, President of the Republic of Uzbekistan Sh. M. Mirziyoyev signed a bill on steps to strengthen the traffic management system on February 14, 2017. [2]

It is proposed to build an effective road management system based on an integrated approach to the design, construction, and operation of roads and artificial structures, as well as improve the finance system and the quality of design and construction work, based on this. In the context of globalization and international collaboration, the modern economy faces a shortage of high-quality road transport infrastructure, necessitating the efficient utilization of the historically built working road network. Their consumer properties have an impact on an organization's transportation expenses, and the infrastructure's modernity and overall network development have an impact on the ability to deploy and the outcomes of transportation and logistics services. The specifics of the road economy's functioning are such that the organizational, technical, socio-economic, institutional, and environmental tasks solved when managing the state of the road

network directly or indirectly affect all sectors of the country's economy and spheres of people's lives, giving the decisions made a unique economic status.[1]

The long-term nature of road operation and the possibility of continuous use to meet the economy's infrastructure needs led to the fundamental construction of the road economy as an economic system, with the allocation of not only management objects, but also cyclically repeating flow processes formed by the main types of activity, which serves as the foundation for developing recommendations for its economic development.

The country's road sector faces completely new scientific tasks. The conceptual apparatus needs to be clarified, taking into account the peculiarities of ongoing economic processes, strengthening the interconnections of enterprises in the logistics systems of the road sector and the transport industry, taking into account the components of information and integration interaction with external systems. There is no economic justification for the feasibility of systematic development of roads based on the management not of individual investment projects of isolated road sections, but of a set of interrelated strategic design decisions within the boundaries of a long-term calculation period. No methodological support has been developed for economically viable investment decisions in the logistics systems of the road sector, taking into account the rational timing of various types of road works in conditions of limited funding.

At present, it is necessary to strengthen the impact of the sector under study on the growth of freight turnover, the speed of transportation, and thereby maintain the required level of transit, which is especially important for the Republic of Uzbekistan.

Theoretical prerequisites for expanding the classification of economic activities in the road sector. A study of the dynamics and structure of traffic flows on the roads, starting from 2010, shows heterogeneous trends in changes in their composition and intensity - from rapid growth to its complete absence and even decline, compared with the previous period[2] .Uneven load on road surfaces and congestion of roads cause differences in defectiveness and degree of wear in sections of the road network, and also necessitate the implementation of a set of measures to bring the transport and operational condition of the road to the standard. The current classification of works performed on highways to improve their consumer properties includes construction, reconstruction, overhaul, current repairs and maintenance[3;4]. The scope of work, deadlines and criteria for the appointment of these activities are regulated by various regulations [3; 5]. The exception is the maintenance of roads, carried out continuously throughout the calendar year. At the same time, the set of maintenance works includes measures that directly affect the throughput of the road and the speed of the traffic flow. This is most clearly seen in the autumn-winter period, when, as a result of untimely snow removal or ineffective control of winter slipperiness, the speed of vehicles decreases significantly, which causes significant economic losses in all sectors of the economy.

As a rule, in conditions of significant growth and positive dynamics of traffic intensity, it is required to carry out work on the composition of those classified as reconstruction. If, at the same time, the magnitude of the predicted traffic intensity does not create prerequisites for increasing the technical category of the road and changing the main parameters of the plan and profile, then the reconstruction with the transfer to another technical category is unjustified and economically unfeasible.

At the same time, a major overhaul does not always make it possible to fully improve the condition and ensure the achievement of the required level of all transport and operational properties of the highway (vehicle speed and safety at any time of the year, throughput and load level (the ability to pass vehicles with a certain axle load). total load capacity and dimensions)) for a long period.

In such a situation, it is advisable to supplement the current classification of works with the introduction of a qualitatively new type of economic activity, which allows not only to extend the durability of the road in the existing technical condition, but also to bring its economic resource to a new level without carrying out reconstruction, if the economic feasibility of this measure is

not sufficiently justified and not backed by a promising increase in freight traffic. In such conditions, it is possible to offer a complex of works on modernization.

The Decree of the President of the Republic of Uzbekistan UP-5890 dated December 9, 2019 “On measures to deeply reform the road infrastructure system of the Republic of Uzbekistan” states that it is planned to “... increase the transit and logistics potential of the republic through the development of a network of modern highways of international importance and expressways, and also their integration into international transport corrid;

consistent reduction of the burden on the budget by attracting investments, funds from international financial institutions, as well as implementing projects on the terms of public-private partnership; a gradual increase by 2022 of the cost of operating roads by at least two times; application of an internationally recognized methodology for selecting and evaluating the most priority projects in the field of road construction, as well as predicting the effectiveness of their implementation; introduction of new technologies and programs for the management of road assets that monitor the condition of roads, collect and maintain the necessary statistical data;

application of modern traffic management systems in order to effectively use the existing road infrastructure…”. At the same time, an analytical study of the current regulatory and technical documentation in the field of roads and road activities made it possible to establish that the classification of the types of work performed on roads does not contain the term "modernization"[3;4]

The concept of "modernization" in English means "modernization" and is determined by the presence of a number of characteristics inherent in modern roads. According to the recommendations of the Board of the Eurasian Economic Commission dated December 25, 2018 No. 29 “On the requirements for roads planned for inclusion in the list of Eurasian transport corridors”, such characteristics should include the presence of a design (normative) load on a single axle of at least 11, 5 tons, arrangement of special technical means operating in automatic mode, provision of roadside service facilities.

The system of normative documents of the Republic of Uzbekistan corresponds to the new economic conditions, legislation and management structure. The main direction of the regulatory documents of the System is the protection of the rights and legally protected interests of consumers of construction products, society and the state in the development of independence and initiative of enterprises, organizations and specialists.

The legal basis of the system is the laws of the Republic of Uzbekistan and, above all, the "Urban Planning Code", the regulations of the President and the Cabinet of Ministers on construction issues that regulate the relationship of participants in the investment process, defining their rights, duties and responsibilities for the quality of products, works and services performed. The system of regulatory documents in construction operates within the framework of the standardization system of the Republic of Uzbekistan for O'z DSt 1.0 and O'z DSt 1.11.

Reconstruction and modernization are objects of technical regulation and standardization in construction in accordance with the Town Planning Norms and Rules and Building Norms and Rules. ShNK 1.01.01 - 09 and “The system of regulatory documents in construction. Basic provisions” ShNK 2.05.02-07 “Motor roads” and ShNK 3.06.03-08 “Motor roads”.

In this case, reconstruction is a subspecies of modernization. Then, the cost of work performed during repairs refers to the expenses of the current period, and during modernization it should be attributed to capital costs, increase the initial cost of the highway and be further accounted for through depreciation.

In the current economic situation, modernization may become more necessary, compared to reconstruction, as an event not only to improve the main technical and economic indicators and consumer properties of an existing road structure, but also a fundamentally new approach to choosing the date and place of its implementation, taking into account the specifics of such an object. fixed assets, like a highway. The essence of the proposed approach is as follows.

The period before partial or complete reconstruction can be 50-60 years. During this time, in the context of the current pace of development of innovations in engineering, technology and the IT-sphere, it is obvious not so much the physical as the obsolescence of the road, road structures and surrounding infrastructure facilities. Physical wear and tear is constantly eliminated by ongoing maintenance and repair activities. Moral - requires updating the object, taking into account the requirements of the country's economy. There is a shift in the system of values by moving from the usual role of the road network to understanding the role and importance of each highway in the economy.

The prerequisites for increasing the volume of modernization of roads are changes in the public consciousness of the role and place of roads in the economy, expressed in the development of the country's transport and logistics system, the formation of markets for transport and road construction services[7-9].

A factor in the modernization of roads is the overcoming and replacement of generally accepted technologies that impede qualitative changes and, as a result, economic growth, with technologies that motivate, on the one hand, road users to meet their needs, on the other hand, road construction organizations for innovative activities to development, creation and application of new technologies, as well as the generation of new organizational and economic relations within the boundaries of logistics systems.

Thus, it is proposed to consider the modernization of the highway as a factor contributing to the economic growth of the area of gravity of the road due to the timely improvement of not only high-quality, but also aesthetic planning decisions taken in order to increase its attractiveness for users within the framework of a single global transport space (roadside service , logistics infrastructure).

For the purpose of the possibility of practical application of the presented approach, let us clarify the definition of the modernization of a highway in relation to the ShNK 2.05.02-07 "Motor roads" and the ShNK 3.06.03-08 "Motor roads".

Modernization of a highway is a set of works and measures aimed at improving and improving the consumer qualities of an existing highway or its individual sections and road structures, bringing performance indicators to the level of modern requirements in parameters corresponding to the actual technical category of the road.

In order to ensure the functionality and practical significance of the proposed concept, a classification of works related to modernization has been developed:

- changing the elements of the plan with an increase in the radius of the curve in order to increase the speed and safety of vehicles;
- increasing the stability of the subgrade;
- increasing the width of the carriageway without changing the size of the subgrade;
- reconstruction of pavement for the design load, ensuring the required evenness according to the international index of evenness and road structures;
- reconstruction (if necessary) and arrangement of recreation areas equipped with modern means of sanitary and hygienic and consumer services for road users;
- reconstruction (if necessary) and installation of engineering and technological complexes for traffic control and winter maintenance based on the latest technologies;
- reconstruction (if necessary) and installation of engineering equipment of the road, communications, modern information systems operating in automatic mode to improve the safety of roads, carry out weight and overall control of vehicles, improve informing road users about the traffic situation;
- arrangement of intersections and construction of transport interchanges in accordance with the requirements for the existing technical category;
– construction of new roadside service facilities and development of existing ones by improving the quality and complexity of the services provided, included in the road modernization project.

- organization of traffic, including temporary, arranged for the period of construction and installation work.

The presented list is advisory in nature and is subject to refinement taking into account practical experience in the implementation of infrastructure projects in the road sector. Its scientific value lies in the proposal and choice of directions for a qualitative new development of roads, which, according to the author, should set the vector for the digitalization of the road sector [10].

Separation of infrastructure modernization and reconstruction projects is economically necessary in conditions of limited resources. An analysis of the cost of these types of work allows us to conclude that the modernization of the highway should be a less expensive project compared to reconstruction, primarily due to the smaller amount of work and the absence of the need to rebuild the existing road structure for transfer to a higher category.

An exception may be cases of applying fundamentally new innovative solutions that require large initial investments, which, as a rule, should be compensated by a large effect during subsequent operation.

Methodical approach to substantiation of the scope of work in the road sector.

Modernization is a transition to fundamentally new consumer characteristics (level of convenience, speed, strength, reliability, safety, environmental friendliness). The choice of objects for its implementation is based on the difference of roads in terms of economic potential, transport and logistics significance, differentiation of functions performed and related activities in the road sector in the provision of road services.

Not all highways need modernization, but only those that are most significant for the country's economy. With this approach, the main qualitative characteristics of the road are not the number of lanes and the quality of the pavement, but the solution of the problems of providing transport links, transit traffic and providing conditions for the provision of the entire range of transport and logistics services.

The developed theoretical provisions need methodological support, which allows further implementation of the proposed provisions in practice. There is a need to determine rational terms for the modernization and reconstruction of the road.

Numerous studies of road operation experience conducted by V.K. Apestin, A.P. Vasiliev, V.N. Efimenko and others made it possible to establish the recommended service life of roads before and after reconstruction work. Thus, the time interval between the construction and reconstruction of the road is on average 2.0 - 2.5 times longer than before the modernization. On highways of categories I and II, the service life before modernization is 25-30 years, before complete reconstruction - 50-60 years; for category III, respectively, 20 - 30 and 45 - 50 years; IV category - 15 - 30 and 40 - 50 years old [12, p. 164].

An analysis of the current road works planning system showed that the length of specific roads and the timing of the implementation of measures related to the operation and bringing the transport and operational state to the standard are determined on the basis of diagnostic data and assessment of the condition of each section of the road. The criteria for assigning types of repair measures depending on the actual state of the road are regulated by regulatory documents [5].

As noted earlier, the dynamics of traffic intensity is uneven on all road sections. Therefore, the need for various types of road works throughout the network is also unevenly distributed both in time and in places. Modernization and reconstruction may not be required at all on sections of roads that are not sufficiently loaded with traffic. There is a need for a reasonable determination of the annual length of roads that require work to improve them.

The current system should be improved with an emphasis on economic development, and the selection of sites for various activities should initially be carried out taking into account the transport and logistics significance of the road as part of the road network [11]. The implementation of the proposed principle of planning road works is based on the method of setting deadlines for performing work during the reconstruction and modernization of roads developed by professors A.P. Vasiliev and V.N. Efimenko [12].

The coefficient of useful use, which takes into account the share of the length of existing roads, on which modernization or reconstruction is required in the near future, as well as major and current repairs, is assigned according to values that take into account the distribution of roads by significance groups. This choice is justified by the use of partial coefficients characterizing the strength of the pavement, as well as traffic intensity, as part of the integral criterion, which makes it possible to correlate the obtained value with the technical category of the road.

In turn, private coefficients characterizing the logistical, economic and social components strengthen the relationship of the proposed indicator with the degree of significance of the types of work being implemented for the country's economy. Overhaul periods for major and current repairs are accepted in accordance with the recommendations [5], modernization and reconstruction - in accordance with the methodology of A.P. Vasiliev[12].

Considering that in the future it is expected that passenger cars will grow up to 60-70% in traffic and the use of more durable and low-abrasion materials in road surfaces (crushed stone-mastic asphalt concrete mixtures, materials with polymer additives, based on composite materials, etc.), options are being considered for postponing carrying out major and current repairs while maintaining year-round maintenance.

The constructed graphs of the dependence of the total discounted costs on the period of extension of the period until the overhaul for roads of all categories showed that the choice of a rational strategy for repair measures when managing the state of roads allows you to get an economic effect. The performed analysis made it possible to establish the expected extension of the service life of the pavement before the overhaul from 25 to 70% of the standard overhaul period, depending on the category and significance of the road. The effect of postponing the period of overhaul is 5–15% of its cost.

Overall.

Thus, the widespread use of innovative digital products, the capabilities of the satellite navigation system, the development of an intelligent transport system and modern logistics technologies, etc., have caused an urgent need to “modernize” roads, not only in the field of design and technological solutions, but first in the intellectual sphere of their use as a strategic resource that provides road users with such infrastructure conditions that, along with the technical condition, would contribute to an increase in the economic efficiency of transport and logistics activities in the country's economy.

The significance of the proposed approach lies in the fact that the economic activities of the road sector (construction, reconstruction, repairs and maintenance) are studied as the main component of the servicing infrastructure of the transport and logistics services market, i.e. the implementation of road projects is closely interconnected with the organization of the delivery of goods and passengers through information support. In this interpretation, the economic development of the road sector, which ensures the economic growth of the state, is seen as a process of qualitative changes in the state of roads, leading to their reliable operation, the growth of markets for road construction and motor transport services. The proposed theoretical foundations and methodological support for substantiating economically feasible scopes of work will improve the effectiveness of management decisions made in the road sector regarding the development of the road network. The criterion for determining the economically viable scope of work is the minimum total (in terms of structure and time) discounted costs resulting from: firstly, supplementing the life cycle of roads with a modernization stage that allows bringing the facility to a qualitatively new level based on the use of innovations; secondly, building such a strategy for repair activities that would allow to postpone the terms of more expensive types of work as much as possible.

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