Specific features of improving automobile road complex of the Republic of Uzbekistan

Aziz Khalmukhamedov¹* and Akhmadjon Anvarjonov¹

¹Tashkent State Transport University, 1, Temiriyolchilar str., Tashkent, 100167, Uzbekistan

Abstract. Automobile and Road Complex (ARC) is a complex technical and economic system, including means of transport (automobile transport) and communications (automobile roads), united by a single goal - to provide constant safe transport of goods and people with maximum efficiency. The term "ARC" [1, 2] more objectively reflects the essence of the efficient transport process carried out by vehicles on roads. It emphasises the equivalence of the contribution of vehicles and roads to a single transport process. The problem of the efficiency of the ARC function is not only of terminological significance, but also touches on the issues of improving the efficiency of the road and motorway economy as a whole.

1 Introduction

The relevance of the topic lies in the need to eliminate the existing negative trend: the carriers are constantly demanding good roads (they position themselves as the "main" in this process), although objectively they are destroying them with increasing intensity (for example, increasing axle loads up to 13-14 tonnes), leaving almost no compensation for the repair and maintenance of the road network. It is clear that even minor overloading does not pass without consequences for the condition of the road surface, and major overloading poses a serious threat to the pavement's useful properties, contributing to its accelerated deterioration and reduced safety [1-4]. Various methods are therefore used in different countries to prevent heavy vehicles from damaging roads. The main ones are: charging tolls, limiting the speed of HGVs, banning heavy oversized vehicles and introducing seasonal traffic restrictions in spring and summer [5, 6].

This situation has a direct impact on the financing of road works. At present, car traffic is financed on a self-financing basis, while the costs of road workers are financed from the state budget (which is usually insufficient). There is a clear economic imbalance here, although it has long been obvious: whoever drives on the roads - pays. Incidentally, this principle is the basis of all systems of transport services on all existing modes of transport [7, 8].

The economic efficiency of ARC functioning in the macroeconomic sense is determined by the amount of necessary costs and the profit received by the economic entities of transport and road workers. Accordingly, the process of cost reduction in the efficient

* Corresponding author: khalmuka@gmail.com

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functioning of ARC is the basis for optimal efficient operation of this complex as a whole [9].

Since the generalised product of ARC is the optimal automobile transport process (freight and passenger transport), it is necessary to solve the problem of increasing its efficiency through the rational joint use of fixed assets, which are still separately owned by vehicles and roads. The effective functioning of the national economy is strictly dependent on the availability of a developed and reliably functioning road network. The higher the density and quality of the road network, the richer the country. The road sector requires adequate funding, and the question is how much of GDP society can afford to allocate to it. Developed countries, which have largely completed their national road networks, continue to invest in the road sector, which stimulates the development of industry, agriculture, commerce, etc., as well as other sectors. Each job in the road sector creates up to 20 jobs in related industries. Public funds invested in the road sector significantly increase revenues to the state budget and provide an opportunity to earn hundreds of thousands of citizens [10].

The development and effective functioning of industrial production, construction, trade, services and agriculture is possible only with a balanced, integrated development of the country's ARC. The main purpose is to supply products of various branches of industrial production, raw materials and semi-finished products, as well as to satisfy the needs of the population in spatial movement. The result of ARC activity is a service that changes the spatial position of goods. In industrial production, trade and services, the cost of transported goods increases during transport, as transport involves the use of material and technical resources, including the improvement of traffic and operational indicators of motorways [11, 12].

2 Materials and methods

The functioning of the ARC is inextricably linked to the activities of automobile transport and road infrastructure. The interaction of these two components of a single economic system is determined by the technical characteristics of automobile transport and the traffic and operational indicators of automobile roads. The speed of traffic flows, traffic capacity, traffic safety and road ecology depend significantly on the technical level and operational condition of the road. With the increase of technical speed, the productivity of automobile transport increases with the constant amount of fixed costs, which reduces the cost of automobile transport per 1 t/km [13, 14].

In conditions of formation of market mechanisms of economic management, development of methods of optimal organisation of management of ARC functioning is an important task of the national economy of the country. In recent years, efforts have been directed to development of optimal organisation and management of operation of motor roads, which is due to a number of objective and subjective reasons. Subjective reasons include those related to the need to maintain the existing road network in conditions of catastrophic shortage of financial resources, and objective reasons include the increasing attention to the issues of road maintenance. As the road network is formed in all developed and developing countries of the world, aspects of road repair and maintenance, i.e. maintaining and bringing the transport and operational performance of roads to the requirements that meet the needs of users for comfortable, unimpeded, safe and economical movement at standard speeds and loads, are of great importance [15].

Consumption characteristics of motorways are directly dependent on their transport operational condition, which is characterised by indicators of the technical level and operational condition of the road. Based on this, the implementation of research on improvement, development and implementation of intensive resource-saving technologies for managing the pavement condition of automobile roads leads to the need to solve a
number of interrelated problems. From the point of view of system analysis in the
consideration of ARC, the structural scheme of optimal management of the state of
transport and economic indicators (TEI) consists of a number of interrelated tasks:
- Social needs in ARC;
- Financial and economic possibilities of ARC creation;
- ARC state management (economic-static management models);
- Correlation of the achieved results with the set objectives.

In order to ensure that roads meet the requirements of modern and future road traffic, it
will be necessary to further increase capital investments, including investments. Rational,
scientifically substantiated spending of these investments is an important national economic
task [15, 16-26].

The practical implementation consists in the development of methods and scientific
validity of evaluation indicators, which form the basis of a comprehensive approach to the
choice of the repair strategy, allowing to forecast possible changes in the TEI of the road at
various stages of service in specific for the considered road changing operating conditions,
and thus to make adequate management decisions. This makes it possible to expand the
improvement of the management of the road repair complex at the stage of planning road
works, when justifying the need for necessary funds and their distribution in time to assess
the developed technical solutions for the assignment of types of road works from the
standpoint of economic feasibility [3].

Currently, there is no legally approved normative document that allows to calculate the
economic efficiency of sectors of the national economy depending on the development of
the road network and road works [7, 9].

In the conditions of limited resources for the repair of the road network, the planning of
these works is significantly complicated and the responsibility for decisions increases.
Therefore, it is impossible to set the task of simultaneously bringing the traffic and
operational condition of the entire road network into compliance with legal requirements.
As a result, the development of a methodology for planning repair works is aimed at
justifying the most rational set of roads, sections and types of works and maximising the
economic effect for users. In this case, it is necessary to first determine those parameters or
road sections that will contribute to the greatest reduction in transport costs, thus avoiding
significant additional costs due to non-performance or inadequate repair of motorways [11].

Objective assessment of the effectiveness of repair measures is related to the evaluation
of a set of technical and economic indicators that reflect the required standards to ensure:
speed and safety of traffic on the road, strength of the road surface and artificial structures,
optimal transport costs, reasonable costs of road repair and maintenance [14, 15].

Quantitative assessment of the necessary costs for the reproduction of the highway
objectively determines the need for financial, material and technical resources. On this
basis, a quantitative analysis of the effectiveness of the costs for the reproduction of the
highway as an object of economic activity is carried out. The management of the state of
the road network is reduced to the definition of a set of regulatory effects on the state of the
road, which will minimise the costs in the automobile transport complex. Such regulatory
impact is the development and implementation of the most effective repair measures. The
objective is achieved by solving the problem of ensuring the minimisation of transport costs
in the automobile transport complex when implementing the most effective repair measures
at the stage of the road life cycle [2, 5].

The obtained result allows to allocate the available limited material and technical
resources with maximum efficiency. The economic component of the impact is a functional
assessment of the financial impact of implementing the adopted repair plan, which is
carried out on the basis of the method of statistical modelling of the functioning of the road.
The financial impact of the response is the sum of the benefits received in the non-transport and transport spheres [2].

The economic effect in the non-transport sphere is connected with the fact that the time of transportation of goods is organically connected with the time of money turnover. The speed of transport, acting as a total value of the technical speed of movement of vehicles and the organisation of movement of commodity masses (objects of transport), has a direct influence on the absolute and relative speed of turnover of funds of industrial enterprises and trade organisations. Increasing the rate of turnover leads to acceleration of the process of expanded reproduction [11, 12].

The transport economic effect is achieved by satisfying the demand for cargo and passenger transport, improving its safety and quality, competitiveness of domestic carriers on the domestic and foreign markets of transport works and services, creation of conditions for financial recovery of transport enterprises through investment activity [5].

The mechanism of the formation of the positive effect, which will have an increase in the efficiency of the functioning of the ARC on the economy of the country, is shown in Fig. 1.

![Fig. 1. Impact of ARC efficiency improvement on the national economy.](image)

### 3 Conclusion

The automobile and road transport complex is the most important component of the economy, a factor ensuring its unity and integrity. The development of the automobile and road transport complex largely determines the national security of the country, the solution of social problems. Sustainable and efficient operation of transport allows other sectors of the economy to reduce the cost of goods and services, which stimulates the growth of production and consumption, as well as contributes to the expansion of international relations, integration of the national economy into the global economic system.

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