

Comprehensive assessment of the impact of road infrastructure development in a rural municipal area (Russia)

Evaluación integral del impacto del desarrollo de la infraestructura vial en un área rural municipal

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Contents

- [1. Introduction](#)
- [2. Methodology](#)
- [3. Results](#)
- [4. Discussion](#)
- [5. Conclusions](#)

[Bibliographic references](#)

ABSTRACT:

The quality of life in rural municipalities depends on a specialized service delivery system and infrastructure facilities. With the help of the road infrastructure, the problem of smoothing the economic effect of the location factor, improving accessibility, ensuring sustainable economic relations is being solved. The purpose of this work is to present the author's conceptual approach to solving the problem of integrated assessment of the consequences of the development of road infrastructure. To achieve this goal, the authors solve the following problems: generalization and development of theoretical positions for assessing the consequences of the development of the rural road network; systematization of the consequences and effects of road infrastructure development; justification of proposals for compensation for damage from road construction; improving the practice of making organizational and territorial decisions in the development of road infrastructure. The consequences of road infrastructure development should be assessed at all stages of the production process. To contribute to this task should the development of pre-project and project organizational-territorial documents.

RESUMEN:

La calidad de vida en los municipios rurales depende de los sistemas de prestación de servicios especializados, instalaciones e infraestructura. Con la ayuda de la infraestructura vial se está disminuyendo el problema del efecto económico asociado al factor de ubicación, mejorar la accesibilidad y garantizar relaciones económicas sostenibles. El propósito de este trabajo es presentar el enfoque conceptual de los autores para resolver el problema de la evaluación integrada de las consecuencias del desarrollo de la infraestructura vial. Para lograr este objetivo, los autores resuelven los siguientes problemas: generalización y desarrollo de posiciones teóricas para evaluar las consecuencias del desarrollo de la red de caminos rurales; sistematización de las consecuencias y efectos del desarrollo de la infraestructura vial; justificación de propuestas de indemnización por daños ocasionados por la construcción de carreteras; Mejorar la práctica de tomar decisiones organizativas y territoriales en el desarrollo de infraestructura vial. Las consecuencias del desarrollo de la infraestructura vial deben evaluarse en todas las etapas del proceso de producción. Para contribuir a esta tarea se debe

Keywords: Rural municipal district, road construction, road infrastructure, assessment of the consequences of road construction, social development of rural areas

desarrollar documentos de organización territorial del anteproyecto y del proyecto.

Palabras clave: Distrito municipal rural, construcción de carreteras, infraestructura vial, evaluación de las consecuencias de la construcción de carreteras, desarrollo social de las áreas rurales

1. Introduction

The quality of life in rural municipal areas depends on many conditions and factors that at first glance are not directly related to the rural way of life, but affect the rural way quite significantly. We are talking about the benefits of civilization, facilitating the life of villagers, and smoothing the differences in the quality of life between the population of villages and cities. These benefits are provided by a specialized service delivery system and specific objects that are commonly referred to as infrastructure.

Without infrastructure, which we regard as the basis for the livelihood of people, a full-fledged life in rural areas is impossible. The lack of compulsory infrastructure makes the existence of rural areas as places of residence and work of people unpromising. Such an existence has no future, no prospects for development, there are no prerequisites for rooting people in rural municipalities.

The information openness of modern society makes it impossible to preserve the pseudo-peasant idea of life in the village, and provides conditions for a qualitative change in the lives of people in rural areas.

The necessary life support services for people are created by complex engineering structures reflecting the level of scientific and technological development of society. These are objects and lines of power supply, communications, supply of the population and production of water, sewage, transport services, logistics complexes, service centers and provision of normal operating conditions for engineering networks and individual engineering facilities.

The issues of transport construction and transport services for the population, including people living in rural municipal areas, are of particular relevance in the modern economy. High-quality transport infrastructure can solve many problems of rural residents. Conversely, the lack of the latter may make it impossible for people to live in rural areas.

From the point of view of the general economy, location is the most important factor ensuring the development of any economic system. The availability of certain objects, systems, services, agents, ensuring stable economic relations in the course of economic activity can reduce the different conditions by location. This problem is solved with the help of good transport infrastructure and high-quality vehicles.

A special place here is occupied by the road infrastructure, which ensures the satisfaction of the complex economic interests of business entities and the social interests of people living in the territory of the highway routes.

In the process of construction and operation of linear road objects, the economic interests of many business entities and individuals are affected. Roads are complex engineering structures that require detailed comprehensive surveys, technically accurate design, large-scale construction and installation work, continuous operational, including rehabilitation and repair work. The specific characteristics of the road infrastructure are: a relatively small area of individual objects, a significant length of linear objects, violations in the organization of the territory of many adjacent land uses, a regulated mode of intersection of roads, restrictions on the use of adjacent land, the environmentally unfavorable impact of the operated road infrastructure objects on the adjacent land, air, water, flora, fauna.

The importance of road infrastructure for rural development cannot be overestimated. The road network creates prerequisites for the growth of the population in rural municipal areas, increasing the income level of residents, gives impetus to the development of entrepreneurship and the economy, provides the necessary social and economic ties. The road network brings the residents of the village closer to the benefits

of civilization, which are concentrated in large cities, leveling different living conditions in rural and urban environments.

A pressing scientific problem today is the development of theoretical and methodological guidelines for assessing the positive and negative consequences of road construction in rural areas, eliminating the negative consequences of road network development, and ensuring the economic and social development of rural municipal areas using modern road infrastructure.

The purpose of the presented scientific work is to present the author's conceptual approach to solving the problem of a comprehensive assessment of the consequences of the development of road infrastructure in a rural municipal area.

To achieve this goal, the authors solve the following problems: the development of theoretical principles for assessing the consequences of the development of the rural road network; systematization of the consequences and effects of road infrastructure development; justification of proposals for compensation for damage from road construction applied to a rural municipal area; improving the practice of making organizational and territorial decisions in the development of road infrastructure in a rural municipal area.

The study of this scientific problem requires the use of an integrated methodological approach and special scientific methods at certain stages of research work.

2. Methodology

Analysis of the modern prerequisites for the development of the practice of establishing and stabilizing the consequences of the development of the road network in rural municipal areas is carried out using an analytical research method. For the development of theoretical positions of the studied direction, the methods of logical modeling and monographic were used. The determination of the size and types of damage caused by the development of road infrastructure in a rural municipal area is made on the basis of the use of a calculation-constructive research method. This provided a unified methodological basis for the research results.

3. Results

Road construction on the territory of rural municipal areas is accompanied by a number of positive and negative effects, which are manifested in environmental protection, social and economic areas. From the point of view of nature conservation, the effect of the development of road infrastructure is negative. In the social sphere, road construction is definitely positive. In the economic sphere, the effect of road network development is both positive and negative. On the one hand, this allows us to develop the supply sphere and quickly provide resources for business entities, on the other hand, the construction of engineering structures is usually accompanied by damage caused to the established system of land use and to the subjects through which the road under construction passes. Therefore, an important task of improving the road network in a rural municipal district is to reduce the negative effects of construction and enhance the positive effects of the construction of roads, that is, to ensure a positive overall balance of these effects.

The positive and negative consequences of the construction of roads in the rural municipal area should be assessed at all stages of the production process. Table 1 shows the author's systematization of the main consequences of the development of the rural road network.

Table 1

The main consequences of the development of road infrastructure in a rural municipal area

Stages	Positive effects	Negative effects
	1. Improving the investment	1. The need to reorganize and change the

1. Road design.	<p>attractiveness of the territory.</p> <p>2. Creating conditions for the future development of the economy.</p> <p>3. Positive social expectations in connection with the upcoming infrastructural development of the district.</p>	<p>specialization of production, changes in business plans of entities that fall into the zone of alienation of land property.</p> <p>2. Negative expectations related to forthcoming land seizures and other real estate for road construction purposes.</p>
2. The construction of the road track.	<p>1. Improving the conditions of economic development of a rural municipal district.</p> <p>2. The development of trade in the municipal area.</p> <p>3. Improving the conditions of accessibility of economic and social services.</p> <p>4. Increasing the level of business and population mobility in the territory of a rural municipal district.</p> <p>5. Creation of new workplaces.</p>	<p>1. Reduction of land and property complex of the agricultural economy and other sectors of the economy.</p> <p>2. Alienation of real estate, crops, perennial plants.</p> <p>3. Violation of the system of the existing organization of the territory.</p> <p>4. Deterioration of the environmental conditions of the territory.</p> <p>5. Reduction of workplaces in reorganized and liquidated industries.</p>
3. Operation of the road.	<p>1. The increase in traffic in the rural municipal area.</p> <p>2. Expansion of the spheres of economic activity in the region and the capabilities of individual economic entities.</p> <p>3. Increasing the level of material and technical supply of business entities.</p> <p>4. Improving the living conditions of people living in the territory of the municipal district.</p> <p>5. Creating prerequisites for the integrated development of the municipality.</p>	<p>1. The deterioration of the organizational and territorial conditions of agricultural farms near the road.</p> <p>2. Pollution of land, water, air resources as a result of the operation of road transport.</p> <p>3. Necessity of the device of crossings, transitions of the road providing its regulated and safe crossing.</p> <p>4. Violation of the habitual rhythm of life of the local population, changes in the living and working conditions of the inhabitants of the rural municipal district</p>

At the design stage, the development of road infrastructure causes an increase in the investment attractiveness of the territory, the creation of conditions for the development of the economy, the formation of a positive attitude in society due to the promising improvement of the conditions of accessibility to the territory. Along with the positive consequences of the development of the road network in the region, negative ones can be identified. These include: the need to reorganize and change the specialization of production, adjusting the management plans of those entities whose land falls into the construction zone; negative expectations of economic entities associated with the upcoming seizures of land and other real estate for road construction.

At the construction stage of the road facility, the conditions for economic development of the district, the development of commodity turnover in the municipal territory are formed, conditions for the accessibility of economic and social services are improving, prerequisites are being created for increasing the mobility of business and the population, and new workplaces are being created. The negative consequences at the road construction stage include: a reduction in the land and property complex of agriculture and other sectors of the economy; alienation of real estate, crops, plantings; destruction of the territory organization system; the deterioration of the environmental

conditions of the territory; reducing the scope of labor in the reorganized and liquidated industries.

During the operation of the road, cargo traffic increases in the territory of the rural municipality, the economic activities in the area expand and the opportunities of economic entities increase, the level of material and technical support of the economy increases, living conditions of people improve, and the prerequisites for the integrated development of the municipal district are created. At the same time, the operation of the road object is accompanied by deterioration of the organizational and territorial conditions of agricultural management near the road, pollution of natural resources, the need to organize its safe intersection, disruption of the habitual rhythm of life and changes in living conditions of residents of a rural municipal district.

An urgent task in modern conditions is to establish the possibility of eliminating or compensating for the negative consequences of the development of road infrastructure. This is, in principle, possible. For example, the stabilization of negative consequences in the environmental field is achieved by complying with environmental requirements in the process of designing, building and operating the road. To this end, the following should be envisaged: creation of protective green spaces along the road, taking into account the relief and other spatial properties of the territory, taking into account hydrography and the location of water sources, developing recommendations on the economic use of land adjacent to the road, taking into account its negative impact on the territory.

For the social sphere of the rural municipal district, the negative consequences of road construction can be eliminated, first of all, by improving the living conditions of people, creating new workplaces and jobs, including in the process of building and operating a road object, increasing the level of development of the municipal district as a whole.

The authors' proposals on the assessment and elimination of the economic negative consequences of the development of road infrastructure in a rural municipal area will be considered at a specific object - the Perm Municipal District of the Perm region. According to official statistics, 11.2% of industrial land or 0.8% of all land of the municipality is in this area of land transport. Land road transport is 1295 hectares. According to our forecasts, by 2022 this value will be 1461 hectares.

Road construction is a development priority in the Perm Municipal District. Improving transport links is required for communities that are remote from the federal highways.

The designed highway "Gorny-Kostaryata" with a length of 2.7 km should connect the villages of the region with the "Eastern Bypass" highway of the city of Perm. For the construction of this object, 6.47 hectares of land for unlimited use are required, including arable land - 1.10 hectares, hayfields - 0.8 hectares, pastureland - 0.96 hectares, deposits - 3.10 hectares, other lands - 0, 43 hectares. In addition, for the period of road construction for technological purposes for temporary use, plots of land along the road of 3.23 hectares are needed, including arable land - 0.55 hectares, haymaking - 0.44 hectares, pastureland - 0.48 hectares, deposits - 1.54 ha, other lands - 0.22 ha.

During the operation of the road to protect the surrounding areas from pollution, it is necessary to set up protective forest stands.

The construction of the road will damage agricultural holdings through which the highway runs, worth 92.7 thousand rubles, including losses for work in progress - 41.6 thousand rubles, losses for the alienation of crops - 22.8 thousand rubles, losses for lost profits - 28.3 thousand rubles. The cadastral value of the seized land plots is 94 thousand rubles, with their market value of 33,644 thousand rubles. To restore the balance of agricultural land use in the area requires 802.3 thousand rubles. for the restoration of unproductive and infertile land.

To eliminate the negative consequences of road construction, it is necessary to compensate losses to agricultural farms (92.7 thousand rubles), to improve unproductive lands in order to be included in agricultural turnover (6.47 hectares), to restore land plots disturbed during construction. Thus, the negative consequences of the development of road infrastructure in the rural municipal district will be compensated.

4. Discussion

The development of road infrastructure is an important factor in the overall development of the rural municipal district, the improvement of market relations, and the improvement of the land market in the territory of the municipality (Bryzhko V.G., 2019, P. 9).

Good roads contribute to engineering development of the territory, create prerequisites for an increase in housing construction in municipal areas (Ogarkov, 2015, P.374), which will overcome the negative effects determined by the unstable nature of rural development and will increase the income level of residents of rural municipalities (Petrikov, 2009, P. 13-16).

It should be noted that in European countries much attention is paid to the issues under consideration: improving the conditions of spatial accessibility, approximating the sources of services and information for residents of rural municipalities (Merzlov, 2005, P. 14-17). There is a connection between the basic conditions of rural development and the economic interests of local residents (Frost, 1986, P. 122-126). A multifunctional agricultural economy, the need to create which is supported by many Russian and foreign specialists, as well as increased incomes in rural areas are impossible without the full use of village resources, without a quality road infrastructure (Marsden, Sonnino, 2008, P. 422-431). The construction of engineering facilities is intended to contribute to the growth of profitability of agricultural production, improving the material situation of rural areas (Anderson, 2003, P. 161-197).

Therefore, the development of rural road infrastructure should be appropriately supported at different levels of economic management.

A serious problem in the organization of land use should be considered the lack of a land management system. This also applies to organizational and territorial decisions taken in the process of developing the road network in rural areas. This process should be reflected in pre-project and project organizational-territorial documents.

In this case, pre-project documents should reflect the results of forecasting the development of land use of road transport for the future, the depth of which depends on the scale of the tasks to be solved, economic feasibility, and comparability with plans for socio-economic development of rural areas. Based on the forecast, scenarios for the development of road infrastructure in the municipal area should be determined.

Pre-project organizational and territorial development, the results of forecasting the development of land use of road transport should be implemented in practice through projects of territorial land management. The provisions of pre-project documents directly on the ground without projects cannot be implemented. Only provisions defined by specific projects can be transferred to nature. This is the main difference between pre-project and project organizational-territorial developments.

Special attention should be paid to the issues of organizational and territorial support for the development of road infrastructure in rural municipalities. As a result of road construction forecasting at the pre-project stage, a system of reasoned ideas should be formed that are probabilistic, but fairly reliable, about the expedient development of road transport land in the future in order to create the necessary territorial conditions for the development of the rural economy in accordance with national, state, public and social interests.

In the pre-project documents on the basis of taking into account the complex of natural and socio-economic conditions, a system of interrelated measures to improve land use of road transport, development and territorial arrangement of the rural municipal district, economic entities should be justified. Specifics have pre-project organizational and territorial documents developed for administrative-territorial entities specializing in the production of food and agricultural products. In this case, all pre-project and project activities are aimed at preserving and developing the land-resource potential of the agricultural economy, creating favorable conditions for the growth of agro-industrial production.

The amount of expenses for organizational and territorial development depends on the economic importance of the tasks to be solved, the territory for forecasting the development of land use of road transport, the methods used for forecasting, the tools and techniques for forecasting, the applied computer tools and technologies, the information resources used, the qualifications of specialists, and the forecast period.

The project of organizing the territory during the development of road infrastructure in a rural municipal district should reflect information about the location of the projected highway route in the district, the size and composition of land for construction, the value and quality of land property, damage to adjacent land users, the terms of use of the soil being removed, the amount of land payments conditions of land use formation of road transport. It is necessary to take into account the peculiarities of establishing and charging for the land of objects of high social importance, which fully include the roads of the rural municipal district (Bryzhko I.V., 2015, P. 4244-4249). It is necessary to make maximum use of the legal possibilities for applying the preferential tax regime for land of motor vehicles of municipal significance (until full exemption from the payment of land tax or rent for land).

All possibilities, including alternative, of compensating for the negative consequences of expanding the road network in a rural area should be assessed. For example, all types of economic damage (losses and damages) inflicted on individual rural municipal areas as a result of the development of road infrastructure can be compensated for by improving the road network inside settlements in the rural area at the expense of construction and installation organizations engaged in the construction of road objects. In this case, all the compensation resources provided by the project are accumulated on special accounts of the road construction organization and are used strictly for their intended purpose - to improve the road infrastructure of villages and villages.

For these purposes, in the project organizational-territorial documents, sections should be provided for providing rural settlements with sustainable external and internal connections: analysis of the existing road network and assessment of its condition; justification of proposals for the placement of additional roads, the reconstruction of the existing road network, improvement of the quality of pavement; determination of specific cost indicators for road improvement; comparison of the cost of work with the magnitude of damage to clarify the volume of road works.

5. Conclusions

The prospects for the development of rural municipal areas are determined by the availability of the necessary infrastructure (considered as the basis for the livelihood of people), including the road infrastructure. With the help of the latter, the problem of smoothing the economic effect of the location factor, improving the accessibility of objects, systems, services, agents, ensuring sustainable economic relations in the course of economic activity is solved.

The road infrastructure ensures the satisfaction of the economic interests of economic entities and the social interests of people living in rural municipalities.

Road construction in rural areas is accompanied by a number of positive and negative effects, which are manifested in environmental, social and economic spheres. An important practical task is to reduce the negative effects of road construction and enhance the positive effects of the construction of roads, that is, to ensure a positive aggregate balance of these effects.

The positive and negative consequences of the construction of roads in the rural municipal district should be assessed at all stages of the production process: at the design stage, during the construction of the highway route, during the operation of the highway. At the same time, it is necessary to establish the possibility of completely eliminating or compensating for the negative consequences of the development of road infrastructure in rural areas (by compensating losses to agricultural holdings, improving unproductive lands with a view to including them in agricultural circulation, and restoring damaged lands).

The development of road infrastructure in rural municipal areas should be supported at all levels of economic management. To contribute to this task should the development of pre-project and project organizational-territorial documents (schemes and projects). Pre-project documents should reflect the results of forecasting the development of land use of road transport for the future, and the results of forecasting should be implemented in practice through projects of territorial land management. This project should reflect data on the location of the road, the size and composition of land for construction, the value and quality of land property, damage to related subjects, the conditions of use of the soil layer, the amount of land payments, the conditions for the formation of land use of road transport.

The possibility of compensating all types of economic damage by improving the road network within the settlements of a rural municipal district should be assessed by organizations engaged in the construction of road objects. This will ensure the economic and social development of rural municipalities through the use of modern road infrastructure.

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