

Improving state policy in the field of safety and road maintenance in the constituent entities of the Russian Federation

Osokin, Nikita A.; Popov, Nikita A.

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СОВЕРШЕНСТВОВАНИЕ ГОСУДАРСТВЕННОЙ ПОЛИТИКИ ПО ОБЕСПЕЧЕНИЮ СОХРАННОСТИ АВТОДОРОЖНОЙ СЕТИ СУБЪЕКТОВ РОССИЙСКОЙ ФЕДЕРАЦИИ

НИКИТА АНДРЕЕВИЧ ОСОКИН, заместитель директора Центра отраслевых исследований и консалтинга ФГОБУ ВО «Финансовый университет при Правительстве Российской Федерации (Российская Федерация, 127083, Москва, ул. Верхняя Масловка, 15). E-mail: NAOsokin@fa.ru

НИКИТА АЛЕКСЕЕВИЧ ПОПОВ, специалист Центра отраслевых исследований и консалтинга ФГОБУ ВО «Финансовый университет при Правительстве Российской Федерации» (Российская Федерация, 127083, Москва, ул. Верхняя Масловка, 15). E-mail: NiAPopov@fa.ru

Аннотация: Уровень развития транспортной инфраструктуры во многом определяет максимальные темпы роста экономики. На автомобильный транспорт в России в 2018 году пришлось 67,1 % объема перевезенных грузов, однако говорить о полной реализации потенциала автотранспортной системы рано – нормативным требованиям не отвечают 57,6 % дорог общего пользования. Сложившаяся статистика на первый план выдвигает задачу обеспечения сохранности автомобильных дорог. В данной статье проанализирована система сохранности автомобильных дорог субъектов Российской Федерации, рассмотрены основные нормативные документы, регламентирующие деятельность подрядных организаций и исполнительных органов власти в сфере обслуживания автодорог. Для формирования предложений по совершенствованию государственной политики в сфере сохранности автодорог рассмотрен передовой зарубежный опыт и проведен анализ технологий обслуживания автомобильных дорог в зимний период. Основным результатом исследования служит предложение внедрения в российскую практику механизма обслуживания автомобильных дорог на основе стимулирующего контракта. Создание экономически обоснованной формы стимулирующего контракта способно привести к снижению стоимости обслуживания автомобильных дорог на 10-40 %.

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Ключевые слова: сохранность автомобильных дорог, стимулирующие контракты, государственная политика, реагенты

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IMPROVING STATE POLICY IN THE FIELD OF SAFETY AND ROAD MAINTENANCE IN THE CONSTITUENT ENTITIES OF THE RUSSIAN FEDERATION

NIKITA ANDREEVICH OSOKIN, Deputy Director of the Center for Industrial Research and Consulting Financial University under the Government of Russian Federation (15, Verkhnyaya Maslovka st., Moscow, 127083, Russian Federation). E-mail: NAOsokin@fa.ru

NIKITA ALEKSEEVICH POPOV, Research Associate of the Center for Industrial Research and Consulting Financial University under the Government of Russian Federation (15, Verkhnyaya Maslovka st., Moscow, 127083, Russian Federation). E-mail: NiAPopov@fa.ru

Abstract: The level of transport infrastructure development directly affects the rate of economic growth. In 2018, in Russia, 67.1 % of the total volume of transported goods were delivered by road transport. However, we cannot talk about the full realization of the road transportation system since 57.6 % of public roads do not meet regulatory requirements. The available statistics indicate that, first of all, attention should be paid to the condition of the roads. The article analyzes the system for road maintenance in the constituent entities of the Russian Federation, considers the main regulatory documents governing the activities of road work suppliers and executive authorities in the field of road maintenance. The article examines and analyzes the advanced foreign experience in the field of technologies for servicing roads in the winter. As the result of analysis, the authors propose introducing performance-based contracts into the field of the road sector. The creation of an economically feasible form of performance-based contracts can lead to a decrease in the cost of road maintenance by 10-40 %.

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Keywords: road maintenance, performance-based contracts, state policy, anti-icing materials

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Introduction

The transport infrastructure has great impact on the development of any economy. The developed transport network affects the growth rate of socio-economic development, the increase in the volume of foreign and domestic trade, the decrease in transport and transaction costs, and the mobility of the population [Maltsev, 2017. P. 59]. Improving the quality of transport system between territory units is of particular relevance for countries with a large land area since this directly affects the creation of a single economic space. The conditions for the formation of the transport infrastructure of Russia are currently expressed in the form of a high regional disproportion, poor quality of the road network, and a low level of integration into the global transport space [Shvelidze, 2018. P. 201]. To achieve a competitive advantage at the global level in the long term, it is required to solve all existing problems in this area.

The transport system of Russia is one of the most developed in the world. The length of railways is 86 thousand kilometers (third place in the world), motor roads – 1529 thousand kilometers (fifth place in the world). According to the Bulletin on current trends in Russian economy, “Freight Transportation in Russia: an Overview of Current Statistics”, in 2018, the transport and logistics complex of Russia added 7% of gross value and 0.19% of GDP growth¹. In 2018, the volume of transported goods increased by 2.4%, and the turnover of Russian transport by 2.8%. The bulk of freight traffic was done by road (Review of the Russian Transport Sector 2018 Results) and amounted to 5.5 billion tons or 67.1% of the total volume of transported goods².

According to the “Russian transport industry overview”, in 2018, the volume of cargo turnover reached 5.6 trillion ton-kilometers, with the leading positions in the pipeline (47.3%) and railway (46.0%) types of transportation³.

Despite the growth of the main indicators of Russian cargo transportation, we cannot talk about the full use of the country’s transport potential. According to the estimates of the World Economic Forum (The Global Competitiveness Report 2019), Russia ranks 41st and 69th out of 141 countries in terms of the development of road traffic and the density of railways⁴. Similar results are obtained by the World Bank’s assessment: the Logistics Performance Index (LPI) for Russia is 2.76 points out of five, which is the 75th position in the corresponding rating of the countries of the world⁵. The low quality and insufficient level of development of the transport network results in significant economic losses. According to experts, the Russian economy annually loses up to 3%

of GDP due to the poor condition of highways [Tvardovsky, 2015. P. 12]. Recognizing the importance of all components of the transport infrastructure, in this article, we will try to highlight all the problems that have arisen and make proposals for improving the maintenance of the road network.

In Russia, the issue of establishing a safe and permanent transport connection both within the region and between different regions is becoming more and more urgent. By Decree of the President of the Russian Federation of May 7, 2018, No. 204 “On national goals and strategic objectives in the development of the Russian Federation for the period up to 2024”, the modernization of the road maintenance system is defined as one of the principal components for improving the quality of the Russian road network. Improvement of the state policy in the field of road maintenance can be considered as the main mechanism for ensuring a qualitatively new level of transport connection in the country.

The system for road maintenance in Russia

Federal Law No. 257-FZ of November 08, 2007, “On Roads and Road Activities in the Russian Federation and on Amendments to Certain Legislative Acts of the Russian Federation” states, that road maintenance is understood as the condition of the road as a technical structure and property complex, maintaining its operational properties and safe use. In the domestic system of state statistics, the main indicator characterizing the level of maintenance is the percentage of roads that do not meet regulatory requirements. According to the Order of the Ministry of Transport of the Russian Federation of August 27, 2009, No. 150 “On the procedure for assessing the technical condition of roads”, the degree of compliance of a road with regulatory requirements is carried out by calculating two groups of parameters:

1. Constant parameters. During exploitation, the roads do not undergo significant changes, for example, the width of the roadway, its structure, etc.

2. Variables. During exploitation, the road undergoes such changes as longitudinal cracking and rutting of the road surface, etc.

Constant parameters and characteristics are established during road planning and can be significantly changed only in the course of reconstruction or overhaul. In this case, it is impossible to carry out any work related to ensuring traffic safety without large capital investments or significant design changes. At the same time, a group of variables is of the highest interest because it allows us to be directly influenced in the process of servicing and maintaining the operational properties of roads.

Evaluation of parameters and characteristics for compliance of public roads with regulatory requirements should be carried out under interstate and approved national standards: GOST 32825-2014 “Automobile roads of general use. Pavements. Methods for measuring the geometric dimensions of damages”⁶; GOST 33101-2014 “Road pavement. Roughness measurement methods”⁷; GOST 33078-

1 <http://ac.gov.ru/files/publication/a/24196.pdf>

2 <https://assets.kpmg/content/dam/kpmg/ru/pdf/2019/05/ru-ru-transport-survey-052019.pdf>

3 [https://www.ey.com/Publication/vwLUAssets/ey-transportation-services-2019-rus/\\$FILE/ey-transportation-services-2019-rus.pdf](https://www.ey.com/Publication/vwLUAssets/ey-transportation-services-2019-rus/$FILE/ey-transportation-services-2019-rus.pdf)

4 http://www3.weforum.org/docs/WEF_TheGlobalCompetitiveness-Report2019.pdf

5 <https://lpi.worldbank.org/international/global?sort=asc&order=Country#datatable>

6 <http://docs.cntd.ru/document/1200117775>

7 <http://docs.cntd.ru/document/1200127196>

2014 "Methods for measuring the adhesion of a coated car wheel"⁸; GOST 32729-2014 "Method for measuring elastic deflection to determine the strength of the non-rigid pavement"⁹; GOST 33161-2014 "Requirements for the diagnosis and certification of artificial structures on public roads"¹⁰; GOST 33220-2015 "Requirements for the operational status of public roads to ensure road safety"¹¹; GOST R 50597-2017 "National standard of the Russian Federation. Automobile roads and streets. The requirements to the level of maintenance appropriate for traffic safety. Methods for testing".

All documents that regulate the conduct of research on the condition of the roadbed and do not take into account the influence of weather and other external factors significantly distort the final result. This problem acquires the greatest relevance in the autumn-winter period.

In the autumn-winter period, precipitation is accompanied by a regular change in temperatures from positive to negative. During this process, water influences the expansion and contraction of cracks on the roads, which inevitably form during the operation of the roadway. The deterioration of the road surface directly depends on the number of such cycles during the autumn-winter season. In foreign practice, measures aimed at reducing damage to road surfaces are well-spread. For example, in Germany, special attention is paid to filling cracks with bitumen mastic and replacing seams¹².

A significant factor that determines the road safety level in the autumn-winter period is the technology of winter maintenance and the use of anti-icing materials (AIM). Experts use the specific corrosivity index to determine the degree of the destructive effect of AIM on the road surface. The most common reagents are sodium chloride (NaCl), calcium chloride (CaCl₂), and magnesium chloride (MgCl₂). Engineer S.Yu. Rozov notes that chlorides are highly corrosive and lead to accelerated deterioration of metal and concrete elements of roads; also, it has a negative impact on the environment. To reduce losses from the use of traditional AIM, we can use innovative reagents that contain less aggressive chemicals, for example, sodium formate (HCOONa), potassium acetate (KAc), calcium-magnesium acetate (CМа) [Rozov, Patkina, Rozov, Shestachenko, 2017].

The level of road maintenance in Russia

According to the Federal State Statistics Service (Rosstat), from 2008 to 2018, the average annual growth rate in the

Figure 1. Dynamics of changes in the level of road maintenance in the Russian Federation

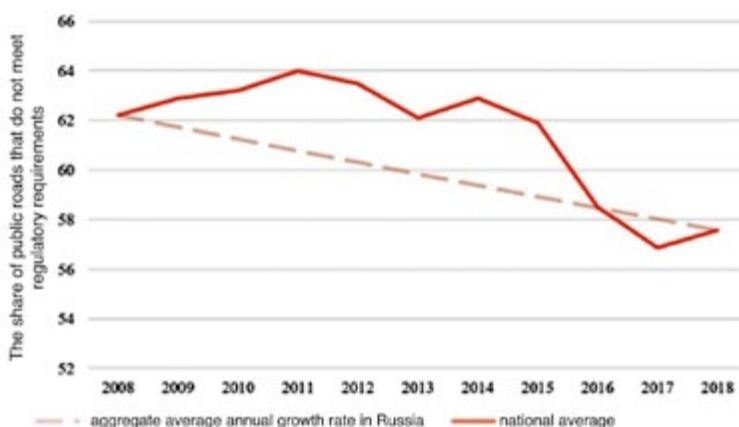
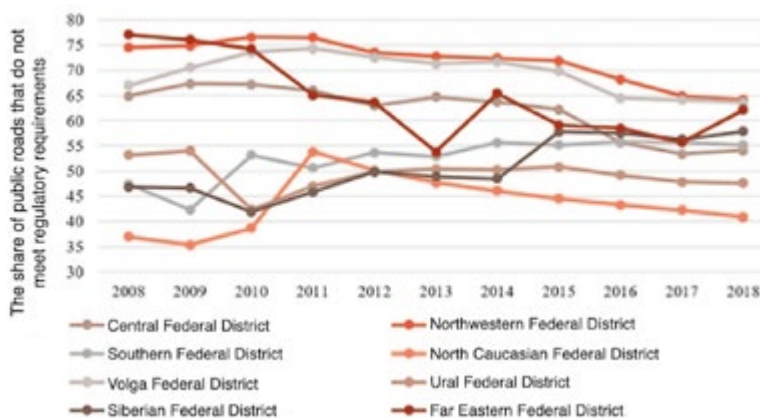


Figure 2. Dynamics of changes in the level of maintaining roads of regional or inter-municipal importance in the federal districts of the Russian Federation



share of roads that do not meet regulatory requirements throughout Russia was 0.77%, which indicates a gradual improvement in the situation with the condition of roads (Figure 1). It should be noted that there are significant differences in the level of development of the road network between different regions. For example, in 2018, the share of public roads that do not meet regulatory requirements in Moscow was 3%, while in the Republic of Mari El, this figure was 98.6%. These figures indicate the high heterogeneity of the road condition throughout the country.

Within federal districts, this indicator tends to gradually decrease; however, the positive dynamics do not apply to all territorial entities (Figure 2). For example, for the Siberian Federal District, the share of public roads that do not meet regulatory requirements increased by 11 percentage points. Such dynamics should be carefully studied not only by regional authorities but also by federal agencies. A significant deterioration in the condition of roads reduces the investment attractiveness of the regions and the standard of living for the population of the corresponding territory.

The total length of public roads of regional or inter-municipal importance that do not meet regulatory requirements is 294 thousand kilometers. At the same time, 58.3% (171.4 thousand km) of non-standard roads belong to the Central

8 <http://docs.cntd.ru/document/1200123715>

9 <http://docs.cntd.ru/document/1200113444>

10 <http://docs.cntd.ru/document/1200127495>

11 <http://docs.cntd.ru/document/1200123498>

12 <https://www.bmvi.de/DE/Themen/Mobilitaet/Strasse/Erhalt-Strassen-Bautechnik/erhalt-strassen-bautechnik.html>

Figure 3. The share of federal districts in the total length of public roads of regional or inter-municipal importance that do not meet regulatory requirements

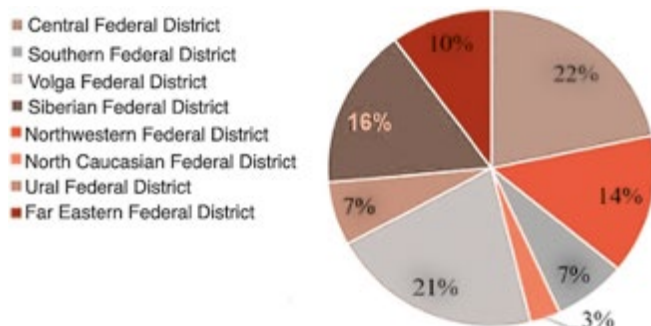
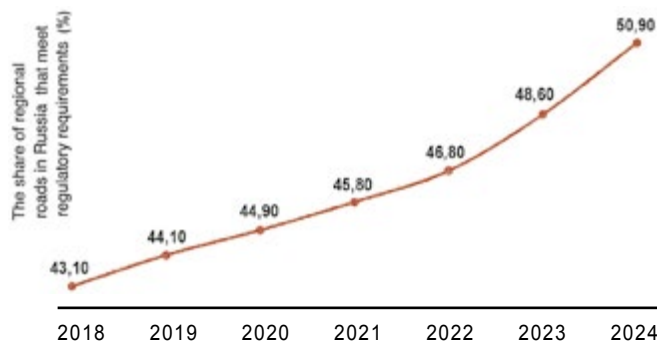


Figure 4. Targets indicators in the share of regional roads in Russia that meet regulatory requirements



(64 thousand km), Privolzhsky (61 thousand km), and Siberian (48 thousand km) federal districts (Figure 3).

The current situation is explained by the high length of roads in mentioned federal districts. According to the Federal State Statistics Service “Regions of Russia. Socio-economic indicators – 2017”¹³ report, in 2016, in these regions, the total share of the total population of the country is 58.58% (86 million people), in the total gross regional product (GRP) – 60%. This fact may indicate a significant impact of these territorial entities on the socio-economic development of the country. We can conclude that at the regional level, the issue of road maintenance requires a differentiated approach.

State policy aimed at stimulating road maintenance

The federal project “System-wide measures for developing road economy” and the national project “Safe and high-quality roads”¹⁴ speak of the creation of mechanisms for economic incentives for maintaining roads of regional and inter-municipal importance. All measures aimed at ensuring road maintenance, indicated in the federal project, can be divided into two groups:

1. Creating weight and size control stations on federal, regional, inter-municipal, or local roads: 753 units until 2025 in 75 constituent entities of the Russian Federation.

2. Introducing amendments to normative legal acts and

¹³ https://www.gks.ru/bgd/regl/b17_14p/Main.htm

¹⁴ <http://rosavtodor.ru/about/upravlenie-fda/nacionalnyj-proekt-bezopasnye-i-kachestvennye-avtomobilnye-dorogi>

documents of technical regulation in terms of strengthening responsibility for non-observance of weight and size parameters of vehicles and axle-load control.

The widespread introduction of digital technologies and mechanisms for developing and operating road network can also be considered as measures to ensure road safety. The development of road management measures based on advanced technologies is a priority of the federal project, which is shown by the target indicators:

- the share of contracts in the field of road management within the framework of national project that provides for the use of new technologies and materials included in the Register of new and advanced technologies, materials, and technological solutions for reuse;
- the share of contracts in the field of road management within the framework of national project that provides for the execution of specified work on the principles of a life cycle contract, which includes various types of road works in one contract.

Digital technologies are designed to optimize traffic and reduce the number of traffic accidents. Life cycle contracts, advanced technologies, and materials aimed at developing and operating road network are necessary to reduce the cost of design, construction, and commissioning of road sections as a single set of works. All measures correspond with the goals of the national project “Safe and high-quality roads”, aimed at increasing the share of roads that meet regulatory requirements from 43.1% in 2017 to 50.9% in 2024 (Figure 4), as well as at reducing the mortality rate in 3 times (from 13 to 4 people per 100 thousand people for the same period).

However, within the framework of the national project, the considered mechanisms of economic promotion are aimed at ensuring road safety with the use of penalties and without offering any financial incentives. To ensure the comprehensive development of road infrastructure, it is proposed to introduce additional measures of economic incentives to the existing system of road maintenance, such as:

1. Carrying out a comprehensive reform of the road maintenance system:
 - incentive contracts for road maintenance businesses based on a target-setting mechanism;
 - 2. Introducing a system of additional economic incentives within the existing road maintenance system:
 - independent assessment of the economic feasibility of road maintenance technologies;
 - monitoring of the level of road deterioration.

The impact of incentive contracts based on target-setting mechanism

The National Project “Safe and high-quality roads” sets targets for implementing life cycle contracts (LCC). The concept of LCC is defined in the Federal Law of April 05, 2013, No. 44-FZ “On the contract system in state and municipal procurement of goods, works and services” as a contract providing for the purchase of goods or work (including the design and construction of an object created as a result of the work), maintenance, repair, and, if necessary, operation

Table 1. Description of Key Performance Indicators

Factor	Indicator	Unit of measurement	Data source
Quality of life of citizens	The share of accidents due to poor road maintenance	%	Road police
	The share of road traffic injuries due to poor road maintenance		
	The share of people killed in road accidents		
Deterioration of road surface	Corrosive activity of the applied anti-icing materials	mg/(cm ² *day)	Rostekhnadzor
	Specific loss of mass of the road surface after 10, 15, 20 freeze-thaw cycles	g/cm ³	Rostekhnadzor, ROSDORNII
Environmental impact	Sodium (Na) concentration in roadside wastewater systems	mg/l	Rosprirodnadzor
	Chlorine (Cl) concentration in roadside wastewater systems		
	The degree of soil salinity (pH value of the water extract in the fertile soil layer)	pH	Rosprirodnadzor

and/or disposal of the obtained goods or an object created as a result of the work. Such agreements assume that the state sets the direction for enterprises on the implementation of state plans and programs. However, the performers (contractors) independently determine the list of decisions to meet the target indicators [Nikitin, Vasiliev, Detkov, 2019. P. 34]. Decree of the Government of the Russian Federation of November 28, 2013, No. 1087 "On determining cases of concluding a life cycle contract" establishes that in the field of roads, LCC can be concluded during the design and construction of roads (or sections of roads).

Regional executive authorities independently decide on the list of works that will be included in the life cycle contract. But currently, the territorial bodies of the Federal Antimonopoly Service and the Ministry of Finance of the Russian Federation have not formed a unified position regarding the procedure for concluding "extended" contracts. Also, the bank guarantees for the construction/service companies are limited by three years, which is also one of the problems for the wide use of LCC.

In Western countries, the outsourcing of road maintenance has been successfully handled by the widespread use of target-based contracts. This approach is called Performance (Output) Based Maintenance (PBM) – target-based outsourcing. The system for concluding a long-term contract is actively used in Norway, Sweden, the USA, Canada, and some other developed countries.

PBM is based on the concept when the customer pays the contractor to keep the road in a condition that meets the established standards. At the same time, the agreement does not regulate the cost and scope of work. The form of payment is a flat rate (monthly) or a lump sum (advance) payment. The widespread use of this contracting model can be explained by the opportunity to improve road maintenance while keeping the same resource provision.

The use of PBM implies the full transfer of responsibility for making operational decisions to the contractor. This gives contractors indirect economic incentives to improve the qual-

ity of road services. In particular, the contractor has an opportunity to increase the profits through more efficient work or the use of innovative methods. In some countries, the savings that come from using PBM over traditional service contracts can be up to 40%¹⁵.

The authors of the article propose to use PBM as a basis for improving the existing contractual system for road servicing in the Russian Federation in the winter period. This would reduce the cost of road maintenance and procurement procedures by the regional and municipal authorities. Companies will be interested in improving the quality of their work and minimizing the risk of incurring additional maintenance costs, as well as in increasing the level of profitability of their activities.

Within the framework of this approach, it is proposed to express key performance indicators (KPIs) in the following groups of indicators: ensuring appropriate quality of life for citizens; deterioration of the road surface; impact on the environment.

It is assumed that by introducing such a mechanism, companies will use advanced technologies to ensure the proper quality of road maintenance, and the performance of service companies will be assessed based on a list of KPIs (Table 1). Data collection on relevant indicators can be performed by the listed bodies.

The authors propose to use the factor "Quality of life of citizens" to assess the frequency and severity of road accidents due to unsatisfactory road conditions. This indicator significantly affects the quality of life of citizens at the micro-level and can also lead to macroeconomic consequences.

Using materials of engineer Rozov, the authors developed KPIs for the factors "Deterioration of road surface" and "Environmental impact" [Rozov, Patkina, Rozov, Shestachenko, 2017]. The principal indicator of the AIM's aggressiveness on the road surface is its corrosive activity. KPIs are based on monitoring anti-icing agents' impact on the condition of the roadway.

It is proposed to consider the anthropogenic impact of road service on the ecological situation as to how it affects the quality of water in adjacent drainage systems and changes in soil characteristics. The highest impact on the condition of the water system brings the high concentration of sodium (Na) and chlorine (Cl). These indicators are especially relevant for the national project "Ecology", which is part of the federal project "Clean water". ROSDORNII studies show that innovative technological solutions make it possible not only to exclude but also to have a beneficial effect on the soil of roadside territories (due to the use of potassium as one of the reagents) [Rozov, Patkina, Rozov, Shestachenko, 2017]. For service companies, the introduction of KPIs for soil salinity may create the necessary economic incentives to use advanced road maintenance practices (Figure 5). As a conse-

15 <https://www.ebrd.com/documents/admin/policy-paper-on-infrastructure-making-district-heating-happen-pathways-to-financial-sustainability.pdf>

quence, it can have a beneficial effect not only on the road surface but on the territories adjacent to the road as well.

One of the fundamental problems in maintaining regional and inter-municipal roads is the low level of prompt repairs on the part of contractors. The introduction of the KPI system will minimize the process of road surface deterioration. When the roadway is overloaded, the road surface will inevitably have microcracks [Voskresenskiy, Voskresenskiy, Verbitskiy, Eunap, 2010. P. 43]. Using such an approach, we can promptly repair these cracks with bitumen-based polymers [Ismagilov, Gatiyatullin, 2017. P. 10]. Also, it is proposed to set a target indicator for each KPI at the regional level.

We cannot introduce this approach into Russian practice without carrying out a comprehensive reform of the road safety system aimed at solving the following tasks:

1. Forming regulatory framework for financing and implementing long-term contracts for the road service contractors.
2. Creating conditions for the development of private businesses in the field of road services.
3. Rejecting the model of privileged position of state budget institutions in determining the contractor for performing road repair and maintenance.
4. Explaining the advantages of PBM-based incentive contracts among road service companies.

Independent assessment of the economic feasibility of road maintenance technologies

Currently, the financial costs of measures for road maintenance of regional and inter-municipal roads are approved at the level of the constituent entities of the Russian Federation. These spendings are calculated based on the road service technology used in a particular city. Often, at the regional level, we can notice an insufficient level of funding for activities to ensure the safety of roads and road maintenance. Most of the administrative-territorial units use outdated technological solutions for the maintenance of the road network. Now, to carry out the road maintenance process, the administration of territorial units should use the new GOST R 50597-2017 normative standard, which has significantly tightened quality standards in the field of road repair work.

However, today there is no mandatory independent assessment of the cost standards and applied technologies of road maintenance approved by regional authorities and municipalities. It is necessary to create a model toolkit that involves comparing at least three technological alternatives to assess the direct and indirect costs of maintaining road facilities and choose the optimal method for corresponding works.

It is necessary to include in the list of comparable alternatives the technology of winter maintenance, involving the use

Figure 5. Schematic description of the incentive road maintenance contract

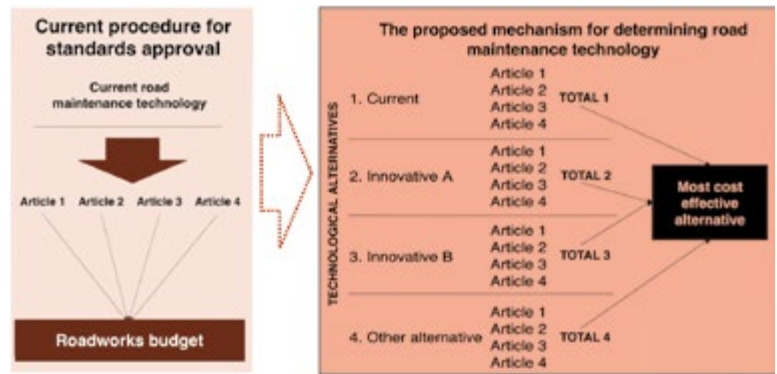
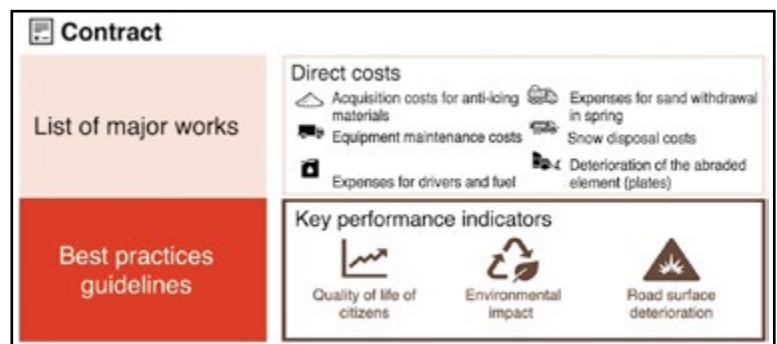


Figure 6. The mechanism for determining the most appropriate technology for road maintenance



of solid and two-phase multicomponent reagents. According to the Association for Winter Road Maintenance, the mentioned types of AIM are the most innovative, as they show the highest efficiency against winter slipperiness and have minimal impact on the road surface and the environment¹⁶.

It is expected that such an assessment will be carried out on an annual basis. Such frequency is explained by the need to take into account changes in the cost parameters of more innovative technologies. Thus, we obtain a mechanism aimed at stimulation of the territory (Figure 6) to apply innovative technologies in the field of road services.

The toolkit should also assess the feasibility of combined technologies. Often, the introduction of innovative technologies in road maintenance requires additional capital expenditures. Complete transition to a more innovative technology may take several years (for winter road maintenance, it will be necessary to update special equipment).

In practice, the use of such tools will make it possible to form the initial maximum price of contracts for the maintenance and servicing of highways (rubles/m²), concluded with specialized enterprises and organizations. The standardization of expenditures will minimize the risk of underfunding services for the maintenance and servicing of roads. Besides, an objective assessment of the cost of road maintenance services will provide an additional incentive to improve the efficiency of road maintenance enterprises.

16 <https://roszimdor.ru/press-tsentr/gilfanov-rustam-khalefovich-publikacii-priglasennykh-ehkspertov/novyy-gost-50597/>

Monitoring of the road safety level

The principal documents regulating winter road maintenance are:

- ODM 218.5.001-2008 "Methodological recommendations for road protection and cleaning snow";
- ODM "Guidelines for combating winter slipperiness on roads";
- ODM 218.5.006-2008 "Guidelines for using environmentally friendly anti-icing materials and technologies for maintaining bridge structures".

These documents are aimed at ensuring the transport and operational state of roads that meet the requirements of GOST R 50597-2017. The attention is paid to organizing works for cleaning roads from snow and ice, interacting with contractors that carry out winter road maintenance, identifying responsible authorities, and ensuring road safety conditions in winter.

The main drawback of the existing system for maintaining the technical and operational characteristics of the road in the winter period is the insufficient level of control over the effectiveness of measures aimed at winter road maintenance. The introduction of control over the road surface condition during the winter period through measuring the coefficient of automobile wheels adhesion with the road surface after cleaning the roadway may become a solution to this situation. The introduction of this measure would allow real-time monitoring of the results of winter road maintenance and its impact on improving road safety.

According to current standards, the adhesion coefficient is measured only at positive air temperatures on a dry road surface. The minimum value of the coefficient is 0.3, which is regulated by GOST R 50597-2017 "Automobile roads and streets. The requirements to the level of maintenance ensuring road safety. Methods for control". In winter conditions, adhesion coefficient measurement is not provided; however, even a small amount of snow and ice significantly reduce pavement friction and lead to a high increase in the number of road accidents. Such deficiencies in the control system can lead to significant macroeconomic losses on the part of the state, as well as a decrease in the quality of life of citizens.

Within the framework of GOST R 50597-2017, it is proposed to provide for 3 types of monitoring of the adhesion coefficient in winter:

- Preventive. Carried out in case of meteorological information about potential snowfall. On days with negative

temperatures in Celsius, it is proposed to determine the need for AIM sprinkling.

- Reactive. After carrying out regular work on the winter road maintenance, there is an assessment of the quality of performed work.
- Routine. Carried out regularly, for example, before the start of the peak load of road facilities.

Determining the coefficient of wheel adhesion to the road surface before the winter slippery control events, together with information on weather conditions, traffic intensity, etc., will make it possible to establish an optimal set of works on a particular section of the road. On the one hand, this will improve the safety of road traffic; on the other hand, it will optimize the costs of contractors for carrying out regulated work by reducing labor costs, reagents, and fuel.

Conclusion

The current state of the road network of the constituent entities of the Russian Federation limits the realization of the country's economic potential. In the field of improving the quality of highways, one of the promising areas is the improvement of the safety system. Existing and prospective mechanisms for ensuring safety and road maintenance relate only to the control of weight and size parameters and the tightening of particular provisions of regulatory legal acts based on penalties. The lack of economic incentives for service providers significantly reduces interest in improving the quality of road services.

Within the framework of the article, three initiatives are proposed to improve state policy in the field of ensuring the safety of the road network:

- incentive contracts for road maintenance enterprises through target-setting mechanism;
- independent assessment of the economic feasibility of road maintenance technologies;
- improvement of the road safety monitoring system under the life cycle contract.

The proposed initiatives can become instruments for solving the following tasks: increasing the period of use of the roadway without repair events; reducing the expenditures of the executive authorities of the constituent entities of the Russian Federation and municipal authorities; reducing the number of road accidents and improving the quality of life of citizens; reducing the negative environmental impact of chemicals; regulating traffic and reducing the level of road congestion.

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