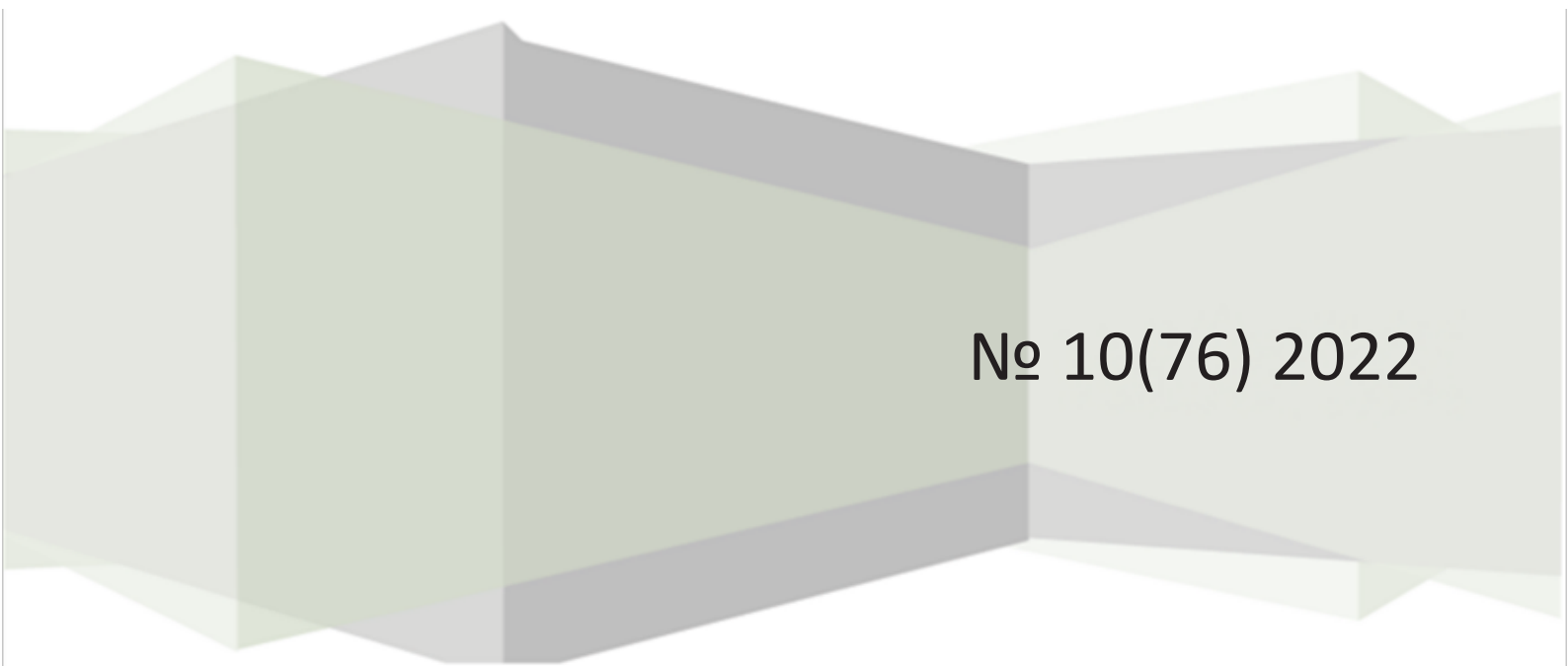


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Creation of a Machine for Unscrewing (Screwing) Couplings from Oil Country Tubular Goods

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Key words and phrases: repair of oil country pipes; machine for unscrewing (screwing) couplings.

Abstract. For the purpose of import substitution, a machine was designed for opening couplings from oil country tubular goods. The hypothesis is the assumption that one of the options for a successful design of a machine for unscrewing (screwing) couplings is a lightweight design with small dimensions and easy changeover to different pipe sizes. Initially, the existing designs of such machines were studied, the advantages and disadvantages of existing designs were analyzed. Based on the analysis and experience of production activities, a machine was designed for unscrewing (screwing) couplings from oil country tubular goods. A 3D model of the machine was made, drawings of individual parts and assemblies were developed. According to the developed drawings, an experimental model of the machine was created. Tests of the machine, its working capacity in production conditions are carried out. The authors designed a fundamentally new machine, which is small in size, more energy efficient, flexibly reconfigured to different sizes, has a relatively low cost, is easy to maintain, and repairable. The machine is easily integrated into the automatic line.

Introduction

Tubing strings must be highly reliable and durable. As a result of exposure to aggressive environments, mineralized waters and oil, intense mechanical stress, salt and water deposits, they are subjected to great wear and tear and are periodically sent for repairs [1; 2]. The weakest point in the body of tubing is the thread.

The thread wears out for the following reasons:

- lack of lubricant;
- tightening the coupling with a moment exceeding the allowable values;
- misalignment of pipe and coupling threads;
- shock axial loads in emergency situations;
- violation of technology during tripping operations;
- uncleaned mating surfaces.

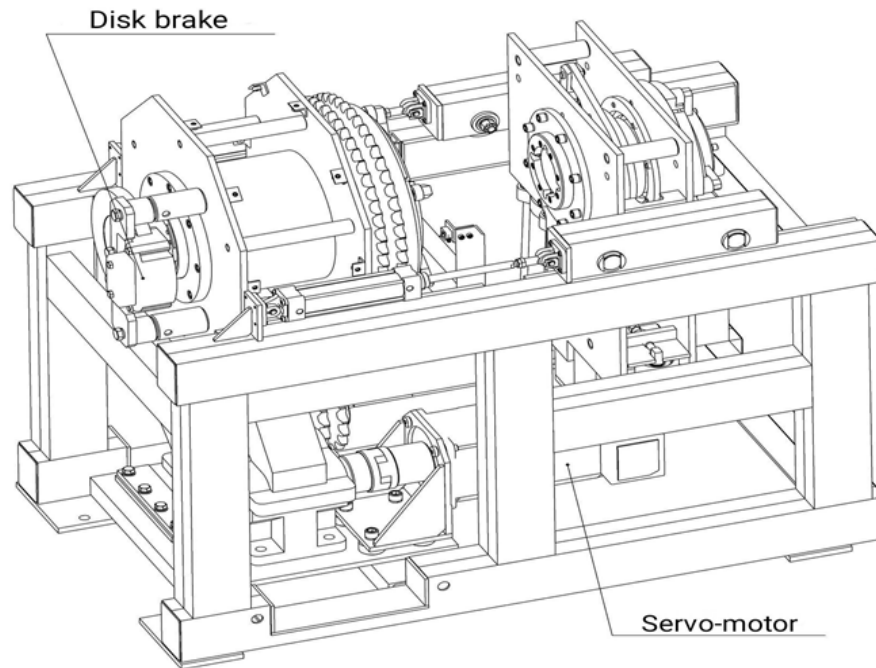


Fig. 1. Machine for unscrewing couplings from tubing

All this leads to thread wear. When repairing a pipe, the threaded sections must be cut off and a new thread cut. To do this, unscrew the coupling from the pipe. For this, a special machine is used to unscrew the coupling from the pipe. Our research is devoted to the creation of the design of this machine. Since the equipment built into the automatic pipe repair line needs to be modernized.

For the purpose of import substitution, a machine was designed for opening couplings from oil country tubular goods. Repair of oil country pipes must be carried out on an automatic line, which is fully automated. All workplaces must be equipped with appropriate equipment.

The goal was to create a machine for unscrewing (screwing) couplings, which is built into an automatic line, fully automated, small in size and weight.

Methods

Initially, the existing designs of such machines were studied, a patent search was carried out, the advantages and disadvantages of existing designs were analyzed [3–5]. Based on the analysis and experience of manufacturing enterprises, a machine was designed for unscrewing (screwing) couplings from oil country tubular goods.

Results and discussion

To create a machine for unscrewing tubing couplings, a 3D machine was made, detailed and an experimental model was created. Performance tests were carried out under production conditions. The advantages are low cost, ease of maintenance. Design compared with analogues has undergone some changes. The machine is easily integrated into the automatic line.

Initially, a 3D model was designed in the Compass application program (Fig. 1).

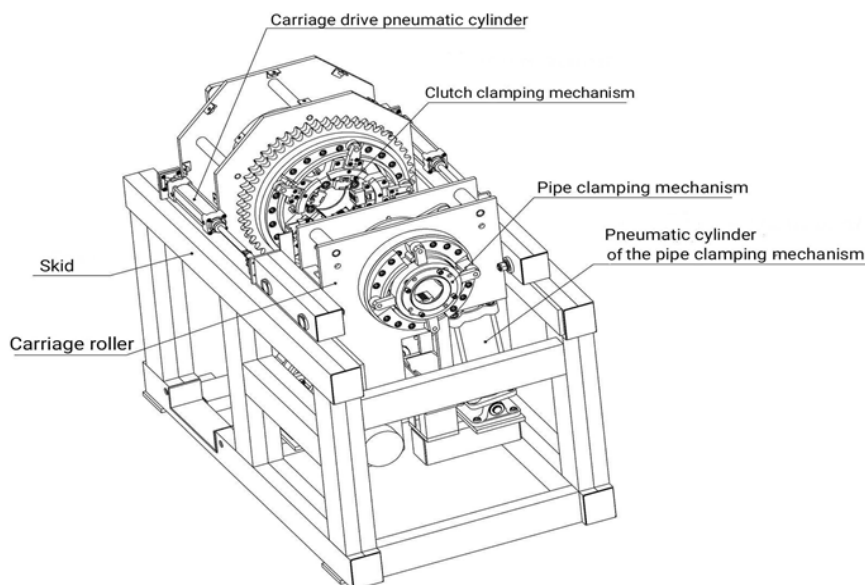


Fig. 2. Coupling unscrewing machine



Fig. 3. Machine for unscrewing couplings (prototype)

The model was tested for strength, durability and reliability using simulation modeling of real operating conditions. Empirically, materials were selected for each part in the nodes of the machine for unscrewing couplings from oil country tubular goods. The assembly drawing of the clutch release has been completed. Created drawings of individual parts. For this, the design of each part has been worked out experimentally.

After the parts were made, everything was assembled into knots. Next, the final assembly of the machine for unscrewing the couplings was carried out. After creating a prototype, tests were carried out under production conditions.

The prototype was built into an automatic tubing repair line. The design of the machine consists of the following units (Fig. 2).

The carriage of the machine moves along the guides of the frame with the help of two pneumatic cylinders. On the carriage there is a pipe clamping mechanism.

The pipe clamping mechanism is a cam mechanism with four sliders. Special crackers are inserted into the sliders, which are in contact with the pipe during clamping. The clamping of the

pipe at the initial stage is carried out by a pneumatic cylinder, in the future the pipe is held due to the self-braking of the mechanism.

The rotation of the clutch clamping mechanism for the implementation of the clutch label is carried out by a servo motor through a cylindrical gearbox and an open chain drive.

The advantages of the designed machine for unscrewing tubing couplings (Fig. 3) include:

- 1) relatively low cost;
- 2) the torque can reach up to 20 kNm, which is necessary for repairing tubing with a long service life;
- 3) for operation of this device, it is not necessary to use a hydraulic station, which leads to a decrease in the cost of maintenance.

Conclusion

A fundamentally new machine was designed, which is small in size, more energy efficient, flexibly reconfigured to different sizes, has a relatively low cost, is easy to maintain, and repairable.

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Создание станка для отвинчивания (завинчивания) муфт с труб нефтяного сортамента

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Ключевые слова и фразы: ремонт труб нефтяного сортамента; станок для отвинчи-

вания (завинчивания) муфт.

Аннотация. В целях импортозамещения спроектирован станок для муфтоотворота муфт с труб нефтяного сортамента. Гипотезой является предположение, что одним из вариантов успешной конструкции станка для отвинчивания (завинчивания) муфт будет облегченная конструкция с малыми габаритами и легкой переналадкой на разные размеры труб. Первоначально были изучены существующие конструкции подобных станков, проанализированы достоинства и недостатки существующих конструкций. На основе проведенного анализа и опыта производственной деятельности спроектирован станок для отвинчивания (завинчивания) муфт с труб нефтяного сортамента.

Выполнена 3D-модель станка, разработаны чертежи отдельных деталей и узлов. По разработанным чертежам создана экспериментальная опытная модель станка. Проведены испытания станка, его работоспособности в производственных условиях. Авторы сконструировали принципиально новый станок, который мал по габаритам, более энергоэффективен, гибко перенастраивается на разные типоразмеры, имеет сравнительно малую стоимость, прост в обслуживании, ремонтостойчив. Станок легко встраивается в автоматическую линию.

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The Organization of Environmental Barriers in Conditions of Technological and Technical Risks

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Key words and phrases: analysis; barrier; environmental; level; multi-scenario; modeling; risk.

Abstract. The considered version of multi-scenario modeling of pollutant migration processes can be used to identify critical areas and zoning of pollutant migration and determine the location of environmental barriers that provide preventive protection of natural-anthropogenic complexes or minimize the level of negative impact.

Conducting multi-scenario modeling provides for the need to implement a unified intersectoral methodological approach that determines the procedure and content for the development of early environmental protection measures and a quantitative analysis of the relevant potential risks.

The purpose of this paper is to organize environmental barriers based on predicted risks using multi-scenario modeling of environmental pollution migration.

Trends in the digital transformation of organizational systems are now widely popular. Dynamism and uncertainty make it necessary to work on the costs of core processes, putting more and more effort into developing or finding new effective tools to improve efficiency.

The distinctive features of the environmental consequences of emergencies are the high intensity and short duration of the formation of significant man-made loads on hydro- and lithosphere objects.

Under the influence of historical, economic and other factors, situations now often arise when industrial facilities and territories that have a negative impact on the environment are located within the city in close proximity to its infrastructure and population. Such facilities are sources of long-term environmental impact, which causes particular difficulties in forecasting, localization and elimination of pollution of the territory.

The most dangerous and unpredictable are environmental pollution as a result of a single or delayed direct exposure to a large amount of pollutants [1; 2].

Large-scale and long-term environmental pollution by industrial enterprises requires a quantitative analysis of the risks arising for various components of the environment [3].

All of the above determines the need to develop adaptive systems to prevent and eliminate

negative consequences and requires a combination of scientifically based methods of forecasting, modeling and analysis of technological and technical risks.

The most effective implementation of deep protection requires a full vulnerability analysis. The use of analysis methods makes it possible to identify the most vulnerable areas in natural and anthropogenic complexes [4] and can become the basis for the development and implementation of measures to minimize such risks. Failure to fulfill the main stages of vulnerability and risk assessment can lead to insufficient preventive measures and emergency response measures, which in most cases has negative consequences for the environment [5].

The content and features of solving the problems under consideration in conditions of uncertainty characterized by extremely serious consequences and damage determine the relevance of the application of complex multidimensional scenario analysis, assessment of the reliability of forecast estimates.

The reliability of the estimates can be based on a large volume of representative data that fully reflects the situation being evaluated, or on a limited number of them characterizing individual fragments (scenes) of a scenario representation with organized and unorganized sources of influence.

Depending on the industrial orientation of the territories under consideration, it is possible to assume the most likely variants of pollutants and the nature of their movement, which, when designing a multi-level system, significantly reduces the likelihood of environmental degradation relative to a scientifically based scenario.

The idea of using a systematic approach to ensuring environmental safety at the objects of past economic activity is due to the positive practice of using an algorithmically verified and technically sound set of organizational and individually oriented technological approaches.

To protect risky nature management objects, it is proposed to use several options for organizing environmental barriers in the form of separate elements, as well as as part of a multi-level system of protection of natural and anthropogenic complexes.

An important advantage of multi-scenario [6], forecasting and constant monitoring of pollution migration within a localized area is the ability to identify critical locations for further environmental impact.

Environmental barriers [7] are understood as a specially created obstacle that ensures the environmental friendliness of production processes and reduces the likelihood of the transition of dangerous phenomena into emergency and emergency situations.

In the case of design accidents, the integrity of at least two consecutive barriers must be ensured, and in the case of non-design accidents, at least one of the impenetrable barriers in working condition is required.

The described types of barriers can be used at many potentially hazardous facilities in the petrochemical and other industries, which allows the use of several degrees of protection at given levels of dynamics and degree of pollution.

When designing a new enterprise, upgrading an existing production facility or performing work to eliminate accumulated environmental damage, an obligatory stage of environmental impact assessment is the analysis of alternative solutions to achieve the goal of the planned activity from the position of least harm to the environment and economic feasibility. This allows for additional research and analysis in the search for measures to circumvent the identified risks and the introduction of components of environmental engineering protection.

Changing the migration path of harmful substances can be a guaranteed result of the use of such barriers. Thus, the possible impact area is reduced, and stabilization and neutralization of pollutants occur when the barrier is permeable and filled with reagents or sorbents.

The purpose of this research is to study the environmental barriers based on the risks under consideration using multi-scenario modeling of environmental pollution migration. The distinctive features of the environmental consequences of emergencies are the high intensity and short duration of the formation of significant man-made loads on hydro- and lithosphere objects.

Under the influence of historical, economic and other factors, situations now often arise when industrial facilities and territories that have a negative impact on the environment are located within the city in close proximity to its infrastructure and population. Such facilities are sources of long-term environmental impact, which causes particular difficulties in forecasting, localization and elimination of pollution of the territory.

The most dangerous and unpredictable are environmental pollution as a result of a single or delayed direct exposure to a large amount of pollutants [8; 9].

Large-scale and long-term environmental pollution by industrial enterprises requires a quantitative analysis of the risks arising for various components of the environment [10].

All of the above determines the need to develop adaptive systems to prevent and eliminate negative consequences and requires a combination of scientifically based methods of forecasting, modeling and analysis of technological and technical risks.

The most effective implementation of deep protection requires a full vulnerability analysis. The use of analysis methods makes it possible to identify the most vulnerable areas in natural and anthropogenic complexes [11] and can become the basis for the development and implementation of measures to minimize such risks. Failure to fulfill the main stages of vulnerability and risk assessment can lead to insufficient preventive measures and emergency response measures, which in most cases has negative consequences for the environment [12].

The content and features of solving the problems under consideration in conditions of uncertainty characterized by extremely serious consequences and damage determine the relevance of the application of complex multidimensional scenario analysis, assessment of the reliability of forecast estimates.

The reliability of the estimates can be based on a large volume of representative data that fully reflects the situation being evaluated, or on a limited number of them characterizing individual fragments (scenes) of a scenario representation with organized and unorganized sources of influence.

Depending on the industrial orientation of the territories under consideration, it is possible to assume the most likely variants of pollutants and the nature of their movement, which, when designing a multi-level system, significantly reduces the likelihood of environmental degradation relative to a scientifically based scenario.

The idea of using a systematic approach to ensuring environmental safety at the objects of past economic activity is due to the positive practice of using an algorithmically verified and technically sound set of organizational and individually oriented technological approaches.

To protect risky nature management objects, it is proposed to use several options for organizing environmental barriers in the form of separate elements, as well as as part of a multi-level system of protection of natural and anthropogenic complexes.

An important advantage of multi-scenario [13], forecasting and constant monitoring of pollution migration within a localized area is the ability to identify critical locations for further environmental impact.

Environmental barriers are understood as a specially created obstacle that ensures the environmental friendliness of production processes and reduces the likelihood of the transition of dangerous phenomena into emergency and emergency situations [14].

In the case of design accidents, the integrity of at least two consecutive barriers must be

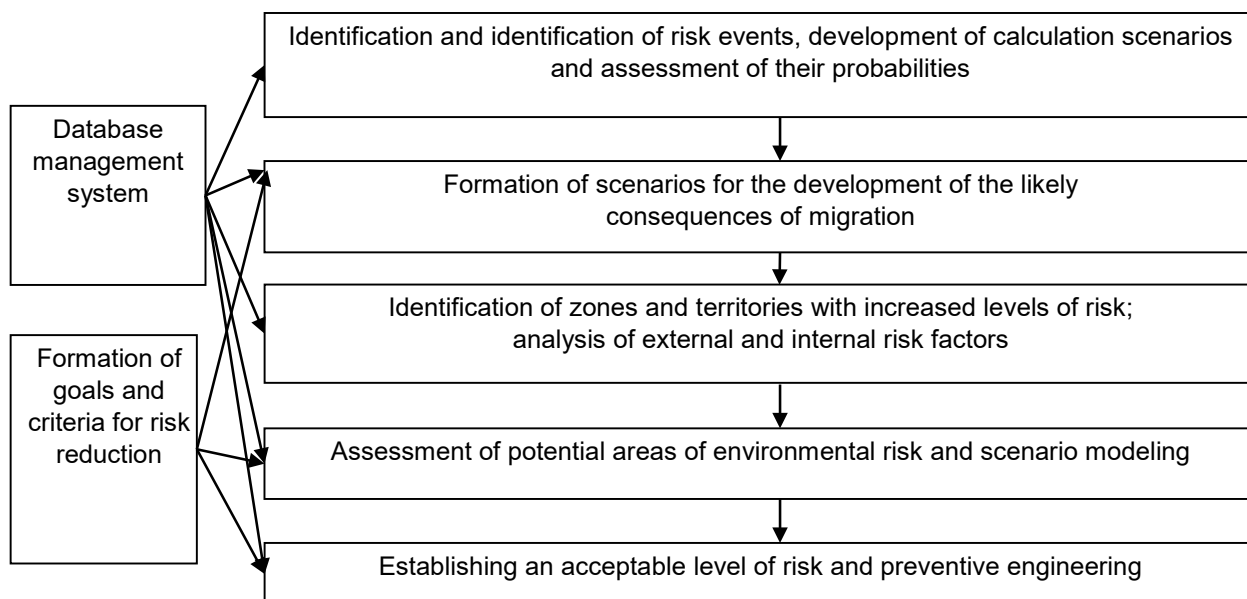


Fig. 1. Environmental risk planning and management

ensured, and in the case of non-design accidents, at least one of the impenetrable barriers in working condition is required.

The described types of barriers can be used at many potentially hazardous facilities in the petrochemical and other industries, which allows the use of several degrees of protection at given levels of dynamics and degree of pollution.

When designing a new enterprise, upgrading an existing production facility or performing work to eliminate accumulated environmental damage, an obligatory stage of environmental impact assessment is the analysis of alternative solutions to achieve the goal of the planned activity from the position of least harm to the environment and economic feasibility. This allows for additional research and analysis in the search for measures to circumvent the identified risks and the introduction of components of environmental engineering protection.

A guaranteed result of using such barriers may be a change in the migration path of harmful substances. Thus, the possible impact area is reduced, and stabilization and neutralization of pollutants occur when the barrier is permeable and filled with reagents or sorbents.

The purpose of this work is to organize environmental barriers based on the risks under consideration using multi-scenario modeling of environmental pollution migration.

The general methodology for creating a multi-level protection system for a vulnerable natural and anthropogenic complex using various barriers involves the consistent implementation of three main stages (a set of necessary studies of environmental risks and, based on their results, the implementation of multi-scenario modeling of pollution migration in order to establish the location of places for the introduction of the constituent elements of the protection system, for example, environmental barriers; direct creation of a multi-level protection system; elimination of possible pollution that occurs in an emergency or already exists when working at an object with accumulated environmental damage).

The barrier provides for the use of several effective levels of protection and additional planned measures to ensure their integrity. They should provide a complex of interactions of these barriers to prevent the development of undesirable conditions (incidents) in the event of

an accident and transfer them to a controlled state with minimizing their consequences.

The construction of zones of vulnerability of the natural and anthropogenic complex should be carried out at the conceptual stage of projects, and then periodically clarified within the limits of the acceptability of potential risks.

Environmental risk in this work is understood as an assessment of the probability of an event having adverse consequences in the form of environmental damage and caused by the negative impact of man-made emergencies.

The structural and logical relationship of the main characteristics of potential risks is shown in Fig. 1.

The best option for preventive measures to protect the environment from predictable negative impacts is the use of a multi-level system.

The general strategy for analyzing the manageability of environmental risks associated with the technical condition of facilities and the randomness in magnitude and time of occurrence of large-scale and long-term environmental pollution is expressed by the following expression:

$$R = f\{Y, P\} > f\{E_R, A_E\},$$

where Y is the probable damage; P is probability of occurrence of emergency and emergency situations; E_R is costs for risk reduction and elimination of consequences of emergency and emergency situations; A_E is cost efficiency coefficient.

Risk analysis is carried out on the basis of risk factors assessment and uncertainty analysis of their implementation.

The concept of multi-level protection has also been chosen for implementation. Similarity analysis is carried out for each object under study, which makes it possible to trace the dynamics of environmental variability over a certain period of time.

Each probable event can be completed with only one predicted option of sufficiency of engineering and protective measures.

Depending on the industrial orientation of protected areas, it is possible to assume the most likely variants of pollutants and the nature of their movement, which, when designing a multi-level system, significantly reduces the likelihood of environmental degradation compared to a scientifically based scenario. In all these cases, the most vulnerable places are natural ecological systems and their components.

The assessments of the risks under consideration can be combined with vulnerability analysis and quantification of the associated impacts. It is expedient to carry them out at the conceptual design stage, then periodically within the limits of acceptability of risks of vulnerability of natural-anthropogenic complexes.

The indicator risk score was applied to visualize the degree of danger and predictive modeling.

We use a scenario format that provides for joint consideration and integration of different types of data (the results of control measurements in various environments imported from databases, modeling results, surveys and expert assessments) based on an analysis of the degree of participation of each used characteristic using a semantic network.

The joint use of the methodology of expert assessment and the choice of options for technological solutions at the stage of conceptual design and risk analysis allows us to quickly refine the main characteristics of the implemented solutions and refine these data for further work.

For such cases, when the development and implementation of defense-in-depth systems is

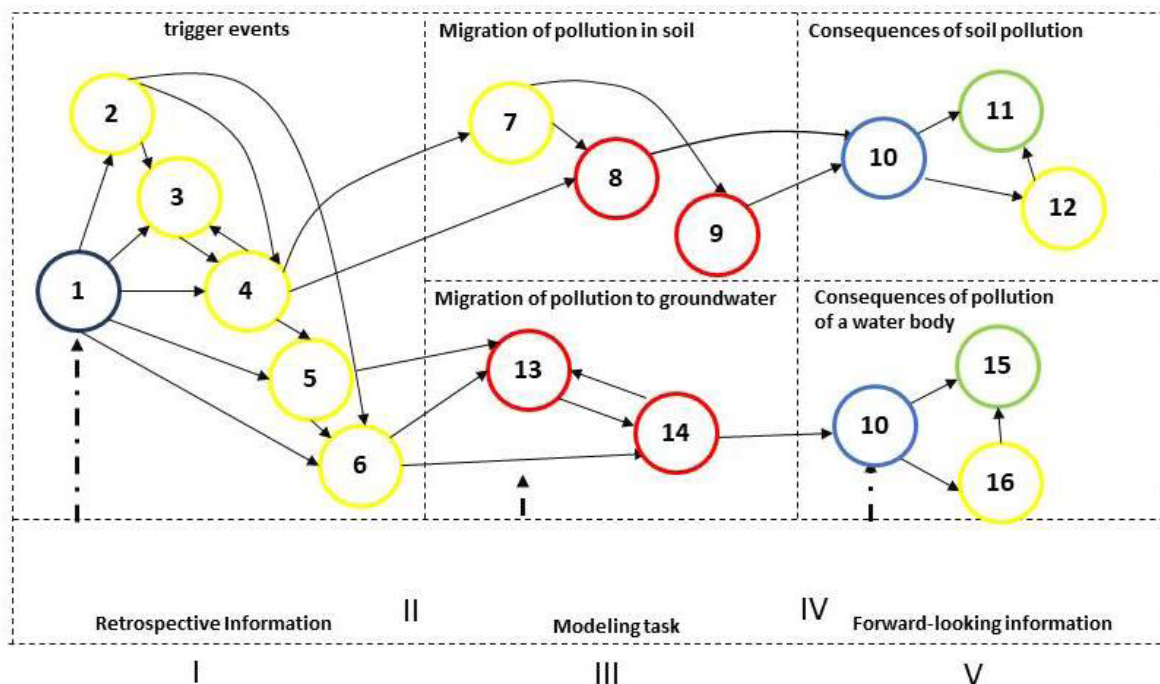


Fig. 2. Semantic graph of multi-scenario modeling of environmental pollution:
 I – retrospective horizon; II – depth of retrospection; III – forecast task; IV – in the soil;
 V – forecast horizon



1 – the occurrence of an emergency; 2 – air pollution; 3 – contamination of the soil surface; 4 – deep soil contamination; 5 – pollution of the water body; 6 – pollutant migration to the groundwater level; 7 – penetration of pollution into groundwater; 8 – blurring of the pollution front; 9 – localization of technogenic deposits of pollutants; 10 – eco-barrier; 11 – restored ecosystems; 12 – adaptation of soil biocenosis; 13 – dissolution in ground moisture; 14 – formation of a filtration flow; 15 – adaptation of aquatic biocenosis; 16 – localization of the consequences of surface runoff and filtration flow

required, one of the preliminary stages is the initial survey of the contaminated area to identify the most optimal locations for the main protection elements to reduce the degree of pollution hazard and its impact on the environment. The vulnerabilities that are detected during such surveys differ in the state and required conditions under which the transition of an emergency situation into a dangerous event will occur, entailing deterioration in the environmental situation and an increase in the damage caused.

For each state of vulnerabilities, its own specific predictive task can be determined, to achieve which preventive and compensatory measures are taken in accordance with emerging threats and risks.

At the same time, the determination of the effectiveness of the barriers used can be assessed, for example, in two ways: protection is sufficient and protection is insufficient. Then it is necessary to take additional planned measures that should ensure the integrity of these barriers to prevent the development of undesirable states (incidents) into emergency situations and direct them to a controlled state with further protection of the population and the environment from damage if the measures taken are not entirely effective.

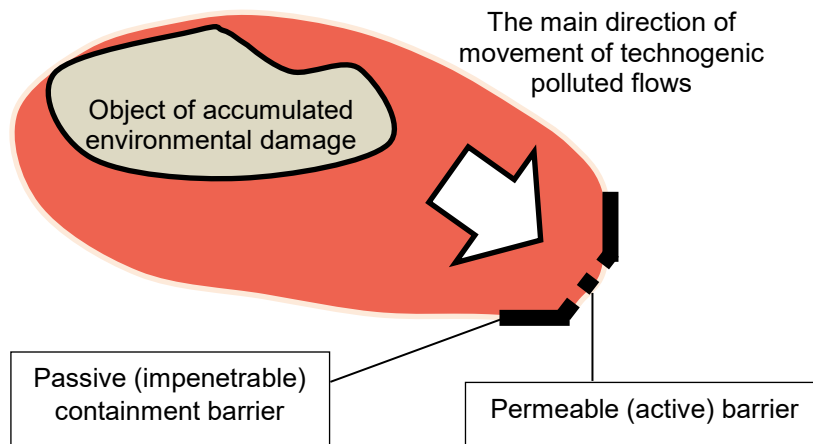


Fig. 3. An example of the implementation of a simplified scheme for the combination of barriers on the territory of the natural-anthropogenic complex

Each vulnerable state has its own specific security goal, to achieve which preventive and compensatory measures are taken in accordance with the identified risks.

The degree and gradation of the severity of the consequences are determined depending on the initial state of the environment.

Fig. 2 shows a semantic digraph, which can be represented as follows:

$$\bar{G}(S, F),$$

where S are scenarios; F are groups of factors; G is the development digraph of the analyzed events.

The installation of environmental barriers in the most probable accident sites and operation zones makes it possible to prevent the spread of pollution and leave them in a special allocated area of the natural-anthropogenic complex. In cases where these barriers are unable to block and localize technogenic flows, their uncontrolled movement occurs. The main task in this scenario is to prevent further movement and pollution of adjacent areas (Fig. 3).

The considered version of multi-scenario modeling of pollutant migration processes can be used to identify critical areas and zoning of pollutant migration and determine the location of environmental barriers that provide preventive protection of natural-anthropogenic complexes or minimize the level of negative impact.

The main feature of this example is the need to ensure the optimal deployment of numerous levels of protection of the natural-anthropogenic complex, including:

- establishment of consistent environmental barriers to the spread of pollutants into the environment;
- preliminary determination of organizational and technical engineering and protective measures for the safety and effectiveness of these barriers;
- early determination of measures to protect the population and the environment in case of partial depressurization or destruction of barriers.

Creation of a system of multilevel protection of natural and anthropogenic complexes is possible due to variant design and technological study of engineering systems for environmental protection.

The degree and gradation of the severity of the consequences are determined depending

on the initial state of the environment. The analysis of risks and threats makes it possible to apply the in-depth protection system more effectively.

The best option is to build and use a multi-level system as a preventive measure to protect the environment from the predicted negative impacts.

The output of the systematic description can also be used to identify critical points and map the movement of pollutants, which can help improve the design of the system and determine the location of environmental barriers.

Thus, as a result of the introduction and operation of an information and analytical complex based on the analysis of risks and threats, pollution is localized and eliminated, regardless of when it appeared and how it spreads during the barriers. It is also possible to implement a multi-level environmental monitoring system within the framework of an adaptive active system of in-depth protection.

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Организация экологических барьеров в условиях технологических и технических рисков

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Ключевые слова и фразы: анализ; барьер; моделирование; мультисценарий; окружающая среда; риск; уровень.

Аннотация. Рассмотренный вариант многосценарного моделирования процессов миграции загрязняющих веществ может быть использован для выявления критических зон и зонирования миграции загрязняющих веществ, определения местоположения экологических барьеров, обеспечивающих превентивную защиту природно-антропогенных комплексов или минимизирующих уровень негативного воздействия на окружающую среду.

Проведение многосценарного моделирования предусматривает необходимость внедрения единого межотраслевого методологического подхода, который определяет процедуру и содержание разработки ранних мер по обеспечению экологической безопасности и количественного анализа технологических и технических рисков.

Целью данной работы является организация экологических барьеров на основе прогнозируемых технологических и технических рисков с использованием многосценарного моделирования миграции загрязнения окружающей среды.

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Improving the Mechanism of State Financial Support for Regional Small and Medium-Sized Businesses (Using the example of the Magadan Region)

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Key words and phrases: crowdfunding; financial support; Magadan region; small business entities; microloans.

Abstract. The article is aimed at identifying the problems of finding various forms and means of public federal, regional and municipal financial support for small and medium-sized businesses in the Magadan region, as well as conducting statistical, methodological and financial assessment of the state of the region's economy to identify factors for improving the development of small and medium-sized businesses. At the same time, the publication identified problems associated with a decrease in the share of small and medium-sized enterprises in the consolidated turnover of regional finances, job cuts, and a drop in the percentage of tax budget revenues of the Magadan Region and municipalities due to the taxation of small businesses. The issues of finding non-state forms of financing for additional support of various forms of entrepreneurial activity, including on a reimbursable basis (crowdfunding, microloans, guarantees of non-state structures) were also touched upon. All of the above allowed the authors to highlight the main purpose of writing the article – a comprehensive systematic study of the implementation of financial support for private entrepreneurs in socio-economic relations in the context of the development of small and medium-sized businesses (on the example of the Magadan region). The main and practically significant results were obtained by theoretical and methodological research of scientific publications devoted to the problems and issues of activity and financial support of small business at the domestic and international level, tools of comparative economic analysis, system-structural analysis, value-normative and institutional methods, content analysis of statistical data and official documents, etc. This article is a problem study of a scientific and advisory

sociopolitical, economic and financial nature, which has an unconditional practical significance, the novelty of clarifying some problems, and is aimed at attempts to study in detail the most important aspects of the development of the system of small and medium-sized businesses in the regional context. At the same time, the topics considered in the work are certainly promising for further scientific deepening and detailing of individual points superficially touched upon in the publication.

Introduction

The formation and development of a multifunctional structure of small and medium-sized businesses in the Magadan region still does not meet the real needs and opportunities of the domestic market economy. The development of small and medium-sized businesses in Russia, with the necessary public financial support in the difficult conditions of the current situation, can become a significant and decisive factor in national and regional socio-economic progress in the country. Despite several national, regional and local policy documents have been adopted since then aimed at addressing issues of financial support for small and medium-sized businesses; the Russian state is significantly inferior to developed European countries in terms of quantitative and qualitative indicators of its development. The alarming trends have been manifested in the reduction of small and medium-sized businesses in the country as a whole in recent years, which allow us to conclude that its growth potential has been exhausted under existing conditions. The adaptation of small and medium-sized businesses to innovative technologies, the change in the concept of state regulation of the activities of medium and small businesses, the new socio-economic concept of Russia's development in a changing world order – all this makes it extremely relevant to consider and study the issues of state support for small businesses in the regions of Russia through the prism of in-depth analysis of current trends in the development of market relations.

Thus, the problem of the development of small and medium-sized businesses in the Magadan region is still relevant and has not been solved at the present stage. That explains the choice of topic. The article is a deep and comprehensive study of complex problems of financial mechanisms, means and directions of support for small and medium-sized businesses at the present stage. According to the stated purpose in the article, the following issues are revealed, which can be called the objectives of the study: to study the current state of small and medium-sized businesses in the Magadan region; to investigate the problems of financial support for entrepreneurial structures in the region; to identify features, ways of development and improvement of small business support tools.

The article involved scientific research and analyzed the main conceptual provisions of the works of various scientists and specialists concerning financial security and the activities of small businesses in the region (Akulich and Lysyanaya, 2020). In addition, some authors note the problems of entrepreneurship development in various countries due to the imperfection of the mechanism of public fiscal management (Rudnitskaya, 2020; Kravchenko, 2020). Some scientists analyze the specifics of regulating entrepreneurial activity in certain economic sectors (Zheng, 2020). Empirical studies related to conducting questionnaires and interviewing entrepreneurs about their financial situation during the pandemic are also interesting (Shepherd et al., 2021).

It should be especially noted the importance, from a research point of view, of using empirical and theoretical materials of interim reports on a research and development (R&D) work in the article that have passed state registration in the Federal State Autonomous Scientific Institution “Center for Information Technologies and Systems of Executive Authorities”, a team of authors (teachers and researchers of Northeastern State University: O.V. Akulich, T.A. Brachun, M.A. Krivulya, N.A. Chapkina, E.A. Shirokova, etc.), written in collaboration with University students. In this research, the problematic aspects of the state support system for small and medium-sized enterprises in the Magadan region, as well as the importance of various forms of non-state financing for the development of small businesses are revealed using statistical and analytical analysis (Information on the amount of funds, 2016–2020). The practical significance of the study is connected with the verification of the effectiveness of the practice of attracting investments and financial assistance to private entrepreneurs (medium and small businesses) and building a system of their provision and well-being in the Magadan region. Moreover, without theoretical study of topical issues in this direction, it is impossible to build a coherent concept of state support for entrepreneurship, protection of interests and rights of businesspersons.

The novelty of the conducted research is connected with the analysis of some topical issues on the policy of the authorities of the Magadan region in relation to entrepreneurs, as well as the modern practice of small business entities in the conditions of the spread of coronavirus (in 2019–2021).

Materials and Methods

To conduct an in-depth study of the problematic issues stated in the publication, the author used tools in the form of the following methods of socio-economic, managerial and financial sciences:

- methods of theoretical study and comparison of scientific and journalistic works related to the subject of the study, i.e. analysis (detailing, separation) of the material and synthesis, generalization of the studied literary and scientific data of the informational and empirical plan concerning the improvement of public regional and federal financial support for small and medium-sized businesses (on the example of the Magadan region);

- specification of socio-economic concepts and categories, terms of public state and municipal management in the field of development of entrepreneurial initiatives and the formation of financial support for small and medium-sized businesses;

- a value-normative method that contributed to the identification and detailed study of the actual and practical significance of socio-economic and financial phenomena of a state support system for entrepreneurs and social relations, the formulation of their modern assessment and understanding of the results concerning foreign experience (activities of other states), this method also made it possible to form proposals and identify ways to improve the business support system in the region;

- the institutional method, which was auxiliary in resolving the issues of research of various structures for financial support of private business. In particular, this method was used in the analysis of tools and means used in the activities of the Magadan Regional Fund for the Promotion of Entrepreneurship, which annually expands the list of business structures and provides them with its assistance in various forms. An institutional analysis of the elements and sections of software for providing state support for small business in the Magadan region was also carried out;

- the structural and functional method made it possible to determine the activities of

individual institutions for providing assistance to small and medium-sized enterprises, as well as mechanisms for resolving problematic issues in their functioning;

- content analysis of regulatory acts of the region aimed at the development of the economy and business initiatives; as well as summary indicators on the activities of small and medium-sized businesses, the digital content of program documents of the Magadan region;

- synthesis, summary, generalization and grouping of information data of statistical observation, literary sources, program documents in the form of systematization and processing of the studied information on the considered problems: reduction and reduction of quantitative and qualitative financial indicators of small business structures, profits, working capital of small enterprises, contribution to the gross regional product by small and medium-sized businesses.

The theoretical and empirical study of the topic stated in this publication “Improving the mechanism of state financial support for small and medium-sized businesses in the region (on the example of the Magadan region)” was carried out in several stages: firstly, at the first stage of the study, actual problems and issues necessary for a detailed study of the problem were posed and highlighted. At the second stage of the theoretical and methodological research, a content analysis of the results obtained, the study of generalized data from scientific sources, statistical reporting, etc. was carried out. At the final stage, the results of the study were summarized to formulate the author’s own position on the identified problematic elements.

Results

To achieve the goal and accomplish the tasks, statistical and analytical official data on the activities of small and medium-sized enterprises in the Magadan region, as well as materials of research work (R&D): “Factors and determinants of the development of small and medium-sized enterprises in the Magadan region” were analyzed. In order to study them information concerning the dynamics of the development of small and medium-sized enterprises (including micro-firms and individual entrepreneurs) in the Magadan region was summarized in a separate table and diagram, digital aspects of the movement of their workforce were identified (Magadan region in numbers, 2017–2020.).

As can be seen from the data in Table 1 and Fig. 1, the number of small and medium-sized enterprises of various forms of organization and activity, as well as the number of jobs needed by the able-bodied population, is decreasing annually.

If 7.355 entities (legal entities and individuals) were officially registered engaged in entrepreneurial activities as small and medium-sized enterprises in 2016 (at the end of the year), then there are only 6.326 of them at the end of 2021 (September). That is, there has been a decrease in the number by a total of 16 % over the past 5 years. Especially, small enterprises operating in the form of various civil forms of legal entities have decreased quantitatively – by almost one third (from 305 to 207 entities) (Magadan region in numbers, 2017–2020). Accordingly, the number of employees of small and medium-sized enterprises is also falling significantly (from 2020 to 2021 by almost 10 %, and by 15 % compared to 2016) (The number of legal entities and individual entrepreneurs, 2021) especially in the last three years (2019–2021), inter alia, due to the spread of coronavirus in the country and the introduction (strengthening) of emergency measures to combat COVID-19 in the regions.

In addition, according to an analytical study of O.V. Akulich and A.Yu. Lysyanaya (2021), published in 2021, the revenue base of small enterprises constantly falls from 2015 to 2020. In particular, scientists have made calculations indicating the need to expand and increase the financial state support provided to small and medium-sized businesses. They claim that over

Table 1. Dynamics of the number (growth/abbreviations) of small and medium-sized enterprises (including micro-firms and individual entrepreneurs) in the Magadan region (2016–2021)

Enterprises and individuals	2016 (end of the year)	2017 (end of the year)	2018 (end of the year)	2019 (end of the year)	2020 (end of the year)	2021 (September)
1. Legal entities, including:	2,507	2,429	2,381	2,294	2,241	2,019
Microenterprises	2,177	2,129	2,096	2,043	2,001	1,793
Small businesses	305	277	264	230	221	207
Medium-sized enterprises	25	23	21	21	19	19
2. IE, of which:	4,848	4,853	4,756	4,565	4,387	4,307
Microenterprises	4,795	4,805	4,712	4,522	4,341	4,260
Small businesses	52	47	43	42	45	46
Medium-sized enterprises	1	1	1	1	1	1
Total (including IE – individual entrepreneurs)	7,355	7,282	7,137	6,859	6,628	6,326

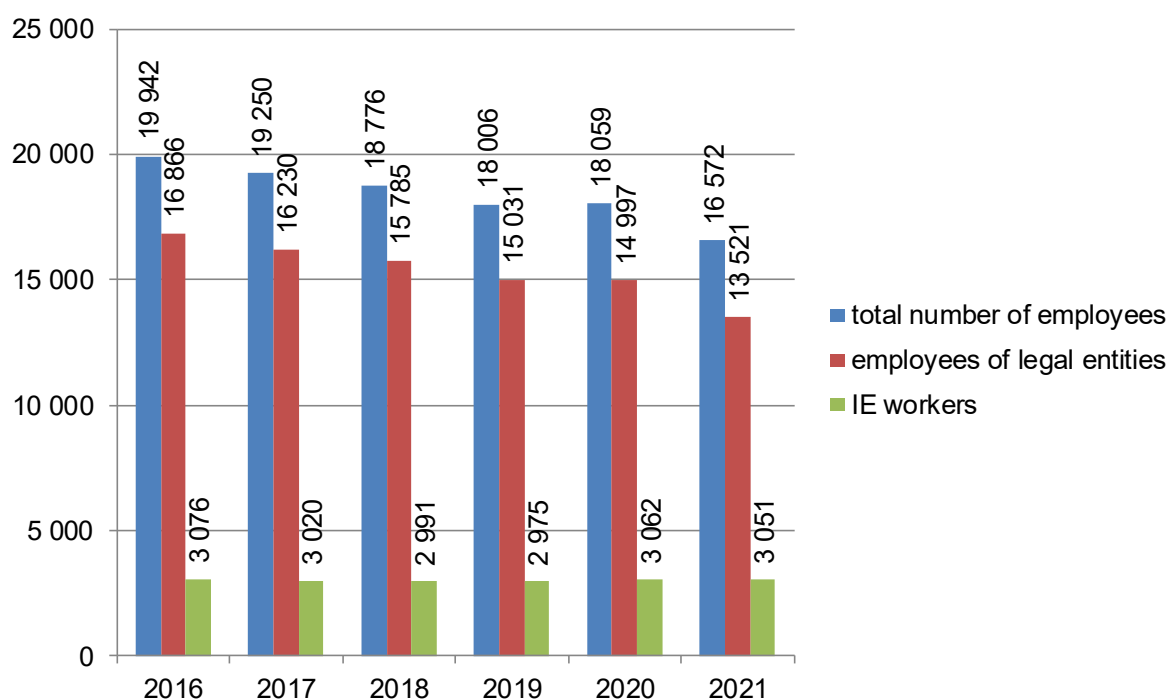


Fig. 1. Dynamics of the number of officially employed employees of small and medium-sized businesses (2016–2021)

the past six years, the number of recipients of this support has decreased from 99 to 11 (by 9 times); the share of regional budget revenues from the total profits of small enterprises has also fallen from 4.63 % in 2015 to 3.98 % in 2020 of all tax revenues. In addition, the share of

small and medium-sized enterprises in the gross regional product also decreased from 39 to 35 % and continues to fall (Akulich and Lysyanaya, 2021).

It should also be noted that the share of financial turnover of small and medium-sized businesses in the total monetary turnover of all commercial structures in the region decreased by almost 4 % in the period from 2015 to 2021. However, in the press, in scientific circles and in the reports of state public structures, the importance of the activities of small and medium-sized businesses for the optimal development of the Magadan region is constantly noted.

Representatives of small and medium-sized businesses of regional significance annually produce 100 % of eggs, 87 % of confectionery and 85 % of sausage products, 78 % of bakery products, 32 % of gold and 21 % of coal are mined, about 40 % of small and medium-sized businesses are engaged in important transportation and construction contracts (On the approval of the state program of the Magadan region, 2019). Therefore, financial support of these business entities is very important, especially during the pandemic. For comparison, the German government allocated 3.979 trillion rubles (50 billion euros) to solve financial problems for small businesses, self-employed people to fight bankruptcy in 2020. 350 billion dollars (25.6 trillion rubles) are allocated by the official US federal authorities to provide state loans to medium and small businesses to finance the remuneration of employees of organizations in 2020–2021. The Italian authorities plan to introduce monetary compensation for rental expenses for the self-employed population, as well as additional state guarantees under loan agreements for small businesses (Rudnitskaya, 2020).

The experience of developed European countries should also be used by the Russian authorities at the federal and regional levels to resolve the urgent tasks of increasing the security and maintaining the financial well-being of small enterprises in Russia. At the same time, a team of scientists (O.V. Akulich, T.A. Brachun, M.A. Krivulya, N.A. Chapkina et al.) emphasizes in an R&D report on the development of small and medium-sized businesses in the Magadan region that financial measures decrease annually in percentage to support entrepreneurship (Factors and Determinants of Development, 2020).

Despite the reduction and decrease in quantitative and qualitative financial indicators of activity, profit, working capital of small enterprises, contribution to the gross regional product from small and medium-sized enterprises, according to Fig. 2, in the future there will be a significant decrease in financial support from the state within the framework of the regional program project for 2020–2025 (Key performance indicators for small and medium-sized enterprises, 2021). In particular, to finance the subprogram “Development of small and medium-sized enterprises” in the region as part of the state regional project “Economic development and innovative economy of the Magadan region” for 2020, it is planned to allocate public funds from the federal and regional budgets in the amount of 461,127.4 thousand rubles; in 2021 – only 124,752.0 thousand rubles; in 2022 – 121,846.5 thousand rubles; in 2023 – 193,551.8 thousand rubles; in 2024 – 77,642.4 thousand rubles; and in 2025 only 600.0 thousand rubles. Moreover, at the expense of financial resources of the federal budget, about 913,271.5 thousand rubles are allocated in 2020-2025 from the total amount of funds in the amount of 979,520.1 thousand rubles (i.e. about 93.24 %), and from the regional only the remaining 66,248.6 thousand rubles (less than 7 %) (On the approval of the state program of the Magadan region ..., 2021).

At the same time, there is a clear tendency for the system of financing small business support to gravitate towards the provision of federal budget funds, rather than using territorial opportunities. Therefore, it would be quite logical to increase the public revenues of the territories of the Magadan region and the regional budget by expanding tax powers to collect from various payers and increasing the percentage of deductions in favor of the subject of the federation, and

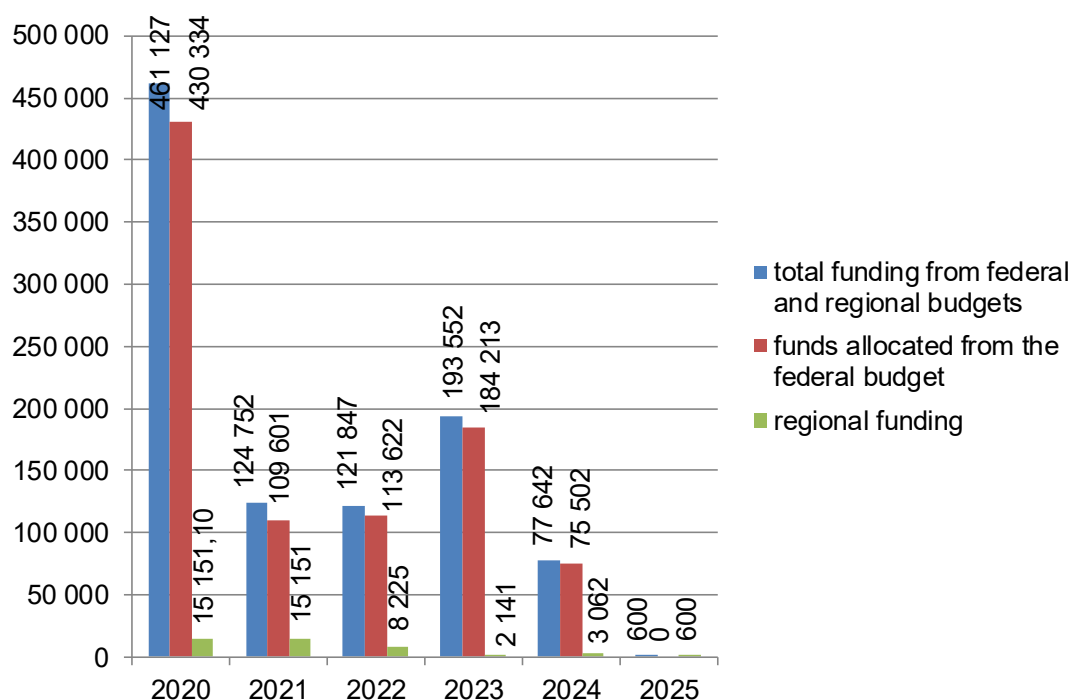


Fig. 2. Total amount of funding for the subprogram to support small and medium-sized businesses (2020–2025)

not the federal budget. It is the regional financing of various projects within the framework of supporting small and medium-sized businesses in the Magadan region that will allow achieving greater targeting and controllability of the funds used.

For comparison, the program of assistance and support for small and medium-sized businesses in the Magadan region, designed for 2014–2020, provided for financing of subjects of this sphere in the amount of 167,730.7 thousand rubles from the regional budget, and only 75,608.3 thousand rubles were borrowed from the funds of the federal centralized budget. This means that almost 70 % of the support for program activities in the development of small and medium-sized businesses was provided from regional state financial sources (Key performance indicators for small and medium-sized enterprises, 2017–2021). A positive shift in the financing and support of small and medium-sized businesses can be considered the emergence and work of the Magadan Regional Entrepreneurship Development Assistance Fund, which annually expands the list of business structures to which it provides assistance in various forms: in the form of providing guarantees in credit relations of small enterprises and financial organizations; as part of a monetary guarantee, etc. At the same time, if in 2018 there were only 35 recipients of the fund's support, then in August 2021 there are already 79 small and medium-sized businesses.

Also, a positive factor can be called the creation in 2020 of an autonomous non-profit organization "Micro-credit Company of the Magadan region", the main purpose of which is to expand the access of small and medium-sized businesses to financial resources by providing profitable microloans on the best terms and providing other types of support: information and advisory, communication, etc.

The authors of research on the development of small and medium-sized businesses in the Magadan region of Northeastern State University, analyzing the advantages of microfinance in

comparison with lending to the banking system, highlight the following: a variety of their forms and the possibility of personal choice of acceptable conditions; financial resources are given even to “startups”; a high level of customer service, which manifests itself in an individual approach; simpler conditions for obtaining loans, etc. (Information on the amount of funds ..., 2016–2021).

In general, it can be noted that small business entities in the region directly affect the general state and well-being of the regional market economy, the most complete saturation of commodity markets with food and processed products of the extractive industry, stimulate the formation of fair competition, increase the filling of the tax base of local and regional budgets, introduce and develop modern technologies.

Discussion

The theoretical, methodological, practical socio-economic problem of ensuring the effective functioning of the institute of small and medium-sized enterprises in various countries, including Russia in the regional context, when using measures of state and municipal financial support was raised and studied by various scientists and specialists of various profiles.

E.A. Kravchenko (2020), considering in the regional context the program activities of the subjects of the Russian Federation, writes about the importance of the place of the institute of small and medium-sized entrepreneurship in the socio-economic development of the Magadan region, as it contributes to the fight against unemployment and provides some financial revenues to the relevant budgets (federal, regional, local). This scientist emphasizes the need to develop and implement a number of regional programs aimed at financial support of business in small and medium-sized enterprises, as well as in micro-firms, to improve the effectiveness of a number of regulations and monetary, property support of economic activities in the service sector, trade, fishing, and other relevant industries. In this regard, it can be pointed out that the main provisions of the regional innovation program aimed at the development of small and medium-sized business structures of the economy of the Magadan region, which provide various forms of financing and monetary support for business systems, have already been considered above.

O.V. Akulich and A.Yu. Lysyanaya (2021), highlighting various forms of the mechanism of public federal, regional and municipal financial support for small and medium-sized businesses in the Magadan region, give a statistical, methodological and mathematical appraisal to identify factors for improving the development of small business. At the same time, they highlighted the problems associated with a decrease in the share of small and medium-sized enterprises in the consolidated turnover of regional finances, job cuts, a drop in the percentage of tax budget revenues of the Magadan region and municipalities due to the taxation of small businesses. In his other work, O.V. Akulich, also co-authored with N.A. Chapkina (2020), studies the dependence of the degree of tax burden on small businesses on the financial success of the activities of representatives of small and medium-sized businesses in the Magadan region.

O.V. Akulich and A.Yu. Lysyanaya (2021) in the written study also reveal the regional aspect of financial support for business, indicating the socio-economic and budgetary effectiveness of public program measures to support small and medium-sized businesses directly affects the financial condition and development of this sector of the economy. The materials are interesting of the interim reports on research registered by the Federal State Autonomous Scientific Institution “Center for Information Technologies and Systems of Executive Authorities, of a team of authors (teachers and researchers of Northeastern State University), written in

collaboration with University students in 2016–2020. These works touch upon various aspects related to public support of entrepreneurship: taxation systems of small and medium-sized businesses, the tax burden in modern conditions, financing and microfinance of these entities, etc. It is emphasized that, according to a team of scientists and students of Northeastern State University, the methodology for evaluating the effectiveness of state support should meet the following requirements: be relatively simple and accessible, and at the same time contain a sufficient number of indicators to allow assessing the economic, social and budgetary effects of state assistance; be universal, be applicable to all enterprises covered by support, regardless of their industry affiliation; information for evaluation should be publicly available; the indicators of the methodology should have a comparable form, therefore, they should be relative indicators, so there will be an opportunity for interregional comparisons. Identification of regions with the highest efficiency of state support will allow extending their experience to other regions and adjust regional assistance programs (Information on the amount of funds..., 2016–2020).

Almost all five reports (2016–2020) also provide comparative characteristics of state support for small businesses in Russia and other countries (USA, Germany, France, etc.) with in-depth study of the material and analysis of specific financial assistance measures. In particular, a separate section of the 2018 R&D report (No. 3) is devoted to a comparative analysis of taxation of small and medium-sized businesses in foreign countries in Russia (Information on the amount of funds..., 2016–2020). A group of European scientists from England, Scotland and Bulgaria: D. Shepherd, J. Wiklund and D. Dimov (2021) analyze and synthesize various scientific research of other specialists, achievements of theoretical scientific thought in the field of entrepreneurship conducting a general study of the features of the sociopolitical situation of modern entrepreneurs in small business. An integrated approach to the study of the future for entrepreneurs allows them to conclude that it is necessary to conduct a detailed study of various trends in the development of commercial activities in small businesses, as well as individual “beginnings” in modern “startups” funded from specific independent sources. This also allows them to make a reasonable assumption about the importance of state measures to ensure the stable development of medium and small business structures.

Based on this publication, it is possible to identify the importance of solving practical problems in ensuring the financial interests of representatives of small and medium-sized businesses in various countries; contextual experimental analysis, problematization and abstraction of research on the development of entrepreneurship in general; the use of surveys and questionnaires to study financial phenomena in the field of profit-making by various organizations. In general, the journalistic generalization of the methodology of research of entrepreneurial activity of these scientists made it possible to formulate a methodological justification, including the author’s article.

S. Qi and his colleague D.D. Nguyen (2021) discover and show trends in the influence of government policies and regulations on access to credit and public financing for small and medium-sized enterprises around the world researching various foreign monographic scientific and journalistic theoretical sources, analyzing the international practice of the state financial mechanism for regulating small and medium-sized businesses, using various business literature in his article, in which the directions of interaction are studied and established between small business entities, public organizations and political public forces. Using a sample of various small and medium-sized businesses from 30 countries that are only in the process of establishing a modern market system, these scientists point to the importance of state support for obtaining a bank loan in developing countries. Moreover, the nature of the financial effect and benefits in this financing directly depends on the institutional environment of small and medium-sized

enterprises, and not on the public relations of business structures. At the same time, the positive effect of the state's influence on banking structures that issue certain funds for the development of small business commercial structures is increasing in countries with a high level of corruption manifestations, since public relations of public authorities with business in developing countries are replacing practically non-functioning formal civil institutions.

A study of state regulation of small and medium-sized businesses to invite investments in transport, energy, supply and other spheres of the Republic of the Union of Myanmar (formerly Burma), conducted by E. Palmer (2021), is associated with the implementation of economic business initiatives in private-public partnership and the financial situation in the country. The scientist and public relations specialist points out that there are significant violations in the provision of financial support to small entrepreneurs allowed by the official authorities of Myanmar during the implementation of the country's sustainable development program for 2018–2030, which was created to ensure the gradual economic growth of a developing state. At the same time, a position is expressed regarding the permissibility of such violations by public management structures related to the need to achieve public and state welfare, the successful development of the country as a whole. This sociopolitical position correlates by E. Palmer (2021) with the norms of international and domestic legislation concerning the mechanisms of civil self-regulation in the country. The specified specialist objectively assesses the economic and sociopolitical aspects of the country's development trends when taking measures to encourage investment in the specified infrastructure, as well as ensuring state obligations to achieve maximum protection of financial rights and investments of small and medium-sized business structures in Myanmar.

French researchers A. Kourula, J. Moon, M.-L. Salles-Djelic and C. Wickert First (2019) give examples of the impact of various forms of public administration and regulation on small and medium-sized businesses in their publication. At the same time, scientists pay special attention to the development of the public sphere of lending and microfinance as important factors in the development of small business in certain foreign countries. Emphasis is also placed on the importance of tax benefits for the prospects of increasing entrepreneurial activity among small and medium-sized businesses. In addition, the problem of the impact of coronavirus on additional monetary measures to support entrepreneurship by French state structures is being studied; in particular, it is planned annually by the public authorities to allocate funds to the solidarity fund for private entrepreneurs involved in small businesses, the self-employed, as well as owners of individual small trade and service organizations. G. Giacca and her colleague (2019) raise an important issue of the implementation of socio-economic rights and financial interests of individual business entities, including small and medium-sized businesses, in military conflicts or the introduction of a state of emergency in the state.

Using the example of the Palestinian military-strategic occupation of the civilian population and commercial organizations, scientists give concrete examples of infringements and violations in the activities of commercial organizations and small business structures, undermining the economic well-being of the country's regions. At the same time, as the researchers note, the prolonged conduct of military operations leads not only to the collapse of the economy of small and medium-sized businesses in emergency conditions in the Occupied Palestinian territory, but also leads to the destruction of all international, trade, and foreign economic relations.

H.W. Hu et al. (2019) his Indian and Chinese colleagues, experts in the field of state economic and political regulation of economic processes, analyze and give a comparative description of the processes of public financial support in two countries with different capitalist way of functioning of market relations: India and China. They note the fact that there is an

exact dependence of the preservation of positive results of the activities of small and medium-sized firms on the state system: it is stronger in the system of public capitalism, with the full allocation of basic resources by the state (for example, in the People's Republic of China), than in a system with joint public-private interaction and regulation of financial processes (as in India). X. Zheng (2020), analyzing the monographic work of Jeremiah Gilbert, draws his own conclusions regarding the protection of financial rights and property interests of entrepreneurs in the use of natural resources. In his monograph, I.J. Gilbert focuses on trade relations, investments in natural objects and the protection of investors' rights, public management of resource complexes and legislative regulation of the licensing procedure for activities in this area, political decisions on the protection of the human environment.

American experts and practitioners often study financial phenomena in the relationship of monetary provision and political aspects of the formation and expansion of a new type of small business and the emergence of "startups" (startup company), – crowdfunding as a kind of broader process and category, – crowdsourcing, i.e. combining the efforts of various people and organizations to implement common projects and ideas, joint solutions to personal and collective problems. Within the framework of protecting the rights of investors (donors) with collective financial cooperation for the implementation of common ideas about the creation of various types of small businesses aimed at maximizing profits, the issue of legalization and legitimization (legitimization) of crowdfunding activities in various areas of human activity arises in the United States. The imperfection of American legislation regarding the sociopolitical and economic entrepreneurial phenomenon in the form of crowdfunding leads to the violation of various rights of financial "donors" (Lewis et al., 2020).

Other scientists from Europe, America and Asia (China and Japan) have also written about various aspects of crowdfunding (Blaseg et al., 2020; Jiang et al., 2020; Piening et al., 2020). In modern Russia and the Magadan region, there are "mature" prerequisites and network conditions for the creation and active implementation of crowdfunding to increase the profitability of the region's population and the use of financial resources on Internet platforms. Further national factors and directions of development of crowdfunding processes in the Magadan region will directly depend on the ability of public authorities and business institutions, other entities to achieve effective compliance and protection of investors' rights in the crowdfunding system, which will further serve positive changes in the digital economy and the implementation of financial initiatives on a new platform. Moreover, in some regions of Russia in 2019-2021, with the participation of official authorities (to provide state guarantees for financial investments), joint crowdfunding services aimed at financing small businesses are being created within the framework of public-private partnership. So, according to the results of the study of statistical, regulatory, scientific sources, and other financial information, it can be argued that important trends in the further development of security and the guarantee of growth in the activity of the business community within the framework of the creation of new and modernization of established small and medium-sized structures are areas to improve the efficiency of decision-making by the competent executive authorities of the region, funds, etc. with constant financial support.

Conclusions

Summing up, it can be pointed out that small and medium-sized businesses in the Magadan region contribute to the necessary saturation of market trading structures with essential goods and services, food, provide services in the field of construction and private transportation,

cargo transportation, carry out their activities in the extractive and processing industries of the region. In addition, small business contributes to the growth of “healthy” competition, ensures the most complete formation of the regional tax base, creates the necessary jobs to help within the framework of the general employment policy in the region. Among the studied scientific works of scientists and specialists aimed at identifying specific problems of financial support and resource and information support for the activities of small and medium-sized businesses, those that relate to the following topical issues were identified as important for the content of the article: the mutual influence of financial support from the state and fiscal, economic benefits of small and medium-sized business structures; new types of entrepreneurial activity in Russia; the impact of state policy and programmatic development measures on improving the efficiency of doing business by small and medium-sized businesses in the country and the region, etc.

In addition, the statistical data and the results of content analysis of various financial reports, analytical information show significant potential and current trends in future work to achieve the effectiveness of the functioning of the small business system in the region.

Summing up, it can be noted that the following promising areas of development of the financial support system for the activities of small and medium-sized businesses should be named.

1. As it was established in the study by statistical analysis, financial support in the form of federal and regional subsidies for small businesses, according to the program documents of the regional authorities, will be significantly reduced in the future. Therefore, it is necessary to develop other types of reimbursable financial support for small and medium-sized businesses: microloans, bank guarantees, and guarantees in credit obligations.

2. Financial analysis of the data on the functioning of small and medium-sized businesses in the regional context indicates that over the past 6 years, all official indicators determining the effectiveness of public financial support have decreased. There was a reduction in the number of jobs and the enterprises themselves, the working capital of small businesses, the number of incoming taxes decreased. At the same time, the stimulating effect of state financial support, especially during the pandemic, is confirmed by the experience of countries such as France, Italy, the USA, and Germany. The regions of Russia need to take advantage of this experience.

3. In addition, for additional financing of small businesses, it was proposed to use crowdfunding funds for the implementation of innovative projects of small and medium-sized businesses.

This work is of undoubted scientific interest, practical significance and socio-economic purpose, and, therefore, can be useful for studying issues and directions of improving the socio-economic and financial policy of the Magadan region authorities concerning the development of small business, including financial support measures.

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Совершенствование механизма государственной финансовой поддержки малого и среднего бизнеса в регионе (на примере Магаданской области)

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Ключевые слова и фразы: краудфандинг; Магаданская область; микрозаймы; субъекты малого предпринимательства; финансовая поддержка.

Аннотация. Материалы статьи направлены на выявление проблем нахождения разнообразных форм и средств публичной федеральной, региональной и муниципальной финансовой поддержки малого и среднего предпринимательства в Магаданской области, а также на проведение статистической, методической и финансовой оценки состояния экономики региона с целью выявления факторов совершенствования развития малого и среднего бизнеса. При этом в публикации были определены проблемы, связанные с уменьшением доли малых и средних предприятий в консолидированном обороте региональных финансов, сокращением рабочих мест, падением процента налоговых бюджетных доходов Магаданской области и муниципалитетов за счет налогообложения малого бизнеса. Также были затронуты вопросы поиска негосударственных форм финансирования для дополнительной поддержки различных форм предпринимательской деятельности, в том числе на возмездной основе (краудфандинг, микрозаймы, поручительство негосударственных структур). Все вышеупомянутое позволило авторам выделить основную цель написания статьи – комплексное системное изучение вопросов осуществления финансовой поддержки частных предпринимателей в социально-экономических отношениях в условиях развития малого и среднего бизнеса (на примере Магаданской области). Основные и практически значимые результаты были получены средствами теоретико-методологического исследования научных публикаций, посвященных проблемам и вопросам деятельности и финансового обеспечения малого предпринимательства как на внутригосударственном, так и на международном уровне, инструментами сравнительно-экономического анализа, системно-структурного анализа, ценностно-нормативного и институционального методов, контент-анализа статистических данных и официальных документов и др. Данная статья представляет собой проблемное исследование научно-рекомендательного социально-политического, экономического и финансового характера, имеющее безусловную практическую значимость, новизну уточнения некоторых проблем, и направлена на попытки детального изучения важнейших аспектов развития системы малого и среднего бизнеса в региональном разрезе.

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Macroeconomic Issues of Support for Manufacturers of All-Terrain Vehicles in the Arctic

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Key words and phrases: domestic market; medium-light two-link tracked all-terrain vehicles; universal and cost-effective vehicle for Arctic exploration; state interest and support.

Abstract. In order to study the need for the development of the domestic market of medium-light two-link tracked all-terrain vehicles as the most versatile and cost-effective vehicle for Arctic exploration, a literature review was conducted. As a result of the conducted scientific research, it was revealed that at present many, including foreign countries, assign a large role in the development of the Arctic to medium-light all-terrain vehicles. Since the global fleet of all-terrain vehicles is actively developing, Russian manufacturers of medium-light all-terrain vehicles need to step up their activities taking into account the interest and support of the state.

The relevance of macroeconomic support measures for manufacturers of all-terrain vehicles for the Arctic region is the subject of heated debate today. All-terrain vehicles are an indispensable technique for solving multifaceted tasks in the development of the Arctic zone of the Russian Federation to ensure economic security and address issues of transport accessibility in the Arctic. Taking into account the super-weather dependence of aviation in the Arctic, all-terrain vehicles are an excellent alternative to small aircraft. The need to solve the problem of cargo and passenger transportation in remote areas of the Arctic zone of the Russian Federation is associated with a constant increase in prices for helicopter services. Factors such as flooding and waterlogging of territories near settlements, as a result of seasonal thawing of soils caused by climate warming, also have a great influence.

Russia produces well-known, cost-effective and widely used all-terrain vehicles for hunting and fishing. These are mainly all-terrain vehicles on low-pressure tires, with a load capacity of up to 1–1.5 tons, with a capacity of 6-8 people, according to the type of the well-known “Sherp” all-terrain vehicle. These all-terrain vehicles are excellent equipment for solving their tasks. But in the Arctic, all-terrain vehicles are needed to solve permanent transport and technological tasks such as a two-link tracked all-terrain vehicle. Two-link tracked vehicles show high results of patency and endurance. Tracked all-terrain vehicles are known to have better stability on slopes,

are more functionally convenient, efficient and safe when working on rough terrain. The problem is that there are few manufacturers of two-link tracked all-terrain vehicles with a lifting capacity of 2.5–3 tons to work in the conditions of the Arctic shelf in the Russian Federation.

Many researchers pay a lot of attention to the advantages of wheeled all-terrain vehicles in terms of environmental friendliness, due to the large spot of contact with the ground, wheeled vehicles less injure the soil. When developing the Arctic, it is absolutely necessary to ensure a balance between the efficiency of economic activity and the preservation of the environment. For example, it is impossible to damage the upper horizons of the soil in tundra and tundra forests. Therefore, tracked all-terrain vehicles have a more traumatic effect on the soil layer. But there is a unique tracked two-section all-terrain vehicle BV206, produced by the “East-West” Russian Alliance of companies. The BV206 all-terrain vehicle is a fairly heavy-duty and well-traveled vehicle that practically does not affect the ecosystem, does not damage the surface of movement. With a load capacity of 2.5 tons, the all-terrain vehicle has an ultra-low ground pressure, 2–3 times less than that of an adult, and does not exceed the ground pressure of a wheeled all-terrain vehicle. The all-terrain vehicle accommodates 17 people, works economically with a full load. Due to the fact that it is equipped with ultra-wide rubber tracks, without metal ground hooks, the all-terrain vehicle does not damage the soil cover. The tests carried out in the swamps demonstrated that, driving through cranberries, the all-terrain vehicle does not even damage the berry. The BV206 all-terrain vehicle weighs significantly less than vehicles with similar characteristics. Since the body of the all-terrain vehicle is made of durable composite materials, it is maintainable, withstands temperature loads up to minus 70 degrees. The tests of the BV206 all-terrain vehicle take place in Oymyakon, at the cold pole, where it successfully performs work.

The formation of a system for creating multifunctional mobile all-terrain bases in the Arctic zone of the Russian Federation, as well as airfields for small aircraft, is relevant. The system of multifunctional mobile all-terrain bases fits well into the concept of ensuring transport accessibility of the Arctic. Such bases equipped with all-terrain vehicles of various types will solve problems not only in the field of transportation of people and goods. Some types of all-terrain vehicles are autonomous “life capsules”, on the basis of which laboratories, meteorological stations, mobile medical and paramedic stations, emergency rescue and reconnaissance modules can be equipped. Special all-terrain bases can be used for the search, development and extraction of natural resources. In emergency cases, it is possible to form temporary settlements and shift settlements from all-terrain vehicles. For these purposes, medium-light two-link tracked all-terrain vehicles with a load capacity of up to 3 tons and a passenger capacity of up to 18 people are best suited, which can be the basis of such all-terrain bases.

The creation of universal all-terrain bases will contribute to the development of Arctic tourism. In matters of identifying the tourist potential of hard-to-reach and little-explored areas of the Arctic zone of Russia, medium-lightweight two-link all-terrain vehicles will perfectly help. Research all-terrain expeditions will not do without this type of transport, which will make it possible to lay Arctic routes, and complex all-terrain bases can serve, at first, as local tourist bases.

It is necessary to develop the domestic market of medium-light two-link tracked all-terrain vehicles as the most versatile and cost-effective vehicle for Arctic exploration. Currently, foreign countries assign a large role in the development of the Arctic to medium-light all-terrain vehicles. This is illustrated by US propaganda videos about the use of medium-light two-link tracked all-terrain vehicles for aggressive development of the Arctic. Today, the global fleet of all-terrain vehicles is actively developing, including companies exporting spare parts for medium-light all-

terrain vehicles. All factors point to the need for Russian manufacturers of medium-light all-terrain vehicles to step up their activities, taking into account the interest and support of the state.

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Макроэкономические вопросы поддержки производителей вездеходной техники в арктическом исполнении

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Ключевые слова и фразы: заинтересованность и поддержка государства; отечественный рынок; среднелегкие двухзвенные гусеничные вездеходы; универсальное и экономически эффективное транспортное средство освоения Арктики.

Аннотация. С целью изучения необходимости развития отечественного рынка среднелегких двухзвенных гусеничных вездеходов как наиболее универсального и экономически эффективного транспортного средства освоения Арктики был проведен обзор литературы. В результате проведенного научного исследования выявлено, что в настоящее время многие, в том числе и зарубежные страны, отводят большую роль в освоении Арктики именно среднелегким вездеходам. Поскольку мировой парк вездеходной техники активно развивается, российским производителям среднелегких вездеходов необходимо активизировать свою деятельность с учетом заинтересованности и поддержки государства.

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Ensembles of Residential Buildings of Krasnoutilovskaya Street and Narodnogo Opolchenia Avenue in St. Petersburg (1960–1968)

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Key words and phrases: architecture; construction; residential building; panel house; district.

Abstract. The beginning of standard panel construction began in the era of N.S. Khrushchev (1956–1964). Under the shortage of materials, it was decided to switch to construction from standard reinforced concrete products with a limited assortment. The first project was completed in 1957. During this period, several series of houses were developed. The problem was that the houses were designed to last 20 years, but in fact most of them are still functioning. The average life of these houses today is 60 years. However, despite the shortcomings and aging, it is necessary to carefully consider the heritage of this period, to highlight the positive that was in it – the work of the architect with nature, low building density, and other advantages lost in modern analogues.

The purpose of the study is to show the advantages and disadvantages of this type of architecture using the example of several prominent representatives of the architecture of the specified period.

Research objectives are to collect information about the early representatives of the architecture of panel houses in Leningrad; to analyze the advantages and disadvantages of panel complexes in 1957–1964 architecture, functions, and layout features; to compile a table of the main series of panel buildings; to draw conclusions from the analysis.

The research hypothesis is as follows: panel blocks of the Khrushchev period in recent decades have been subjected to all sorts of criticism, persecution, and calls for demolition. Meanwhile, in terms of a set of objective functional and consumer qualities, the number of residents per front door, the presence of green areas, the amount of greenery and space per capita, they are close to elite low-rise housing and, according to these indicators, are several times superior to

modern residential complexes with a height of 16–25 floors and above. Their main drawback is purely physical aging, the expiration of the service life, which can be compensated for by cosmetic, overhaul or reconstruction.

The study used comparative and visual-analytical methods, including observation of architectural monuments, photographing objects, collecting historical materials.

The best examples of ensembles of residential panel buildings of the Khrushchev period 1957–1964 are considered. The main early series of houses are given. Their features, advantages, disadvantages are outlined; the advantages are shown against the background of modern multi-storey residential complexes.

Introduction

This article proposes to reconsider the usual views on an important layer of domestic architecture of the 1950s–1960s, which is traditionally underestimated by society. Panel housing construction is a global cultural phenomenon of the mid-twentieth century as a reaction to the need to quickly and cheaply solve housing problems after the Second World War. Panel houses were built in France, Germany, Eastern Europe. The most striking complexes of panels with integrated communications were built in post-war France, and many are still in operation.

Meanwhile, the destruction of such ensembles as Krasnoutilovskaya st. or a panel district on Narodnogo Opolcheniya Avenue in St. Petersburg will deprive us of a large layer of material culture that has developed in the hardships of rebuilding the country after the war, and in fact of those objective advantages that these residential complexes have. The relevance of the topic is in the call to take a different professional look at the architecture of this period.

Problem statement


Currently, there is lack of understanding of the patterns of emergence and development of panel housing construction, as well as misunderstanding of the historical prerequisites in which the panel house dramatically changed life in its time, and for a number of factors it is not at all outdated and surpasses its analogues now.

The problem is that such houses are physically outdated and require expensive repairs, but rather new approaches to their reconstruction. In Germany and Russia there are successful examples of renovation and reconstruction of prefabricated houses.

The origin of prefabricated housing construction in the USSR began in the mid-1950s, when the housing problem escalated. The consequences of the war, resettlement in the cities, and severe deterioration of the housing stock led to a protracted housing crisis. In 1957, the Central Committee of the CPSU and the Council of Ministers of the USSR adopted a resolution “On the development of housing construction in the USSR”, which determined the vector and technologies for promoting standard housing for a significant increase in the housing stock in the shortest possible time. Of great importance was the decision on the family settlement of apartments in residential buildings under construction instead of living in communes. The speed of people’s construction projects has increased. Between 1956 and 1963 the national housing stock has almost doubled – from 640 to 1184 million square meters [14].

Industrial housing construction in the USSR began in the 1920s. An early workers’ settlement

Table 1. Panel blocks of the main series of the Khrushchev era

	Series	Description
1-506 (1-506e)		– 1957–1960 – Krasnogvardeysky (30 quarter of Malaya Okhta), Nevsky districts (5th and 7th quarters of Elizarov Avenue), Vyborgsky (Kantemirovskaya street) – Trusts No. 3, 19, 104
1-335 (1-335A)		– 1959–1968 – The main massif in the Krasnogvardeysky (Malaya Okhta) and Kalininsky (Grazhdanka) districts – DSK No. 1
OD		– 1957–1963 – Nevsky and Kalininsky (Piskarevka, Grazhdanka) districts – DSK No. 2
GI		– 1959–1968 – Kirovsky, Moskovsky and Krasnoselsky districts – DSK No. 3
1LG-507		– 1958–1972 – Frunzensky (North of Kupchino), Nevsky (North of Vesolovo Poselok), Kirovsky (Ulyanka), Moscow, Kalininsky, Krasnogvardeysky districts – DSK No. 4, No. 6

is being built in the city of Ivanovo, based on the half-timbered timber frame technology.

In 1927–1928, two large blocks were constructed – at 5 Sovetskaya Street and on Bolshaya Polyanka in Moscow.

There were experiments with panel blocks back in the 1930s, but they began to be fully used after the war. From the mid-1940s, houses were built in Yekaterinburg, from the end of the 1940s – in Kyiv, Moscow, and other cities. Early trial samples lived up to expectations in terms of economy and speed of construction. Transitional block systems soon became widespread. Later, thickened panels were used – for internal load-bearing walls and insulated – for external self-supporting ones. The first frameless panel house was built in quarter 20A of Magnitogorsk in 1950 [15].

The last and most important step towards the industrialization of construction was made with the release of the resolution of the Central Committee of the CPSU and the Council of Ministers of the USSR of August 19, 1954 “On the development of the production of prefabricated reinforced concrete structures and parts for construction”, which marked the beginning of the mass production of standard prefabricated reinforced concrete products. Dozens of plants for prefabricated reinforced concrete products were put into operation [12; 13].

On November 4, 1955, Decree No. 1871 of the Central Committee of the CPSU and the Council of Ministers of the USSR “On the elimination of excesses in design and construction” was issued. The new architecture of rationalism and functionalism in the spirit of Le Corbusier was taken as a guideline, in which the parameters of new small-sized apartments and the buildings themselves were strictly regulated by the minimum and sufficient residential function and tied to the dimensions of people of average height. It is known that N.S. Khrushchev recognized that the new rationalist architecture was intended only to temporarily solve the housing problem. Architecture turned towards modernism. Instead of “architectural excesses” came simple, minimalistic forms, functionality and ergonomics. The following goals were set as a priority: standard design solutions, the use of precast concrete, economy and speed of new buildings. In Leningrad at the end of the 1950s, it is worth highlighting three vectors of progress in industrial construction.

The first generation blocks in terms of technical and economic indicators are still very close to the buildings of the Stalin era. They are characterized by spacious rooms, separate bathrooms, 3-meter ceilings, and high-quality panels with an individual look. In this technology, quarters 122 and 123 were built in the Shchemilovka district of the Nevsky district, and the first was a house at 10th Polyarnikov Street.

The second generation is represented by brick houses for family settlement made of silicate brick. On the basis of the standard series 528, various modifications appeared – five-story houses with bay windows (1-528 kp), long 9-story, “point” single-entrance 9–12-story houses. All-Union block series 1-240 and 1-439 appeared on a smaller scale.

The third generation was the construction of large-panel housing with economical residential cells. In Leningrad in 1960, there were 5 reinforced concrete plants: Kuznetsovsky (expanded concrete), Avtovsky (aerated concrete), Obukhovsky (reinforced concrete with insulation), Polyustrovsky (reinforced concrete with foam concrete) and Kolpinsky (reinforced concrete with insulation). Below are early types of panel blocks [5–11].

The most interesting for consideration is a “GI” series of aerated concrete panel blocks, common in the Kirovsky and Krasnoselsky districts.

Krasnoutilovskaya Street ensemble

A striking example of panel housing of the Khrushchev era can be called the



Fig. 1. Ensemble of Krasnoutilovskaya Street in Leningrad. G-3MI series

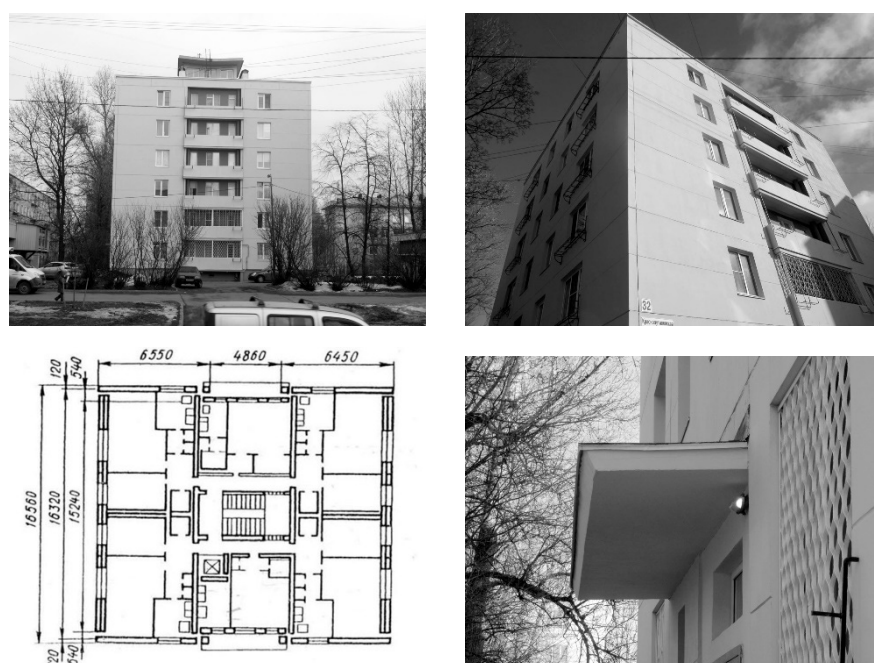


Fig. 2. Point 6-storey panel blocks of the G-4P series

Krasnoutilovskaya Street ensemble in the southwestern Avtovo district in Leningrad. Here, a whole street has been designed as a complete ensemble of a highway connecting two important districts of the city – Komsomolskaya Square near the Avtovo metro station and Constitution Square near the Moskovskaya metro station and Moskovsky Prospekt. These houses can be classified as semi-panel (two rows of panels per floor), made by Avtovsky DSK-3 together with Lenproekt. Architects V.A. Kamensky, N.Z. Matusevich, A.V. Zhuk and others (1960–1962).



Fig. 3. An ensemble of panel blocks at the corner of Narodnogo Opolcheniya Avenue and Leninsky Prospekt in Leningrad:
 a) point 9-storey houses of the G-5i series; b) linear 5-storey house of the G1 series on Narodnogo militia avenue; c) skylight and utilities; d) part of the courtyard facade

Today, these are bright monuments of the era when the buildings had 6–9 floors and large adjoining uncompacted green areas (Fig. 1).

Here, one can see two fundamentally different representatives of the new G1 panel series (1960–1968) – a linear plate for five or seven front doors of the G-3MI series (Fig. 1a) and a point 6-storey one-section panel house of the G-4P series (Fig. 2) and G-5P series. The first of them have five residential floors, set on a commercial non-residential floor that was fashionable in those years with undercutting, a canopy and stained-glass windows. Entrances to the front doors are made from the courtyard in niches (see Fig. 1b). The walls are made on the basis of half-panels, two panels per floor (Fig. 1d) [2; 3].

The block had two apartments per floor (Fig. 1c). The area of three-room apartments was 41 m² (15–10–6), four-room apartments – 49 m² (15–10–8–6). They had neither balconies nor loggias. The kitchen area was 5 m², that of bathroom was 2 m². The ceiling height was 2.5 m. In these long blocks there were 10 apartments per entrance. 1–2-room apartments appeared in the dotted house and there were already six apartments per floor (Fig. 2c). The staircase was unlit by windows and had only an upper lantern and a characteristic gable V-shaped roof (see Fig. 2a). In the house of the G-4P series, open loggias appeared (see Fig. 2b). The ensemble was advanced, promising, and largely experimental for its time [1; 4].

Ensemble of panel blocks at the corner of Narodnogo Opolcheniya Avenue and Leninsky Prospekt in Leningrad

The blocks of this ensemble are a clearly structured cell with a developed system of yards. Representatives of the linear series G-3i are located orthogonally to each other in a “ladder”, forming a through alley in the center of the block. The blocks face Narodnogo Opolcheniya

Table 2. Advantages and disadvantages of early 5–9 storey panel blocks

Disadvantages of panel blocks	Advantages of panel blocks
Physical aging Exceeding the service life by 3 times	10–15 apartments per front door. Intimacy of life and good neighborliness
Purge of old joints, roof leaks, basement leaks	Low building density, large percentage of greenery, clean air
No elevators in 5-storey blocks	Setting taking into account insulation
Physical deterioration of communications Damp basements, no waterproofing	Low rise and fire safety
Cramped rooms, low ceilings	Presence of classic balconies
Costly demolition due to rigid panel structure	Possibility of renovation through insulation and plastering

Avenue at an angle of 45 degrees, which deviates from the orthogonal structure and adds a diagonal to the master plan. Buildings of the G-5i point series are the dominants of the prospectus. Their facades are located along the avenue in a half-turn, creating the perspective of the street and maintaining the rhythm of the highway. The blocks were built mainly in 1963–1964 from lightweight aerated concrete semi-panels by Avtovsky DSK-3. Unlike the Krasnoputilovskiy Ensemble, these modifications do not have commercial premises on the ground floor. Linear buildings G-3i are represented by 5-storey buildings with 50 apartments. The nine-story version of the “tower” G-5I is designed for 54 apartments. The facades of the blocks are minimalistic – plasticity is created by loggias and a light lantern of point houses. Using the example of one of the blocks, reconstruction was carried out with facade insulation and embossed colored plastering.

Conclusion

Despite the moral and physical aging of structures and exceeding their service life by 3 times of their originally planned resource (20 years), today, against the background of mass compacted development of residential complexes with a height of 16–25 floors, this housing offers residents a higher standard of living, several times more the area of adjoining territories per capita, green spaces, fresh air, space, small squares and park areas, lower population density and, as a result, more good neighborly relations between people and a higher level of psychological comfort, which modern developers, do not always pay due attention.

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Ансамбли жилых домов Краснопутиловской ул. и пр. Народного ополчения в Санкт-Петербурге (1960–1968)

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Ключевые слова и фразы: архитектура; жилой дом; конструкция; панельный дом; район.

Аннотация. Типовое панельное строительство началось в эпоху Н.С. Хрущева (1956–1964 гг.). В условиях нехватки материалов было принято решение перейти на строительство из типовых железобетонных изделий с ограниченным сортаментом. Первый проект был выполнен в 1957 г. В данный период были разработаны несколько серий домов. Проблема состояла в том, что дома были спроектированы на 20 лет, но фактически большинство из них функционирует до сих пор. Средний срок службы этих домов сегодня составляет 60 лет. Однако, несмотря на недостатки и старение, необходимо внимательно отнестись к наследию данного периода, выделить то положительное, что в нем было – работа архитектора с природой, низкая плотность застройки и другие преимущества, утраченные в современных аналогах.

Цели исследования:

1) собрать информацию о ранних представителях архитектуры панельных домов в Ленинграде;

2) проанализировать преимущества и недостатки панельных комплексов 1957–1964 гг. архитектуры, функции, особенностей планировки;

3) привести таблицу основных серий панельных зданий;

4) сделать выводы из проведенного анализа.

Задача исследования: вопреки сложившимся стереотипам об устаревании и необходимости сноса показать на примере нескольких ярких представителей архитектуры указанного периода преимущества и недостатки данной архитектуры.

Гипотеза исследования. Панельные дома Хрущевского периода в последние десятилетия подвергались всяческой критике, гонению, призывам к сносу. Между тем, по набору объективных функциональных и потребительских качеств, числу жителей на парадную, наличию зеленых зон, количеству зелени и пространству на душу населения они приближаются к элитному малоэтажному жилью и в несколько раз по данным показателям превосходят современные жилые комплексы этажностью 16–25 этажей и выше. А основной их недостаток – чисто физическое старение, истечение срока службы, которое может быть компенсировано косметическим, капитальным ремонтом или реконструкцией.

Методы: сравнительный, визуально-аналитический. Осмотреть памятники архитектуры, выполнить фотофиксацию объектов, собрать исторический материал, сравнить с современными аналогами.

Результаты: рассмотрены наиболее яркие представители ансамблей жилых панельных зданий Хрущевского периода 1957–1964 гг. Приведены основные ранние серии домов. Изложены их особенности, преимущества, недостатки, показаны достоинства на фоне современных многоэтажных жилых комплексов.

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