SCIENTIFIC RESEARCH OF THE SCO COUNTRIES: SYNERGY AND INTEGRATION

上合组织国家的科学研究：协同和一体化

Materials of the International Conference

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上合组织国家的科学研究：协同和一体化
国际会议

参与者的英文报告

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“Scientific research of the SCO countries: synergy and integration”

Part 1: Participants’ reports in English

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这些会议文集结合了会议的材料 – 研究论文和科学工作者的论文报告。 它考察了职业化人格的技术和社会学问题。一些文章涉及人格职业化研究问题的理论和方法论方法和原则。
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These Conference Proceedings combine materials of the conference – research papers and thesis reports of scientific workers. They examines tecnical and sociological issues of research issues. Some articles deal with theoretical and methodological approaches and principles of research questions of personality professionalization.

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Foreword

We thank all participants of our conference "Scientific research of the SCO countries: synergy and integration" for the interest shown, for your speeches and reports. Such a wide range of participants, representing all the countries that are members of the Shanghai Cooperation Organization, speaks about the necessity and importance of this event. The reports of the participants cover a wide range of topical scientific problems and our joint interaction will contribute to the further development of both theoretical and applied modern scientific research by scientists from different countries. The result of the conference was the participation of 56 authors from 7 countries (China, Russia, Uzbekistan, Kazakhstan, Azerbaijan, Tajikistan, Kyrgyzstan).

This conference was a result of the serious interest of the world academic community, the state authorities of China and the Chinese Communist Party to preserve and strengthen international cooperation in the field of science. We also thank our Russian partner Infinity Publishing House for assistance in organizing the conference, preparing and publishing the conference proceedings in Chinese Part and English Part.

I hope that the collection of this conference will be useful to a wide range of readers. It will help to consider issues, that would interest the public, under a new point of view. It will also allow to find contacts among scientists of common interests.

Fan Fukuan,
Chairman of the organizing committee of the conference
"Scientific research of the SCO countries: synergy and integration"
Full Professor, Doctor of Economic Sciences

前言

我们感谢所有参加本次会议的“上海合作组织国家的科学研究：协同作用和整合”，感谢您的演讲和报告。代表所有上海合作组织成员国的广泛参与者都谈到此次活动的必要性和重要性。参与者的报告涵盖了广泛的主题性科学问题，我们的联合互动将有助于不同国家的科学家进一步发展理论和应用的现代科学研究。会议结果是来自7个国家（中国，俄罗斯，乌兹别克斯坦，哈萨克斯坦，阿塞拜疆，塔吉克斯坦，吉尔吉斯斯坦）的83位作者的参与。

这次会议的召开，是学术界，中国国家权力机关和中国共产党对维护和加强科学领域国际合作的高度重视的结果。我们还要感谢我们的俄罗斯合作伙伴无限出版社协助组织会议，准备和发布中英文会议文集。

我希望会议的收集对广大读者有用，将有助于在新的观点下为读者提供有趣的问题，并且还将允许在共同利益的科学家中寻找联系。

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教授，经济科学博士，中国科学院院士，会议组委会主席“上合组织国家科学研究：协同与融合”

金砖国家的环境问题和能源消耗
ENVIRONMENTAL ISSUES AND ENERGY CONSUMPTION IN THE BRICS COUNTRIES

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注解。 本文探讨了环境问题，并分析了金砖国家的能源消费来源。 显示了金砖国家过渡到可再生能源的必要性。

关键词。 金砖四国，环境问题，能源消耗。

Annotation. *The article deals with environmental problems and analyzes the sources of energy consumption of the BRICS countries. The necessity of transition of BRICS countries to renewable energy sources is shown.*

Keyword. *BRICS, environmental problems, energy consumption.*

Despite the fact that for Russia the problems of climate change and environmental pollution are not among the priorities of the scientific and technological sphere, the degree of relevance of these issues is very high. Building a model of the interdependence between electricity consumption, urban population, and economic growth and CO_2 emissions in the BRICS countries in the period 2004-2010 revealed that the increase in GDP in Brazil and Russia contributed to the reduction of carbon dioxide emissions, while in India, China and South Africa the opposite situation was observed. At the same time, the increase in electricity consumption due to the ongoing urbanization process has caused an increase in CO_2 emissions into the atmosphere in all States of the Association [1]. In addition to changes in GDP and the degree of urbanization, the dynamics of the indicator is influenced by changes in the structure of the energy balance of States. Accordingly, the transition to more environmentally friendly fuels will reduce the burden on the environment.

In Brazil, the main sources of energy are oil and water resources; in Russia – natural gas, in other BRICS countries – coal (table 1). The predominance of non-ecological fuels in the total volume of energy consumption predetermines a high level of load on the environment per capita. But because of the size of the economy, total CO_2 emissions may be relatively low.

Table 1 - *Volume and specific structure of fuel consumption in BRICS countries in 2016*

Country	Total fuel consumption, mln t	Share of fuel type in consumption structure, %					
		Oil	Natural gas	Coal	Nuclear	hydroelectric	renewable energy
Brazil	297,8	46,6	11,0	5,5	1,2	29,2	6,4
Russia	673,9	22,0	52,2	13,0	6,6	6,3	0,03
India	723,9	29,4	6,2	56,9	1,2	4,0	2,3
China	3053,0	19,0	6,2	61,8	1,6	8,6	2,8
South Africa	122,3	22,0	3,8	69,6	2,9	0,2	1,5

Source: calculated by the author according to BP Statistical Review of World Energy June 2017. 66th edition // London: Pureprint Group Limited, 2017. P. 9.

In 2016, the share of BRICS countries in the global pollution structure was 41.18%, including China-27.29%, India-6.79%, Russia-4.46%, Brazil-1.37%, South Africa-1.27%. Since 2006, the group's share of global CO2 emissions has increased by 6.47 percentage points, mainly due to the growth of industrial production in China and India [2, p.47].

But in recent years, the BRICs countries have seen a tendency to reduce pollution due to quantitative (reduction in total fuel consumption) and qualitative changes (transition to more environmentally friendly energy). The exception is India, which in 2014-2016 increased CO2 emissions by 8.9% (to 2271.1 million tons), due to an increase in fuel consumption by 13.5%. Over the same period, the indicators of China decreased by 1.1% (to 9123 million tons), Russia – by 3.4% (to 1490.1 million tons), Brazil – by 9.9% (to 458 million tons), South Africa – by 4.1% (to 425.7 million tons). It should be noted that in China, against the background of an increase in total fuel consumption, the share of coal in the structure of the energy balance decreased from 66 to 61.8%.

The reasons for this shift were the reduction of coal production in China and the implementation of the state policy to reduce environmental pollution. In particular, China is implementing a large-scale investment program to introduce new technologies at coal-fired thermal power plants, which produce more than 600 MW of electricity in total [3, p.506]. In partnership with the American company Colombia Clean Power & Fuels, the Chinese enterprise Dinghy is engaged in research of a new technological process for the production of metallurgical coke. In turn, the Chinese government provides comprehensive support to national companies engaged in the development of competitive technology for underground coal gasification.

International experience shows that the use of clean coal technologies can significantly reduce pollution. According to the environmental protection Agency, the use of such technologies has led to a reduction in the specific rate of pollution emissions by 77% [3, p.505]. Since the largest share in the energy balance of India,

China, and South Africa is occupied by thermal power plants operating on coal, the introduction of clean technologies is an economically feasible and effective way to improve the environmental situation.

As a result of the full transition of the national economies of the BRICS countries to the use of clean coal, the total share of the group in the global structure of pollution can be reduced to 24% while maintaining the current level of energy consumption. At the same time, it is possible to strengthen the positive effect of the introduction of clean coal technologies through the implementation of the state energy saving policy.

Accordingly, increasing the degree of environmental friendliness of coal energy can become an intermediate stage of transition of economies to the use of renewable energy sources (RES).

According to clean Edge, a clean technology Analytics firm, the global alternative energy market was $ 247.6 billion in 2013, including biofuel segments - $ 97.8 billion. (39.5% of the total), solar energy-91.3 billion dollars, (36.9%), wind energy – $ 58.5 billion. (23.6%). Despite the slowdown associated with the unstable economic situation in the world, the industry as a whole remains positive. However, it is worth noting that in the period 2000-2013. There was a decrease in the volume of individual segments, in particular, the size of the global solar market decreased by 13% in 2012, and wind-by 20.7% in 2013.

According to experts, the volume of the global renewable energy market will increase to 397.8 billion dollars by 2023, it is expected that the main driver of growth will be the solar energy sector, which should increase to $ 158.4 billion, which is 173.5% to the level of 2013. in turn, the biofuel and wind energy segments, according to experts, will expand to $ 145.6 billion by 2023 and $ 93.8 billion., respectively [4, p.2] .

According to the forecasts of the Russian energy Agency, by 2030 the share of biofuels in the structure of the global energy market will average 20% [5]. The share of solar energy is expected to approach 25%, as the segment is projected to grow faster relative to biofuels. Based on this, it is assumed that by 2030, more than half of the world energy market will be accounted for by renewable energy sources, including wind, geothermal, tidal power, etc. This determines the relevance of research in the field of renewable energy and promising areas of scientific and technological cooperation within the BRICS.

The world leaders in the production of biofuels are the United States, Brazil and the EU, whose combined share was 82.5% at the end of 2016. The Main type of biofuel is bioethanol, which occupies more than 80% of the total volume; its main producers are the United States and Brazil. In turn, the European Union specializes in the production of biodiesel, the share of which in the global production of biofuels tends to grow [6, p.6-7].

Brazil's experience in the use of biofuels in the transport sector is a positive example of the implementation of public policies aimed at supporting biofuel producers and, as a consequence, reducing environmental pollution. The introduction of mandatory requirements for the content of ethanol in gasoline at the level of 20% led to the modernization of automotive production and the increase in the use of biofuels. Currently, about 80% of Brazil's car fleet is powered by a mixture of gasoline and ethanol [2, p.45].

Accordingly, the prerequisites for the development of the biofuel industry can be attributed to the growth of car parks in China and India, the volume of which is close to the indicator of the United States, as well as the depletion of world oil reserves and the need to diversify the structure of the energy balance of countries.

However, currently there is a problem in the development of the biofuel sector, which is the use of food raw materials for its production, which reduces the level of food security. In addition, the production of biofuels is associated with the risk of crop failure of food crops used as a basis for its production, which also reduces the attractiveness of the industry. In this regard, it is advisable to conduct joint research within the BRICS aimed at developing a new generation of biofuels, for the production of which non-food crops, industrial waste, etc. will be used.

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在俄罗斯实施积极的长寿战略的区域经验
REGIONAL EXPERIENCE IN IMPLEMENTING ACTIVE LONGEVITY STRATEGIES IN RUSSIA

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抽象。 作者进行了比较分析，并调查了在俄罗斯地区实施积极长寿的战略和方法的经验。 这项研究的新颖之处在于作者得出的结论是，对于俄罗斯而言，积极长寿的具体因素–人口的功能性老龄化； 长寿的地理特征与环境状况有关，与传统观念无关； 老一辈的俄罗斯人缺乏传统，无法长寿并对其健康进行系统的监控。 研究结果的实际意义在于将其结果用于解决国民经济问题–确保俄罗斯积极长寿。

关键词：策略，积极长寿，区域，退休年龄。

Abstract. *The author conducted a comparative analysis and investigated the experience of implementing strategies and methods of active longevity in the regions of Russia. The novelty of the study is the author's conclusions about the specific for Russia factors of active longevity - functional aging of the population; geographical features of longevity associated with the environmental situation, and not with traditional ideas; the lack of tradition among the older generation of Russians for a long life and systematic monitoring of their health. The practical significance of the research results lies in the application of its results to solve the national economic problem - ensuring active longevity in Russia.*

Keywords: *strategy, active longevity, region, retirement age.*

For the first time in history last year, the number of people over 64 years old exceeded the number of children under 5 years old. Not only the developed countries of Europe, but also India, South Africa, Indonesia, Mexico, Turkey, China, Argentina, South Korea, the USA, Russia and Canada now have the status of an "age country". Demographic aging is an evolutionary process that requires the development and implementation of a state policy of active longevity in order to improve the quality of life of the population and sustainable development of the economy.

World experience confirms that in high-income countries (to which Russia is assigned, according to the UN quality of life rating for 2018, 49th place [1]), older people are in search of new alternatives to traditional life stages. The Lancet publication published the results of a study that claims that Russians are one of the fastest growing nations in the world [2]. Based on data from 1990 to 2017, the global average age of senile was established, to which several "senile" diseases accumulate. He averaged 65 years. This age is approaching for residents of different countries at different times: in Japan and Switzerland, on average, at 76 years old, in the Central African Republic at 53 years old, in Afghanistan at 51 years old, and in Papua New Guinea at all at 45 years old. Scientists attributed Russia to the number of countries whose population is aging faster than the global average: a set of diseases characteristic of old age among Russians usually accumulates by the age of 59. For residents of Ukraine, old age begins two years earlier - at 57 years old, in Belarus - at 60. Calculations based on official statistics show that the median age of the Russian population over the period 1959-2018 increased by 11.9 years and amounted to 1 January 2018, 38.4 years, with a global median age of 29.5 years [3, 118]. The average life expectancy in Russia is influenced by geographical factors - in the top ten regions with a good environmental situation - the Republic of Ingushetia, the Republic of Dagestan, Kabardino-Balkaria, the Republic of North Ossetia-Alania, the Chechen Republic. Despite the strong opinion of “Caucasian longevity”, the North Caucasian Federal District occupies the penultimate place in the number of centenarians (184 people per 100 thousand people), noticeably lower than the national average (253 people per 100 thousand people). The leaders are the Central and North-Western Federal Districts (369 and 408 people per 100 thousand people, respectively), in which the two largest megacities - Moscow and St. Petersburg (534 and 535 people per 100 thousand people, respectively) make the largest contribution.) One of the features of achieving longevity in Russia is the lack of traditions of long-term orientation and systematic monitoring of one’s health in the older generation. According to the Federal State Statistics Service of Russia for 2017, 14.7% of women and only 5.2% of men are retired. In addition, Russia's position in international ratings reflecting the current situation and the expected consequences of the current policy in the context of demographic aging necessitate the development and implementation of an integrated approach to the problem of population aging, taking into account the specifics of structural demographic changes and the most significant factors of active longevity for Russia [4]. An important point is the fact that in 2019 in Russia new standards for retirement were adopted, as a result, the retirement age is increased by five years. Changing the boundaries of the retirement age in Russia will change the picture, this will lead to a change in strategies, will require the introduction of new types of aging. At present, several types of aging

are distinguished [5, 195]. Changing the situation in Russia will require the fifth type of aging (active aging) from society and individuals of pre-retirement and retirement ages. This type of aging is determined by the need to implement the concept of healthy old age, the main purpose of which is to maintain a functional ability that ensures well-being in old age. The strategy aimed at implementing the concept of healthy old age is a strategy of active longevity. It is a global standard established by the World Health Organization (WHO (2002)), "active aging refers, first of all, to the process of optimizing the opportunities for ensuring health, participation in society and human security in order to improve the quality of life during aging". WHO experts believe that the health of older people in the world lags behind the growth of life expectancy. They recommend new strategies based on new ideas about aging to implement the concept of active old age and longevity: early prevention and a healthy and active lifestyle, which should strengthen the ability of older people to succeed in the ever-changing conditions in which they have to live [6, 22].

Russia has adopted the "Strategy for the Interests of Senior Citizens in the Russian Federation until 2025" [7], the implementation of which should ensure the achievement of the main goal of active longevity in Russia, which is a strategic national goal, to achieve an expected life expectancy of 80 years by 2030 [8]. To implement this strategy, the Russian regions implement three main strategies of public administration in the field of active longevity: a strategy of active participation, decentralized regulation and a mixed strategy. The active participation strategy involves financing and creating various forms of active longevity for third-age citizens: circles, tourist centers, recreation centers, sports clubs, competitions, etc. The decentralized regulation strategy assumes that the region does not form its own strategy of active longevity, and the leading role is played by public organizations, foundations, private specialized institutions. The state should create the necessary legal, economic and other conditions for them and implement key measures to improve the quality of life of the elderly population with the help of departmental ministries (health, labor and social protection, sports and tourism, etc.). A mixed strategy is used in regions whose government is interested in harnessing the potential of the elderly. In relation to state organizations, the regional government uses a strategy of active intervention, to the rest - a strategy of decentralized regulation [9], [10].

Many subjects of the Russian Federation have a number of regional programs aimed at increasing the period of active longevity and the duration of a healthy life in the following areas:

1. Increasing the availability of medical care (providing senior citizens with medical examinations and preventive examinations, including citizens living in rural areas);

2. Increasing the availability of services taking into account the needs of older citizens (providing social services at home, technologies that ensure the receipt of social services by citizens living in rural areas, expanding the practice of mobile, including interagency teams to provide various services, as a priority in remote, inaccessible territories);

3. Education of senior citizens;

4. Promotion of employment;

5. Maintaining the physical activity of older citizens;

6. Ensuring tourist mobility of senior citizens;

7. Organization of cultural and leisure activities;

8. Development of voluntary (volunteer) movement (volunteering and "silver" volunteering);

9. Improving the living standards of citizens of the older generation, etc.

In order to improve the quality of life of older citizens, various technologies are used in social service organizations: foster families, nursing schools, a hospital at home, a sanatorium at home, a social taxi, nurses, third-age universities, mobile teams, etc. Consider the best regional practices. Since 2014, technology has been actively spreading in the Rostov Okrug - the "social taxi" service. Since 2012, in the Khanty-Mansiysk Autonomous Okrug - Ugra, the technology of family care for senior citizens "Adoptive family for an elderly citizen" has been applied, which provides for the cohabitation and maintenance of single older citizens who are unable to perform everyday activities due to health reasons and their assistants appointed by the guardianship authorities. In the Khabarovsk Krai, the Neighborhood Assistance project is being implemented, aimed at maximizing the extension of citizens' stay at home and maintaining their social, psychological and physical condition. In 2018, Healthy City campaigns were held as the population events in the Moscow Oblast, dedicated to the following World Health Days: World Cancer Day, World Kidney Day, World Health Day, World Hypertension Day, World No Tobacco Day, International Day against Drug Abuse. All-Russian Day of Sobriety and the Fight Against Alcoholism, World Heart Day, World Day Against Stroke, World Diabetes Day and World No Smoking Day. In 2018, 265 radio broadcasts, 414 television programs, 910 publications in periodicals, and 615 materials were posted on the Internet in the media at the regional and municipal levels. As a group and individual prevention in the Moscow Oblast, 28 Health Centers for the adult population are organized and operate.

In the Nizhegorodsk Region, in accordance with the Law "On Physical Culture and Sports in the Nizhegorodsk Oblast", non-working pensioners who are old age members of health groups at these institutions have the right to use free of charge sports facilities owned by the state.

In Moscow for several years, in order to improve the quality of life of pensioners, the Moscow Longevity program has been implemented. All interested pensioners can attend sports sections in the interests of various areas: general physical training, classes on sports simulators, swimming, zumba, Nordic walking, chess and checkers.

In the Ivanovo Oblast, the Travel Odyssey project is being implemented, senior citizens are trained at Schools of social guides, where they master the theoretical knowledge and practical skills of a social tour operator and social guide based on the principle of volunteering.

The Federal Law "On Education in the Russian Federation" for the first time normatively enshrines the concept of lifelong education, which provides the opportunity to realize the right of citizens to education throughout their lives. On average, 30 percent of the country's adult population is enrolled in formal and non-formal education (in the world in the developed countries, the share of studying adult population reaches 70–80 percent). Therefore, relevant for educational institutions of Russia is a way to support the activity of citizens of the older generation - a university of third age. The best practices in this case are the experience of the Kaluga Oblast, where on the basis of the State Budgetary Institution of the Kaluga Oblast “Borovsky Center for Social Services for Senior Citizens and Disabled Citizens”, third-year universities and interest clubs operate. As part of third age universities, older citizens are taught foreign languages (German, English, Spanish), computer literacy. For the visually impaired, computer literacy courses are available in a special program.

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国家经济安全保障体系：性质，结构，功能特点
NATIONAL ECONOMIC SECURITY PROVISION SYSTEM: PROPERTIES, STRUCTURE, FEATURES OF FUNCTIONING

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抽象。 介绍了国家经济安全保障体系的性质，结构和功能特征分析的结果。确定了建立该系统的先决条件，世界经济中需要在国家决策层面作出适当反应的主要挑战和威胁。 概述了现代条件下对国家经济安全的主要威胁。 简要介绍了国家经济安全体系各要素之间的联系。

关键词：经济安全，发展，全球化，宏观经济稳定，金融危机

Abstract. *The results of properties, structure and functioning features analysis of the national economic security provision system are presented in the article. The prerequisites for the formation of this system, the main challenges and threats in the world economy that require an appropriate response at the national level of decision-making are determined. The main threats to national economic security in modern conditions are outlined. The connection of elements of the national economic security system is schematically presented.*

Keywords: *economic security, development, globalization, macroeconomic stability, financial crisis*

The development of globalization processes in the world economy and the increasing interdependence of national financial and economic systems increases the level of requirements for methods and mechanisms aimed on ensuring national, regional and sectoral economic security. Taking in consideration that the world's economic processes are not characterized by stability, and financial, raw-material and commodity markets concentrate significant risks, the whole complex of Russia's economic security ensuring issues is characterized by relevance and requires appropriate application of scientific efforts.

In conditions of foreign sanctions toughening, protectionism growth and absence of positive dynamics in domestic high-tech producers' competitiveness growth it is necessary to provide stability of national economy development, economic security resistance and intensive expanded reproduction of the economy. Solution of these tasks is the material basis for ensuring national security and all its components.

National economic system functioning is mediated by a number of cyclical processes. At the same time, the non-viability of this system depends on the reproduction of its components. We also note the importance of ensuring the consistency of individual elements and subsystems of the national economy, their goals, objectives, strategic priorities and plans. As well as existing capabilities, resources and actions aimed at decompensating threats.

In these conditions, ensuring economic security largely depends on the coordination and harmonization of functioning processes of all subsystems that ensure the comprehensive development of the national economy. It is also important to promptly identify all threats that are formed at different levels of forecasting and have a corresponding impact on the processes of making operational, tactical and strategic decisions. At the same time, the level of activities efficiency in the field of economic security of large economic systems of various levels is estimated taking into account the capabilities of these systems for extended reproduction. In this case, the objects of analysis are the individual stages of the process of expanded reproduction (production, distribution, redistribution, consumption of national wealth). As absolute indicators should be considered indicators of growth of gross product, created value added, as well as relative indicators of their growth. Comprehensive economic security at the national level requires a systematic implementation of management functions. Thus, the issue of substantiating the structure of the system of ensuring national economic security is relevant.

Issues of national economic security are in the focus on numerous scientists' and economists' attention. Among the priority areas, the problem of mineral resource base influence on the studied phenomenon is considered (Sekerin et. al., 2019). We also note the attention paid to tax security issues (Kosova et al., 2019) and ensuring freedom of enterprise (Morozova et al., 2018). The impact of innovative development (Zakharkina et al., 2018) and social stability (Stukalo et al., 2018) on the processes of ensuring economic security is considered in the scientific literature. Special attention is paid to the study of economic security as a component of the national defense strategy of Brazil (Rezende et al., 2018). Significant from the point of view of the subject of our work are the achievements of authors from Iran (Asghari, 2017), India (Dash, 2018) and Ukraine (Sytnyk, 2017).

The presented structure of the system of national economic security provision (fig. 1) assumes the action of the subjects of this process in the conditions of the presence of external adverse factors of influence. The internal environment of the system functions in the direction of achieving certain goals (different planning horizons) in accordance with the principles, available resources and national development priorities. The result (output) of this system is the achieved rate of long-term economic development, the achieved level of resistance to external risks and threats, as well as the degree of competitive superiority of the national economic system over competitors in the world markets of goods and services.

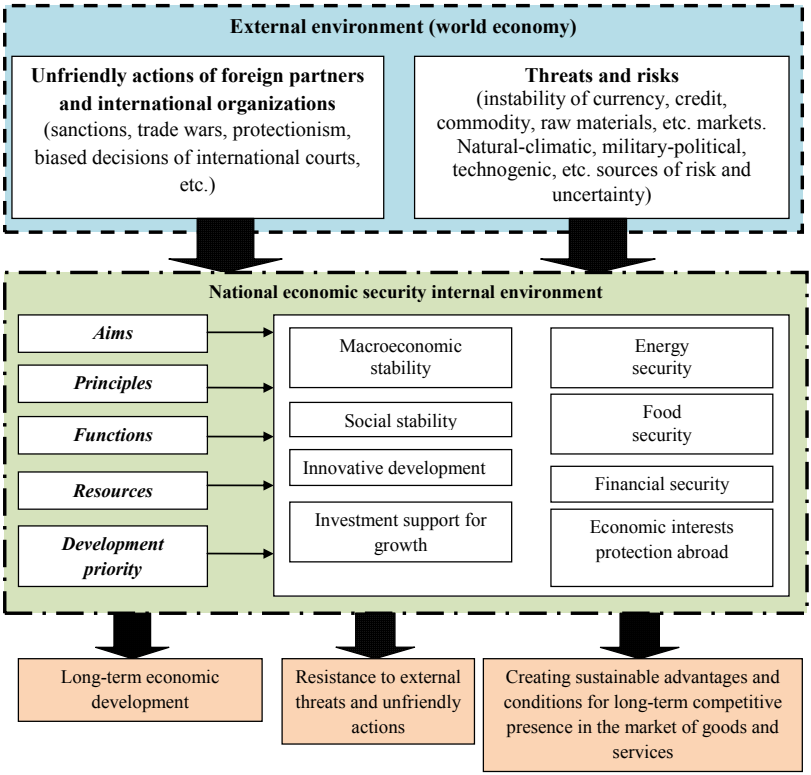

Fig. 1. *Structure of the national economic security system*

The system of national economic security provision is a complex combination of components including objects and subjects of management, mechanisms, functions, principles, resources, methods and specific tools for managing internal economic processes. System integration of the above components allows to achieve the goals of the management process in the conditions of adverse environmental factors.

Achieving a high level of national economic security contributes to the formation of an appropriate investment attractiveness of the country (its individual regions, territories and industries). The effective activities of the relevant state structures in this direction contribute to an increase in investment, reinvestment of foreign capital, and the relocation of profit centers of foreign corporations to the territory of the country. In this case, the issues of ensuring the transparency of the economy and creating conditions for the free development of business structures are also important. In the absence of such conditions as free competition and lack of administrative (including regional) protectionism, transparency of all business registration procedures (including certification, passing other approvals and formalities related to the launch of production and entering the market), free access to the public procurement market (including procurement of state corporations), development of market institutions and relevant infrastructure (the entire complex of subjects of investment, financial, raw materials, etc. markets) national economic security provision is significantly complicated.

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俄罗斯工业政策实施中的竞争发展和进口替代问题
PROBLEMS OF DEVELOPMENT OF COMPETITION AND IMPORT SUBSTITUTION IN THE IMPLEMENTATION OF RUSSIA'S INDUSTRIAL POLICY

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抽象。 俄罗斯现代工业发展方式在于解决发展竞争和进口替代的问题。 本文考虑了对俄罗斯竞争环境的评估，从而可以识别出阻碍工业发展的关键问题并分析进口替代领域中的问题。

关键词：竞争发展进口替代产业政策

Abstract. *The modern way of industrial development in Russia lies through solving the problems of developing competition and import substitution. The article considers the assessment of the competitive environment in Russia, which allows to identify key problems that impede the development of industry and analysis of problems in the field of import substitution.*

Keywords: *development of competition, import substitution, industrial policy.*

The path of industrial development in Russia lies through solving the problems of developing competition and import substitution. An increase in the number of industrial entities will make it possible, on the one hand, to meet the demand for industrial products both for the country and for export abroad, and on the other hand, it will contribute to the improvement of products in the competition.

Evaluation of the competitive environment in Russia allows you to identify key problems that impede the development of industry, namely, increasing the number of enterprises, increasing productivity and quality of goods that are possible as a result of fair competition. Weak competition reduces the effectiveness of market mechanisms, since the economic environment cannot transmit control signals to market participants. Thus, with weak competition, the market model of economic management loses its meaning.

Important in the formation of competition in the economy and industry, in particular, is the level of state participation. According to some reports, the share of the state and state-owned companies in Russia's GDP today is about 70%, while in 2005 this share was about 35%.

A high share of the state's presence, according to 2011 data, was observed in engineering (15%) and the oil and gas sector (45%), as well as in a number of other sectors not related to industry. The state is practically not represented only in non-ferrous and ferrous metallurgy.

At present, the problem of maintaining competition in Russia is particularly urgent, since the devaluation of the ruble, for objective reasons, has limited the competitiveness of foreign producers and forced them out of the domestic market, however, national producers are not so differentiated in their quantity and are often limited to one or several companies. Sanctions and import substitution act in the same direction. All this can further reduce the level of competition in our economy, which is already excessively monopolized [1].

This problem is indicated in many studies, therefore, we consider the statistics of imports of goods to Russia [2].

According to monthly reports of the Ministry of Economic Development, for the period from January to September 2015, imports of goods decreased by 35.7% compared with the same period in 2014, exports - by 32.0% [3].

The authors of the study "Food Embargo: Import Substitution and Changing the Structure of Foreign Trade" believe that the result of restricting competition with imported products was not only an increase in prices, but also a decrease in product quality. Without internal competition, both of these effects will only be exacerbated in the long run [4].

However, there are moments that will change the structure of investment. Thus, the departure of foreign investors and a number of restrictions on investments abroad will enable Russian investors to reorient themselves to the domestic market. A similar process has already been observed in the post-crisis period. It should be noted that in this situation it is important not to forget about the conceptual quality of projects: a decrease in Western institutional investments and a lack of competition in the capital market can lead to its decline [5].

The difference in the economic conditions of doing business in the regions of Russia, which is explained by the natural and geographical features of the territories, leads to a difference in their development. At the same time, the development potential of each individual region largely depends on the state of the competitive environment.

Another aspect of industrial development is the implementation of an import substitution policy. It is closely related to the development of competition. Prior to the deterioration of the political situation and the imposition of sanctions, many

domestic industrial goods were inferior to their foreign counterparts in competition. Now the industry has gained the opportunity to develop by filling in the market share, which previously accounted for imported products. In addition, sanctions have affected not only manufactured goods. Other industries in the Russian Federation, for example, agriculture, were also in competition with imported goods. Now, agriculture needs to fill up vacant niches, and for this, equipment is needed that domestic industrial enterprises can supply.

However, in a downturn, demand is also declining, which, according to Prime Minister D.A. Medvedev is the main problem for the development of industry. For example, consider the situation with the metallurgical industry. In this regard, market participants have proposed a number of measures that could improve the situation of the industry.

1. Stop state support for the creation of excess steel production capacities, since this affects the reduction in prices in the domestic market.

2. The creation of a special service under the Ministry of Economic Development that assists Russian manufacturers in considering disputes in the WTO on the unjustified introduction of protectionist measures against our companies [6].

3. The use of offset transactions, in which foreign equipment manufacturers are obliged to purchase metals to produce products that subsequently go to the Russian market.

In addition, the state plans to rely on a business initiative in the field of import substitution and help companies that want to grow. At the same time, the authorities promise to create conditions for an equal dialogue between business and the state.

Today, there are the following problems in the field of import substitution:

1. Lack of information. This problem is mutual. On the one hand, access to information on orders from industrial enterprises, especially the defense industry complex, is limited for a wide range of Russian suppliers. And vice versa, industrial enterprises do not own information about existing domestic suppliers of the required products and look for them abroad. There is no accessible and high-quality information on the technological and production capabilities of Russian suppliers capable of providing supplies (materials, parts, components, assemblies, devices, etc.) in accordance with the required quality, on time and at an acceptable cost.

One of the reasons for the lack of awareness is the problem with ARCTEA, which does not reflect all the information about the activities of the enterprise. So, if an entrepreneur registers an enterprise using the code of the All-Russian Classifier of Types of Economic Activities, then he can describe the activities of the company using only one such code. It is much more convenient if the activities of the enterprise are described comprehensively so that potential customers can easily find a manufacturer and see the full range of opportunities.

2. The low quality of the preparation of the feasibility study, business plans and financial models by the initiators of import-substituting projects. Often, enterprises that need credit resources or state support and have every chance of getting them cannot achieve this because of poorly prepared financial documents. This problem is formal in nature, since in fact the conditions for obtaining a loan, subsidy or other assistance can be met, however, this is incorrect or not reflected at all in the documents submitted.

The causes of this problem are a number of factors. Firstly, the qualifications of the specialists who make up the financial document have an effect. When preparing a business plan, feasibility study, financial model, it is necessary, on the one hand, to understand the essence of the enterprise's activities, on the other hand, to know the requirements for preparing financial documents and be able to comply with them. A financial document can be prepared by the head of the enterprise, a full-time or a third-party specialist, and the following relationships will often be observed here (in the order of transfer from the head to a third-party specialist or consulting company): a decrease in the degree of understanding of the essence and all the features of the company's activity and an increase in competence in the field of correct financial reporting documents. The solution is to establish communication and the fullest possible coverage of the current state and plans for future activities of the enterprise and a detailed study and implementation of the requirements for financial documents.

The participation of a professional consultant in the preparation of documents for project financing gives additional guarantees to banks and speeds up the process of considering applications. In addition, even with a good business plan and funding received, as practice shows, the further fate of the project and its effectiveness will largely depend on the transition to a modern management system, managerial accounting, reporting and control. Of great importance to the bank is the independent financial and technical supervision of the project in the investment phase.

For import substitution projects, in addition to the business plan, it is required to develop several options for a financial model, solve issues on the organization of export, investment and project financing depending on the type of project, develop organizational, financial and legal schemes for their implementation, as well as further support and maintenance of the project on all stages until the production reaches its design capacity [7].

3. The next problem is the difficulty in organizing financing at the initial stage, namely at the stage of preparation of production and providing manufacturers with working capital, including in order to improve the properties of domestic products and switch to innovative products with new properties. Difficulties arise, for example, due to the poor quality of the preparation of feasibility studies, business plans and financial models by the initiators of import-substituting projects.

4. Lack of industrial sites. In addition to financial problems, there is the problem of the lack of properly equipped and suited production sites for the organization of import-substituting facilities, properly trained and equipped with the necessary network and personnel infrastructure.

5. Customs problems. There are problems and customs. Deficiencies in customs regulation when importing raw materials and finished products make it possible to appear on the Russian market of counterfeit products, smuggling, cover goods, etc. A fairly large number of smuggling and counterfeiting are observed in the country.

6. Legal issues. To determine whether the goods are produced in the territory of the Russian Federation, the processing criteria specified in the agreement "On the rules for determining the country of origin of goods in the CIS" are used. But CIS rules were developed to determine the status of the origin of goods in export-import operations, and not for public procurement. Therefore, the problem arises of the absence in the EAEU legislation of a document clearly regulating the concept of "goods of the Eurasian Union".

7. Inertia of Russian manufacturers. They continue to import, because they are used to it and so it is more convenient. Often, enterprises continue to purchase foreign equipment in the presence of a Russian analogue that fully meets the necessary requirements. The reasons for this are often established relationships with the manufacturer of the person responsible for the procurement in the company, "special motivation".

8. Quality standards. Russian manufacturers mainly work according to domestic quality standards, and sometimes they are very different from foreign ones. And not necessarily for the worse - there are examples where our standards are higher than foreign ones. But this, in turn, overestimates the cost of domestic products. All this impedes the promotion of their products by Russian manufacturers in foreign markets.

9. Also problems are:

- a significant weakening of the role and professional capabilities of the leading scientific and technical institutes against the background of the weak development of modern engineering companies;

- the high cost of raw materials used in the production of import-substituting products, often also imported;

- the lack of opportunities for the production of related products, the release of which helps to reduce the total cost of import-substituting products.

It should be noted that investment projects on import substitution are aimed at creating production, the share of imports of which in Russia is 80-100 percent. In addition, the initiator of the project must be in the jurisdiction of the Russian Federation, the participation of organizations located in offshore jurisdictions is not allowed.

Consider the proportions of production, consumption and import, their impact on the mobilization of growth factors. If we look at the share of imports in consumption and output by type of activity, we will see that we have an extremely overestimated share of imports in consumption and output in mechanical engineering, in other processing industries and, in part, in construction. Therefore, in this area there is a large resource for import substitution. According to the academician of the RAS M.N. Uzyakov, if for these types of activities the dependence on imports is halved, the Russian Federation will receive 0.8 percent. to economic growth [8].

For the effective development of import substitution in every industry, where possible, it is necessary to switch from manual control to systematic work with the business community, provide a set of incentives, and establish processes related to the provision of financial assistance to enterprises involved in import substitution, removal of administrative barriers and monitoring industry processes.

The identified problems of financial support for industrial enterprises, the development of competition and import substitution make it possible to adjust industrial policy both at the federal level and at the regional level.

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对某些活动的估算收入适用单一税率的分析
ANALYSIS OF THE APPLICATION OF A SINGLE TAX ON IMPUTED INCOME FOR CERTAIN ACTIVITIES

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抽象。 在危机前时期，在没有预算赤字的情况下，税收制度面临的主要任务是解决两个矛盾的问题：增加税收和减轻税收负担。

关键字：税收，特殊税收制度，税收制度，STII

Abstract. *In the pre-crisis period, in the absence of a budget deficit, the main tasks facing the tax system were aimed at solving two contradictory problems: increasing tax collection and easing the tax burden.*

Keywords: *tax, special tax regime, tax system, STII*

Single tax on imputed income (hereinafter - STII) is a tax regime that can be applied only to a limited list of activities and only in those regions where this regime has been introduced by local authorities [Art. 346.26, 1].

The peculiarity of this taxation system is that the tax is levied on imputed income, that is, estimated, rather than actual. This means that the actual volume of cash receipts does not affect the amount of payment to the budget. This is both a benefit and a disadvantage. On the one hand, you can earn much more than the expected amount, and pay a minimum tax. On the other hand, the amount of payment will remain the same, even if the business does not generate income or is completely unprofitable.

In addition, STII tax payers are exempt from a number of payments (table 1).

To apply the special tax regime, restrictions have been introduced, which are reflected in Figure 1.

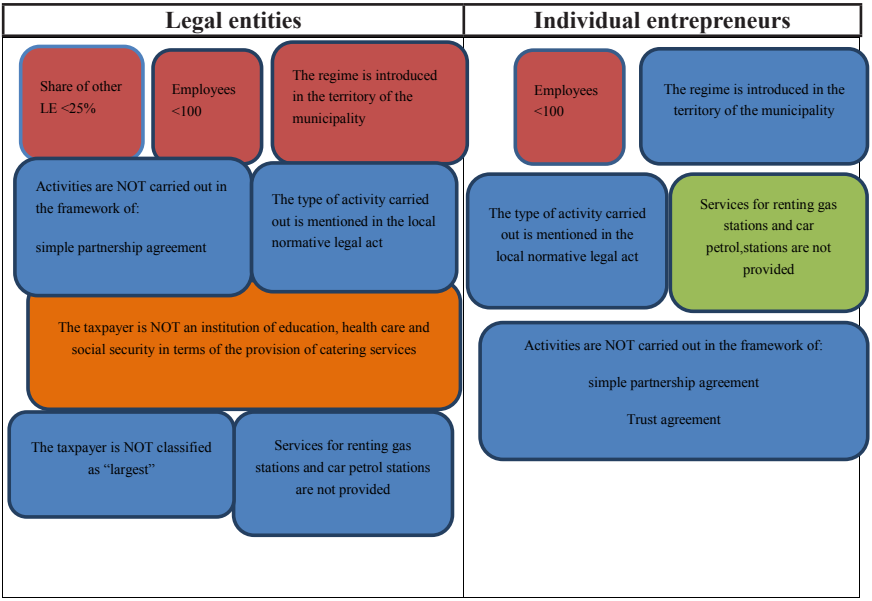
In the pre-crisis period, in the absence of a budget deficit, the main tasks facing the tax system were aimed at solving two, at first glance, conflicting problems: increasing tax collection and easing the tax burden. It is these tasks that can be traced in the created single tax concept.

Table 1 - *Taxes replaced by STII*

For legal entities	For individual entrepreneurs
1. Corporate income tax With respect to profits from single tax business	1. Personal income tax In respect of income derived from single tax business
1. Corporate property tax With regard to property used for conducting business taxed by a single tax (with the exception of real estate, the tax base for which is determined as their cadastral value in accordance with the Code)	2. Property tax on individuals With respect to property used for entrepreneurial activities subject to single tax
1. Value Added Tax In respect of operations recognized as taxable in accordance with Chapter 21 of the Tax Code of the Russian Federation, carried out as part of entrepreneurial activities subject to single tax).	3. Value Added Tax In respect of transactions recognized as taxable in accordance with Chapter 21 of the Tax Code of the Russian Federation, carried out as part of entrepreneurial activities subject to single tax

Source: [1]

This taxation system was first introduced in 1998 [2]. But a single tax on imputed income was put into operation in 2002.



Source: [p. 346.26, 1]

Figure 1 - *Conditions for the transition to STII*

It helped to solve the problem of control over the circulation of funds of medium and small entrepreneurs. Also, with its help, it was possible to simplify the system of business administration by replacing many taxes with one payment. STII became the tool that, in the 2000s, made it possible to train entrepreneurs to pay taxes and take business out of the shadows. And municipal budgets began to receive funds to replenish the local public purse. At that time, it was practically impossible to determine the real turnover of the enterprise, so the application of such a tax regime was the most correct decision [8].

This system was different in that the tax was paid on the basis of a special document - a certificate. The imputed tax was defined as the potential gross income of the payer minus the potentially necessary costs, calculated taking into account the totality of factors directly affecting the receipt of such income, based on data obtained by statistical studies during audits of tax and other government bodies, as well as evaluations of independent organizations. Since 2013, STII has ceased to be mandatory, organizations and individual entrepreneurs switch to paying imputed tax voluntarily. According to paragraph 2 of Art. 346.28 of the Tax Code of the Russian Federation, a taxpayer who wishes to apply the "imputation" must register at the place of business, except for the following activities [6]:

- motor transportation services for the transport of goods and passengers;
- services for advertising on transport; delivery or distribution trade.

When providing such services, they are registered at the place of registration in their tax office.

The amount of *ЕНВД* tax is calculated by the formula (1):

$$ЕНВД = БД \cdot ФП \cdot K_1 \cdot K_2 \cdot 15\%, \quad (1)$$

where *БД* - basic profitability adjusted for K^1 and K^2 coefficients, and is determined by the tax code for each type of activity;

ФП - value of a physical indicator;

K_1 - deflator coefficient (considering the current stagnation of the economy) is determined annually by state legislation;

K_2 - correction factor that determine the value of the basic profitability (introduced by regional authorities);

15% — STII tax rate. This is the maximum rate determined by the Tax Code of the Russian Federation, but local authorities have the right to reduce it to 7.5% by local laws.

To calculate the amount of the single tax, depending on the type of entrepreneurial activity, physical indicators are used that characterize a certain type of entrepreneurial activity, and the basic profitability per month, which are approved in the Tax Code of the Russian Federation [Art. 346.26, 1;7].

The abolition of this tax system has been under discussion for several years, but each time at the end of the year it became known about the extension of the action of STII. Since the taxation system in the form of STII is applied until December 31, 2020 inclusive, the deflator coefficient required for calculating the tax base for a single tax on imputed income is presented in table 2.

Table 2 - *Deflator coefficient for calculating the tax base for a single tax on imputed income*

Period for which the deflator coefficient is set K_1	Deflator coefficient size K_2	Indexable quantity	Reason
2020	2,009	Base return	Order of the Ministry of Economic Development of Russia of 10.21.2019 N 684; ind. 5 art. 346.27, par.4 art. 346.29 TC RF
2019	1,915	Base return	Order of the Ministry of Economic Development of Russia of 30.10.2018 N 595; ind. 5 art. 346.27, par. 4 art. 346.29 TC RF
2018	1,868	Base return	Order of the Ministry of Economic Development of Russia 30.10.2017 N 579; ind. 5 art. 346.27, par. 4 art. 346.29 TC RF

Source: [7]

The application of STII involves the payment of tax on the basis of the amount not of actual but imputed by officials of the individual entrepreneur or organization of income. Since when determining the magnitude of the basic profitability, the representative bodies of municipal districts and urban districts can adjust (multiply) the basic profitability by the correction coefficient K_2, determined by regulatory acts of local authorities $(0{,}005 \le K_2 \le 1)$, the procedure for paying STII may be different due to the fact that in different regions coefficient K_2 may vary.

If the registration of an organization or individual entrepreneur with the tax authority as a single tax taxpayer or their removal from the said account is not made on the first day of the calendar month, the amount of imputed income for a given month is calculated based on the actual number of days the organization or individual entrepreneur spent it entrepreneurial activity according to the formula (2):

$$ВД = \frac{БД \cdot ФП}{КД} \cdot КД_1, \quad (2)$$

where *ВД* - the amount of imputed income per month;

КД - number of calendar days in a month;

$КД_1$ - the actual number of business days in a month as a single taxpayer.

The amount of STII calculated for the quarter can be reduced by the compulsory insurance premiums actually paid in the given quarter (4) (table 3).:

$$ЕНВД = НБ \cdot НС - СВ, \quad (3)$$

where *НБ* - tax base;

НС - tax rate;

СВ - insurance premiums.

In this case, it matters whether the STII payer is an employer or not:

- individual entrepreneurs who are not employers reduce the amount of the single tax by the full amount of insurance premiums paid for themselves on compulsory pension insurance and on compulsory health insurance;
- individual entrepreneurs using hired labor reduce the amount of the calculated single tax on paid insurance premiums for themselves and for employees, but not more than 50% of the accrued amount of STII [art. 346.32, 4].

Table 3 - *Conditions for reducing STII on compulsory insurance premiums*

Types of premiums	Insurance premium rates	Limit for calculating contributions for 2019	Limit for calculating contributions from January 1, 2020
Contributions to compulsory pension insurance (CPE contributions)	22% - from payments that do not exceed the limit for calculating contributions to CPE; 10% - from payments exceeding the limit for calculating contributions to CPE;	1 150 000 rub.	1 292 000 rub.
Contributions to compulsory health insurance (CME contributions)	5,1 % for CME;	no limit base	
Contributions to compulsory social insurance in case of temporary incapacity for work and in connection with motherhood (CIaM)	2.9% - from payments that do not exceed the limit for calculating contributions to CIaM.	865 000 rub.	912 000 rub.
Contributions for compulsory social insurance against industrial accidents and occupational diseases (contributions for injuries)	established depending on the class of professional risk of the main type of activity of the organization (part 1 of article 21 of law № 125-FL, article 1 of law № 484- FL).		

Source: [art. 430, 1; 5]

After almost 20 years, the situation in the country has changed significantly. Therefore, economic experts who work closely with the government, believe that the STII system has long become obsolete and is ineffective for both the state and small businesses. It does not contribute to an increase in tax revenues, and creates an obstacle to healthy competition between representatives of microbusiness and large companies [8].

Based on the analysis of the application of STII in the Russian Federation, it can be stated that frequent and quite radical changes in the application of STII are not the result of well-considered and balanced decisions that pursue the tasks of developing the small business segment. On the contrary, the next bill is aimed solely at supporting microenterprises. For small enterprises there is an increase in the tax burden [3]. The mismatch of the criteria for small business forms in the tax legislation and the legislation that defines the state support system also indicates the absence of a unified policy for the support of small businesses.

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制定财政拮据的矿产资源开发战略

FORMATION OF A STRATEGY FOR THE DEVELOPMENT OF MINERAL DEPOSITS UNDER FINANCIAL CONSTRAINTS

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抽象。 确定了独联体国家矿业企业发展中最重要的问题。 概述了在资金限制下形成矿床开发战略的主要规定。 证实了采矿企业成本构成的主要因素及其对项目经济效益的影响程度。 考虑到采矿企业成本构成的采矿地质，采矿，组织和经济因素的相互联系和相互依存关系，开发了对采矿运输综合体的结果进行经济和数学建模的方法。 给出了为特定项目提取矿物原料的设计解决方案有效性的建模结果。

关键词：矿业经济，战略发展，投资，经济和数学模型，生产成本，效率因素。

Abstract. *The most important problems of the development of mining enterprises in the CIS countries are identified. The main provisions on the formation of a strategy for the development of mineral deposits under financial constraints are outlined. The main factors of the cost formation of the mining enterprise and the level of their influence on the economic results of the project are substantiated. The approaches to the economic and mathematical modeling of the results of the mining transport complex are developed taking into account the interconnectedness and interdependence of mining-geological, mining, organizational and economic factors of the cost formation of a mining enterprise. The results of modeling the effectiveness of design solutions for the extraction of mineral raw materials for a specific project are presented.*

Keywords: *mining economy, strategic development, investment, economic and mathematical modeling, production costs, efficiency factors.*

The mining industry at the present stage remains an important component of the global economy: tens of thousands of deposits of coal, ferrous and non-ferrous ores, mining and chemical raw materials and building materials are mined; annually produce over 6 billion tons of resources worth more than 150 billion US dollars; its share in the domestic world product is about 8% [1, 2].

The mining industry of most CIS countries makes a significant contribution to the global production of mineral raw materials, but at the same time has a pronounced "costly economy" with high labor, capital and material intensity of production [3, 4]. Maintaining competitiveness at the level of global world markets in conditions of equalizing the cost of consumed resources takes many manufacturers out of the range of sustainable development [5].

The mine development process is a long cycle in which strategic investors are involved, providing financing for a set of standard procedures: exploration - putting reserves on the balance sheet - designing - construction - developing the field. The basic procedures for the development of the field over the past decades have not fundamentally changed and it takes at least 6-8 years before the enterprise reaches its design capacity.

The pace of commissioning of new deposits is determined by a complex set of external and internal factors: market conditions for a particular mineral raw material; cost of credit resources and their limits; socio-economic constraints. In addition, in recent decades there are typical key problems of developing new fields:

- remoteness of the field from the main consumers, lack of a full-fledged industrial and social infrastructure in the construction area;
- level of organization of production, which predetermines low productivity of labor and equipment, high operating costs, capital intensity and terms of development of mining areas;
- decrease in the quality of the raw material base and long payback periods of projects;

As practice shows, when designing the development of new deposits, an economic analysis system is used that corresponds to the functional management of the subsystems of a typical mining enterprise and based on local criteria in technological processes: stripping operations; mining operations; the cost of primary processing of raw materials, etc. In general, according to the technological scheme, the main economic indicator of its work is the cost of production of 1 ton of final product. Assessment of the efficiency of mining a subsurface site in accordance with this methodology for one of the quarries located in the Republic of Kazakhstan showed that the use of indicators of unit costs of an analogue enterprise leads to complete economic insolvency of the project (Table 1).

Table 1. - *Assessment of the efficiency of mining of mineral resources according to the analogue-company*

Name of indicator	Basic quarry	Projected quarry
Stripping ratio, m^3/t	0,63	3,9
The prime cost of mining, tenge/ton of ore	1 799	1 799
The prime cost of stripping operations, tenge/m^3	2 529	2 529
The prime cost of ore mining, tenge/t ore	3 392	11 753
The cost of concentrate, tenge/t	15 301	15 301
Concentrate yield, %	43	43
Processing prime cost, tenge/t of concentrate	1 871	1 871
The prime cost of production, tenge / t of concentrate	9 759	29 204
Profitability, %	57	-48

Due to the fact that the average stripping ratio during mining of the designed subsurface area will be at least 3-4 m^3/t, when using the data of an analogue-quarry in calculations, the cost of concentrate production is 1.9 times higher than its cost. With such initial data, the estimated quarry mining indicators show the lack of profitability and cause the need to determine the potential possibility of achieving the economic efficiency of the project and strategic decisions in this direction.

The main difference between the modern field development strategy is that now the main goals of the enterprise development are no longer set by the state, but by private companies, investors, which find and allocate the necessary resources. The role of the state in this case has become fundamentally different: it develops "rules of the game" and exercises control over their implementation. At the stage of transition from public administration to private, some owners sought to obtain short-term high profits through selective mining of the field's reserves. But at the present stage, the owners of most large deposits are holding structures that are interested in the sustainable long-term development of their business. Many of them built vertical chains, which provide not only the extraction of mineral raw materials, but its deep processing and production of final products. Under these conditions, the most important goal of the development of the mining complex is to ensure sustainable supplies of raw materials of a given quality at affordable prices.

Formation of a mining enterprise development strategy is a multifaceted task that must be solved based on the generalization and intellectual analytical processing of technical and economic information on forecast economic results, taking into account the dynamism and interdependence of mining and geological, mining, organizational and economic factors of mining in conjunction with accepted technological and technical solutions. Obviously, the optimal performance of individual units and equipment does not always mean high overall performance of the enterprise.

To ensure the effectiveness of the whole complex as a system, the following is necessary:

- methodology for accounting and forecasting the costs of a mining enterprise, taking into account specific mining and geological, mining, economic and organizational factors;
- reliable initial data on the formation of costs in the main and auxiliary technological processes;
- models, algorithms and mechanisms for the qualitative and comprehensive assessment of the efficiency of the mining transport complex, which allow to quickly evaluate and optimize parameters, qualitatively substantiate management decisions

The formation of costs for mining in a quarry is determined not only by the volume of mining and stripping, but also by the volume of drilling and blasting and transportation; dumping, reclamation, etc. [6, 7]. Moreover, the technological parameters can be quite dynamic in nature with a wide range of changes in both absolute values and their ratios [8]. Adequate accounting of mining factors is a prerequisite for the formation of a given level of production costs based on the management of mining and transport operations (Table 2).

Table 2. - *The impact of changes in mining parameters on the expenditure of resources of a mining enterprise, %*

Parameter	**Change in costs per 1 ton of extracted raw materials**		
	variables	**constants**	**overall**
Technological parameters			
Quarry depth	11,5÷15,0	0,1÷0,2	8,1÷10,6
Current stripping ratio	8,0÷9,0	0,5÷1,0	5,8÷6,6
Transportation distance	4,9÷5,6	0,2÷0,3	3,5÷4,0
Quarry area	2,6÷3,2	0,5÷0,7	2,0÷2,5
Organizational Parameters			
Equipment performance	-(0,3-0,5)	-(9-10,0)	-(2,91-3,4)
Unit power of equipment	-(1,5-2,0)	-(3-4,0)	-(1,95-2,6)
Equipment Maintenance Duration	0,2-0,3	4,5-6,0	1,5-2,0
Staff productivity	-(0,2-0,3)	-(3,5-4,5)	-(1,19-1,6)

* percentage of cost reduction by 10% reduction in the corresponding parameter.

The basis of economic and mathematical modeling of the results is reliable initial information, including the justification of the cost indicators of the main technological processes. A reliable calculation of the cost indicators of mining in specific mining technical, geological and geographic conditions is carried out using the economic and mathematical model of the forecast of costs, taking into

account the interdependence of the parameters of mining, mining and transport operations and the main economic factors (cost of resources, tax environment, etc.) ; the dynamics of mining conditions, as well as the results of the management of mining and transport operations.

The main directions for optimizing the parameters of a mining enterprise relate to a set of technological and economic measures:

• optimization of the parameters of the pit side, as well as the boundaries and the order of development of the field (reserve efficiency and availability of dumps);

• optimization of the field of application of mining and transport technologies, ensuring reduction of transportation distances, taking into account the use of combined transport and internal dumping.

• redistribution of overburden operations by years (transfer to later dates) and accounting for the separation of overburden into loose and rocky

• "parameter-result" analysis for local issues: size range of equipment; stripping ratio; quality of extracted raw materials; working depth; transportation distance; performance; the availability of infrastructure.

• estimation of the cost of operations by direct account on the main technological processes and justification of the production product as a tax base;

• using market prices for final products and optimizing the cost of key resources consumed (electricity, fuel, personnel);

• justification of the discount rate with a view to minimizing risks when using the competitive advantages of the project.

Using these approaches for the above example allowed us to determine effective options for mining of the subsurface area (Table 3).

Table 3. - *Financial and economic results of the project development of the field*

Name of indicator	Variant 1	Variant 2
NPV of the project, million tenge	182 776	79 353
Discounted capital investments, million Tenge	69 193	84 239
IRR, %	23,93	14,57
Discount payback period, years	9	17
Profitability Index, units	3,64	1,94

Thus, the mining industry, while remaining the most important component of the global economy, is forced to develop under the conditions of an objective decrease in the characteristics of the mineral resource base and severe financial constraints. Given the shortage and increase in the cost of investment resources, the formation of a strategy for developing mineral deposits is possible only on the basis of optimization of technical and technological solutions, taking into account mining and geological, mining technical, organizational and economic factors of mining.

The solution to the problem of optimizing the final boundaries of field development and the dynamic characteristics of production processes is carried out using simulation block models of the field, as well as economic and mathematical models for optimizing interrelated processes and forecasting total costs, taking into account the interdependence of mining, mining and transportation operations and major economic factors.

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数字经济发展背景下的风险管理方法论基础

METHODOLOGICAL FOUNDATIONS OF RISK MANAGEMENT IN THE CONTEXT OF THE DEVELOPMENT OF THE DIGITAL ECONOMY

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抽象。 有各种各样的方法，根据这些方法，使用综合的多学科方法是在创新领域实施有效，可持续和主动的风险管理计划的关键要求。 在国外，创新是根据俄罗斯以外的其他标准进行评估的–创新本身的内容不是头等大事，而是创新和推广所带来的风险（包括经济风险）。

关键词：风险管理，创新，数字化。

Abstract. *There is a wide range of methods, according to which the use of integrated multidisciplinary approaches is a key requirement for the implementation of effective, sustainable and active risk management programs in the field of innovation. Abroad, innovations are evaluated on the basis of several other criteria than in Russia - not the content of the innovation itself comes to the first place, but the risks (including economic) associated with its creation and promotion.*

Keywords: *risk management, innovation, digitalization.*

To understand the structure of new risks in the field of innovation, it is necessary to take into account the scale of the changes taking place within the framework of the digital economy. We list only some areas that were previously almost not taken into account when identifying and assessing risks:

1. Digital automation. The use of this element, according to statistics, reduces the production life cycle by 30%. By automating the most routine production areas, staff frees up time and resources to develop new and optimize existing business lines.

2. Virtualization of the workspace. In fact, we are talking about introducing a remote work mode. The entire main document flow takes place in electronic form, working materials are collected in grouped virtual databases, allowing you to combine individual knowledge of employees into one single collective knowledge. Thus, everyone gets the opportunity to use the results of work of each employee.

3. Optimization of executive management. With the introduction of electronic task setting systems, as well as statistical information accumulation systems, managing staff is able to make decisions based on real statistics. Obtaining data from

different areas, the authorities have the opportunity to compare the effectiveness of various managerial practices in order to implement the most successful solutions everywhere.

4. The threat of manipulating data sets, which may be a risk in the application of artificial intelligence systems and, under certain conditions, lead the company to bankruptcy.

An objective analysis of the areas and the risks contained in them is hindered by the lack of specialized information, as well as the high level of uncertainty associated with the problems of creating innovations. Accordingly, a methodology is required that takes into account the basic uncertainties. Morphological analysis reveals the key factors associated with the innovation of uncertainty being developed, possible alternative exceptional states for each factor are developed, pairwise compatibility of each state is evaluated (i.e., it is determined whether the two states conflict with each other).

We propose to calculate the integral indicator of innovation risk (IIIR) according to the following formula:

$$\mathrm{IIIR} = \sqrt{\frac{\sqrt{f \times e}}{r}} \quad (1)$$

where, f and e are partial functions of possible damage (utility) and probability (respectively), and r – is the probability of market demand for innovation, calculated taking into account digitalization trends.

While other countries are actively developing evidence-based methods, programs and innovation policies, in Russia cognitive stagnation is observed in this regard. Methods can be formed on the basis of understanding empiricism, which is best formed by researchers in professional and applied fields.

Simple methodologies are less susceptible to errors; moreover, it is easier for interested parties to understand them. It is more likely that such methodologies will be consistent with the principles of transparency and practicality of application. In addition, it is necessary to take into account the factor of subjectivity - in the end, the choice is made in favor of a methodology that best meets the needs of the decision maker, regardless of whether it is objectively the best choice.

Keep in mind that the priorities for locating innovation risks vary by industry. This is evidenced by the empirical data presented in table 1.

A clear, logically justified methodologically correct risk management structure should be at the heart of the collective effort to create innovation. The methodology provides the understanding necessary to better comprehend and prepare for the upcoming changes associated with the formation of the digital economy. This understanding is important for creating organizations that meet the demands of the near digital future. Understanding will require fundamentally new methodological tools. The use of such tools, in turn, will require logical explanations.

Table 1

The significance of innovation risk factors in%
in the conditions of the "digital economy"
(at the level of developers of innovative artifacts and technological solutions)[1].

Risk types	1	2	3	4	5	6	7	8
Innovation requirements risks	73	49	7	82	84	43	6	60
Idea leak risks	46	44	8	46	44	59	70	81
Risks of non-receipt of funding	16	5	6	14	19	22	19	23
Risks of the dynamics of the technological ecosystem	21	7	4	19	8	14	2	25
Segmentation risks and project complications	9	12	20	22	11	20	3	31
Techno-economic risks of innovation	13	8	15	30	34	30	2	27
Human factor risks	6	6	8	9	19	7	24	9
Risks of Intangible Resources	22	34	5	11	10	11	-	17

Table Column Codes:

1. IT industry. 2. Banking. 3. Transport industry. 4. Unmanned technology.
5. Medical equipment. 6. Metallurgy. 7. Education. 8. Industrial production.

To manage risk effectively, the right information must be presented to the right people at the right time. Risk reports should contain relevant content and be submitted on time to decision makers.

In relation to the problems of digitalization, the methodology, as necessary, should be so complex as to adequately correspond to the solution of the problem under consideration. Methods can be developed to achieve the goals of the "electronic economy" or within the framework of individual areas of innovation support policy.

Since this is not primarily about individual innovative developments, but about conceptual models of economic activity, for example, in the framework of the "digital economy" or "smart cities", the basic requirements must include replication of positive effects in different conditions, as well as scaling proven designs.

Thus, for the distribution of innovative system-level solutions, in contrast to the promotion of individual innovations, it is the comprehensive coverage of the population with new artifacts and technologies that is the main dependent variable. The degree and quality of implementation, as well as the response of users to the proposed innovations, become additional dependent variables. Since this is not primarily about individual innovative developments, but about conceptual models of economic activity, for example, in the framework of the "digital economy" or "smart cities", the basic requirements must include replication of positive effects in different conditions, as well as scaling proven designs.

[1]The table is compiled by the author based on the content analysis of publications in industry publishings in Russia.

Thus, for the distribution of innovative system-level solutions, in contrast to the promotion of individual innovations, it is the comprehensive coverage of the population with new artifacts and technologies that is the main dependent variable. The degree and quality of implementation, as well as the response of users to the proposed innovations, become additional dependent variables.

It must be borne in mind that the updating of the methodology does not take place from scratch, since the considered intellectual creativity represents the development of a paradigm in terms of Thomas Kuhn[2] in relation to the theory of diffusion of innovations. Empirical studies have shown that successful innovation depends on a number of different factors, such as knowledge, skills, financial resources, demand, etc[3]. The methodology allows you to advance in the search for valuable long-term innovation.

In the context of updating the methodology, risk management includes the application of logical and systemic methods for the following actions:

•Informing and consulting during the process of formation of the "digital economy".

• Detection of the context relevant to the identification, analysis and assessment of risks associated with any activity, process, function or innovative product.

• Monitoring the development of digitalization-related risks.

• Development and practical application of risk indicators for innovation.

• Assistance in the development of strategic business expansion plans in the context of the development of the digital economy.

• Promoting the development of various forms of transfer of specialized knowledge on the topics considered in this study.

Modeling and risk management methods should always be verified by experienced judgment. Different models can be used to assess or measure each type of risk. In determining the methods or models that will be adopted to measure risk or assess the relevance of the methodology used, it is necessary to consider all factors relevant to the conduct of business.

When considering the above facts, it is necessary to take into account the practical and conceptual limitations of methods and models, using a qualitative approach, which includes judgments based on experience and a critical analysis of risks related to innovation. Essentially new methodologies are required in a number of breakthrough areas, including the use of artificial intelligence in the digital economy, robotics, and the protection of critical infrastructure from unmanned threats.

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Often, the assessment of alternative options for action within the framework of risk management is considered as part of a risk assessment methodology. Although the development of alternatives is the next step in the risk management cycle, many business executives prefer alternatives to be integrated into risk assessment, requiring additional data collection and analysis.

The ability to conduct risk assessments using alternative methods is an important component of the risk assessment system for creating and promoting innovations, as well as an integral part of the organization's management system. Management is a dimension that represents a higher number of identified problems. Since the responsibility for various components of the system is distributed between different areas of management, a systematic understanding of risk management in the framework of innovation requires a "holistic" view of risk management[4].

The organization of effective risk management in the field of innovation is a rather complicated process, the organization of which must be approached with professional knowledge. It is a complex relationship system into which it is necessary to integrate risk management practices. Internal control of decisions acts as a key factor guaranteeing the successful implementation of the project.

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俄罗斯单一轮廓城市住房和社区综合体的开发管理
MANAGEMENT OF DEVELOPMENT OF HOUSING AND COMMUNAL COMPLEX OF SINGLE-PROFILE MUNICIPALITIES IN RUSSIA

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抽象。 本文讨论了俄罗斯联邦单一城市的发展。 给出了单轮廓城镇的特征及其分类。 文章还反映了俄罗斯联邦单一轮廓城市住房和社区综合体的发展条件，分析了从1996年至今的问题发展情况。 考虑了私营国家伙伴关系的选择。

关键词：单一城镇，单一城镇，单一工业城镇住房和社区综合体的发展，公私伙伴关系，特许权，住房和公共服务的现代化，投资吸引力。

Abstract. *The article discusses the development of single-profile municipalities in the Russian Federation. The characteristics of single- profile towns and their classification are given. The article also reflects the conditions for the development of the housing and communal complex of single-profile municipalities in the Russian Federation, analyzes the development of the problem from 1996 to the present. The options of private-state partnership are considered.*

Keywords: *single- profile town, single- profile municipalities, development of the housing and communal complex of single-industry towns, public-private partnerships, concession, modernization of housing and communal services, investment attractiveness.*

Based on monitoring and analysis of the socio-economic development of the territories of the Russian Federation conducted by the Ministry of Economic Development, in 2014 a single-profile city development fund was created. The main activity of the Fund is aimed at preserving and maintaining small municipalities in Russia, attracting investments and diversifying the activities of dying organizations, and improving the production potential of the “city-forming” enterprise, thereby creating new jobs.

Single-profile municipality (single-profile city) is a settlement that has the status of urban or township type, numbering more than 3 thousand people and having organizations on its territory (carrying out the same type of main economic activity or activity on the territory of the municipality which is carried out as part of a single production and technological process and whose staff consists of 20% of the local population).

By order of the Government of the Russian Federation dated July 20, 2014 № 1398 "On the list of single-profile municipalities of the Russian Federation (single-profile cities)", a list of single-profile municipalities (single-profile cities) in the Russian Federation was approved. The list includes 313 single-profile cities in 60 constituent entities of the Russian Federation (Table 1) with the following categories:

Category 1 - Single-profile municipalities of the Russian Federation (single-profile cities) with the most difficult socio-economic situation (including in connection with the functioning problems of city-forming organizations - which includes 75 single-profile cities, both in urban and and rural settlements;

Category 2 - Single-profile specialized municipalities of the Russian Federation (single-profile cities), in which there are risks of worsening socio-economic situation - 150 single-profile cities were included in this category;

Category 3 - Single-profile specialized municipalities of the Russian Federation (single-profile cities) with a stable socio-economic situation - includes 88 single-profile cities. [1]

Table 1 - *The number of single-profile specialized formations in the constituent entities of the Russian Federation by category*

№	Subject of the Russian Federation	Category 1	Category 2	Category 3	№	Subject of the Russian Federation	Category 1	Category 2	Category 3
1	Amurskaya Oblast	2		2	31	Penza Oblast		2	1
2	Altai Krai		4	1	32	Perm Krai	6	4	
3	Arkhangelsk Oblast	2	4		33	Primorsky Krai	3	5	1
4	Belgorod Oblast			1	34	Republic of Bashkortostan	2		4
5	Bryansk Oblast	1	6	3	35	Republic of Buryatia	1	3	2
6	Vladimir Oblast	2	2	3	36	Republic of Dagestan	1	1	
7	Vologda Oblast	3	2	1	37	Republic of Karelia	6	5	
8	Voronezh Oblast		2	2	38	Komi Republic		1	3

№	Subject of the Russian Federation	Category 1	Category 2	Category 3	№	Subject of the Russian Federation	Category 1	Category 2	Category 3
9	Jewish Autonomous Oblast			1	39	Republic of Crimea		2	
10	Zabaykalsky Krai	2	6		40	Republic of Mordovia		4	2
11	Ivanovo Oblast	2	6	2	41	Sakha Republic (Yakutia)		4	2
12	Irkutsk Oblast	2	4	2	42	Republic of Tatarstan	2	1	3
13	Kaluga Oblast		1		43	Republic of Khakassia	1	3	2
14	Karachay-Cherkess Republic		1		44	Rostov Oblast	1	1	1
15	Kemerovo Oblast	5	16	3	45	Ryazan Oblast		1	1
16	Kirov Oblast	4	3	3	46	Saratov Oblast		1	1
17	Kostroma Oblast		1	1	47	Samara Oblast			2
18	Krasnoyarsk Krai		5		48	Sverdlovsk Oblast	6	5	6
19	Kurgan Oblast		3	1	49	Smolensk Oblast	1		
20	Kursk Oblast		1		50	Tambov Oblast			2
21	Leningrad Oblast	1	1	1	51	Tver Oblast	4	2	
22	Lipetsk Oblast			1	52	Tomsk Oblast		1	
23	Magadan Oblast		1		53	Tula Oblast		2	2
24	Murmansk Oblast	2	5		54	Udmurt Republic		2	1
25	Nizhny Novgorod Oblast		1	11	55	Ulyanovsk Oblast		1	3
26	Novgorod Oblast	1	4	2	56	Khabarovsk Krai	1	1	
27	Novosibirsk Oblast		2		57	Chelyabinsk Oblast	5	8	3
28	Omsk Oblast			1	58	Chuvash Republic	1	3	1
29	Orenburg Oblast	3	2	2	59	Chukotka Autonomous Okrug		1	1
30	Oryol Oblast		1		60	Yaroslavl Oblast	2	2	

As of August 08, 2019, this list has been supplemented to 319 single-profile cities and will be subject to change. [2]

When analyzing the list of single-profile cities, transitions of urban settlements from the category of single-profile cities with a stable socio-economic situation to the category of single-profile cities with the risk of worsening socio-

economic situation and vice versa were revealed. These movements are mainly associated with global issues such as urbanization and demographic decline. Also among the obvious problems of these single-profile cities, it is necessary to highlight the average and low income level, a small number of industrial production, as a result of the lack of jobs, a high percentage of emergency and dilapidated housing, as well as problems in the field of housing and communal services and social infrastructure.

From 2014 to 2019, the Development Fund for single-profile cities of the Russian Federation reported on the implementation of development plans for 25 cities, and the achievement of a plan for attracting investments in single-profile cities to 8 billion rubles.

Within the framework of the problems of each specific single-profile city, the solution should be based on the desire of a resident of this single-profile city to live in comfortable conditions with high-quality infrastructure. Thus, in parallel with the withdrawal of the single-profile city from a depressed state due to the improvement of economic indicators in the "city-forming" enterprise, it is necessary to develop programs and mechanisms to improve the quality of life and the welfare of the population.

The problem of the quality of life of the population has been quite acute since 1996, and was reflected at the state level in the Federal Comprehensive Program for the Development of Small and Medium Cities of the Russian Federation in the context of economic reform. [3] In which a set of measures was considered to improve the activities of state support for housing and communal services in municipalities and bring the existing infrastructure in line with established regulatory requirements, through the creation of modern city services for the construction, maintenance and operation of housing and communal services.

About 64 billion rubles were allocated for these events, 62% of which were provided by regional and local budgets. As a result of the reforms carried out in 2002, the development program was recognized as not effective, and ceased to exist. In subsequent years, programs for the development of the housing and communal complex, as part of the overall development of the region or municipality, were included in the development concept, and had the character of maintaining the working condition of the engineering infrastructure and no more.

In modern conditions, the development of the housing and communal services is carried out to a greater extent due to federal targeted programs aimed at the sustainable development of individual territories. Most single-profile cities will not be able to solve the problem of the critical state of communal and engineering networks and housing stock on their own, it is necessary to attract a large agent - but the likelihood of a private large investor joining this sphere of activity is negligible, only state support remains.

The question arises of the formation of public-private partnership in the field of housing and communal services. Thus, according to the development program of the Housing and Utility Sector Reform Support Fund, concession agreements for projects aimed at modernizing the municipal infrastructure of small municipalities can count on co-financing from the state budget up to 60%, provided that a private investor is involved in projects worth no more than 300 billion rubles.

So, according to the annual report of the Housing and Utilities Reform Support Fund for 2018: "During the period of the Government of the Russian Federation Decree № 1451, the Fund provided financial support for the modernization of public utilities infrastructure at 50 applications from 23 constituent entities of the Russian Federation. In 11 projects, financial support was directed to the preparation of projects, for 38 projects - for the implementation of projects, for 1 project - to subsidize the interest rate on a attracted bond loan. It should be noted that the preparations for all 11 projects were fully completed, however, in respect of 5 of them, the constituent entities of the Russian Federation (Rostov Region, Yaroslavl Region) did not fulfill their obligations to start the implementation of such projects or conclude concession agreements in a timely manner, and in accordance with the terms of the agreements on the provision of financial support to the constituent entities of the Russian Federation, the money of the Fund were returned. [4]

As practice has shown, both single-profile cities and investors were not ready for such projects under concession agreements. The main problem was the lack of funds in municipalities for legal support of transactions under concession agreements, in addition, the real state of the communal and engineering infrastructure of industrial single-profile cities affected the decision of private investors. In turn, investors were faced with contradictions in the requirements of the Fund for Assistance to Reforming Housing and Utilities Sector by target indicators, for example, the payback period should not be more than 7 years, but for projects of modernization of communal and engineering networks of large cities this indicator is 15 years or more. For small municipalities, such projects announced at PPP with state co-financing are not real. Concession agreements on such terms are not reliable for both parties.

Thus, management of the development of the housing and communal complex in single-profile specialized municipal entities is impossible without high-quality state support and increasing the investment attractiveness of this industry.

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增加巴什科尔托斯坦共和国疗养院和度假胜地组织竞争力的问题
PROBLEMS OF INCREASING THE COMPETITIVENESS OF SANATORIUM AND RESORT ORGANIZATIONS OF THE REPUBLIC OF BASHKORTOSTAN

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抽象。当前，疗养和度假领域的服务供应超过需求，因此，该行业的企业之间的竞争正在加剧。尽管俄罗斯联邦的疗养院和度假产业服务潜力巨大，但在全球市场上却只占很小的份额。内部疗养院和度假胜地的状况表明，就定性和定量特征而言，其发展水平不足。

这项研究的目的是开发具有战略和战术性质的管理技术，旨在改善评估和管理，以提高疗养院和度假村组织的竞争力。为了实现这一目标，在研究过程中解决了以下任务：在竞争环境形成的条件下，研究该地区疗养院和度假区发展的社会经济方面；确定发展因素并提高提供疗养和度假服务的组织的竞争力；分析本组织在提供疗养院和度假村服务方面的竞争发展的潜力和机会；确定提高疗养院在区域疗养院和度假服务市场中的竞争力的方法。根据研究结果，该文章：查明了俄罗斯和巴什科尔托斯坦共和国疗养院和度假胜地组织机构发展中的现代问题并将其系统化；证实了区域疗养院和度假胜地（SRC）的竞争力与该地区发展水平之间的相互关系；根据反映巴什科尔托斯坦共和国疗养院和渡假胜地组织内部业务流程的指标体系，对其竞争力水平进行了全面分析，从而确定了制约因素并确定了优先发展领域。

关键词：疗养院和度假村治疗，竞争力，消费者，文化研究，疗养院，服务，价格，负担能力，质量。

Abstract. *Currently, the supply of services in the sanatorium and resort sector exceeds demand, therefore, competition between enterprises in this industry is intensifying. The Russian Federation, despite the high potential of its sanatorium and resort industry services, in the global market occupies a very small share. The state of the internal sanatorium and resort potential indicates an insufficient level of its development in terms of qualitative and quantitative characteristics.*

The purpose of this study is to develop management technologies of a strategic and tactical nature, aimed at improving the assessment and management of increasing the competitiveness of sanatorium and resort organizations. To achieve this goal, in the research process, the following tasks were solved: to study the socio-economic aspects of the development of the sanatorium and resort complex of the region in the conditions of the formation of a competitive environment; identify factors of development and increase the competitiveness of organizations providing sanatorium and resort services; to analyze the potential and opportunities for the competitive development of the organization for the provision of sanatorium and resort services; identify ways to improve the competitiveness of the sanatorium in the regional market of sanatorium and resort services. According to the results of the study, the article: identified and systematized modern problems of the development of sanatorium and resort institutions and organizations in Russia and the Republic of Bashkortostan; the interrelation of the competitiveness of the regional sanatorium and resort complex (SRC) with the level of development of the region is substantiated; based on a system of indicators reflecting the internal business processes of the sanatorium and resort organization of the Republic of Bashkortostan, a comprehensive analysis of its level of competitiveness was carried out, which allowed to identify constraints and determine priority areas of development.

Keywords: *Sanatorium and resort treatment, competitiveness, consumer, cultural studies, sanatorium, service, price, affordability, quality.*

Relevance of the research topic. Sanatorium and resort treatment, type of medical and preventive care to the population. Based on the predominant use of natural healing factors (climate, mineral waters, healing mud, sea bathing, etc.). It is carried out taking into account the achievements of balneology, internal medicine clinic and other medical disciplines. At present, the supply of services in the sanatorium and resort sector exceeds demand, therefore, *competition between enterprises in this industry is intensifying.* The properties of sanatorium and resort services include inseparability from the source, the complexity of quality assessment, the impossibility of preliminary demonstration, the need for control by the state, the trustworthy relationship between seller and buyer.

In foreign economic literature, competitiveness issues are studied in the works of B. Karlof, F. Kotler, M. Porter [1, 2], R. Waterman and other scientists. The issues of competitiveness of organizations of the sanatorium complex are considered in the works of L.I. Vasiltsova, A.M. Vetitneva, N.A. Zadorozhnoy, Z.G. Zainasheva, V.V. Kiseleva, N.V. Klimovskikh, R.M. Kobleva, O.A. Nikitina, M.S. Oborina, A.A. Oshkordina, A.N. Razumova, G.M. Romanova, T.O. Tolstoy [3 - 22], and others.

The purpose of this study is to develop managerial technologies of a strategic and tactical nature, aimed at improving the assessment and management of improving the competitiveness of sanatorium and resort organizations.

The object of the study is a sanatorium and resort organization of the Republic of Bashkortostan - "Assy" Sanatorium **LLC**.

According to Russian scientists, organizers of health care and physiologists, sanatorium and resort treatment reduces the duration of temporary disability after suffering serious illnesses and injuries to 20–25% [19]. Annual long-term prophylaxis and treatment in sanatorium-resort conditions can significantly increase life expectancy (from 3 to 15 years) [20]. The ***consumer*** exerts a special influence on the sanatorium and resort complex, forming requirements for the quality of the sanatorium and resort services and their completeness, having a direct impact on the pricing and financial performance of the complex, determining the vector of its development.

Today, organizations of the sanatorium and resort complex have to function in the market of tourism services in the conditions of fierce competition. Competitiveness of sanatorium-resort organizations refers to the ability to form internal and external strategic advantages that allow achieving superiority over competitors in the long term and reflected through indicators that adequately characterize such ability and its dynamics [17].

Over the past ten years, a major restructuring has been observed in the development of the sanatorium and resort complex, which determines the reduction of weak organizations and the enlargement of the most competitive ones. According to statistical indicators, it is possible to ascertain an increase in the flow of patients by an average of 10-13% against the background of a decrease in the number of sanatorium and resort organizations and institutions at the level of 20%.

Current problems in the development of sanatorium and resort institutions and organizations in the Republic of Bashkortostan are: moral and physical obsolescence of the material and technical base of most sanatoriums - inconsistency with modern requirements; lack of investment attractiveness; high cost of sanatorium and resort treatment; lack of qualified personnel; imperfection of the regulatory framework; insufficient budget allocations; lack of financial resources; low level of development of transport infrastructure.

The study substantiates the relationship between the competitiveness of the regional sanatorium and resort complex (SRC) and the level of development of the Republic of Bashkortostan: social and demographic indicators, the development of the regional economy and its investment attractiveness, the quality of the regional infrastructure, the standard of living of the population, in addition, SRC itself is a significant locomotive of the regional social

- economic development. It should be noted that in all regions a significant part of vacationers prefers local health resorts (in some regions up to 80% of vacationers in sanatorium and resort organizations are residents of this region), and it is these regions that are steadily demonstrating the profitability of sanatorium and resort activities.

The Republic of Bashkortostan occupies a leading position among the regions of the Volga Federal District (VFD) in terms of the number of sanatoria.

Sanatorium and resort institutions of the Republic have modern complexes of facilities for accommodation, catering, fitness and recreation services. The geographical location of the health resorts of the Republic of Bashkortostan allows you to organize excursions to historical, cultural, architectural monuments, which allows vacationers to satisfy spiritual needs, while on vacation and treatment. Sanatorium and resort institutions of the republic have modern complexes of facilities for accommodation, food, physical education, cultural and social services for tourists, health treatment.

As of 01.01.2018, only 3056 employees worked in the sanatoriums of the Republic of Bashkortostan, of which 200 doctors and 730 paramedical workers. It should be noted that against the background of a general increase in the number of workers in health resorts, in recent years there has been a tendency towards a decrease in the number of doctors and paramedical workers. So, in 2018, 5.9% fewer doctors and 3.9% fewer medical workers worked in the sanatorium and health system of the Republic of Bashkortostan in comparison with the previous year [23]. However, a decrease in the number of medical workers was compensated to a certain extent by an increase in their qualifications.

Based on a system of indicators reflecting the internal business processes of "Assy" Sanatorium LLC of the Republic of Bashkortostan, *a comprehensive analysis of the organization's competitiveness level was carried out*, which made it possible to identify constraints and determine priority development areas.

"Assy" is one of the youngest institutions of the Republic of Bashkortostan in the sanatorium and resort network. Despite his youth, he quickly gained fame with unique treatment methods far beyond the borders of Bashkortostan.

Since January 2017, the State Unitary Enterprise Sanatorium "Assy" of the Republic of Bashkortostan was reorganized in the form of a transformation into a limited liability company Sanatorium "Assy" on the basis of an order of the Ministry of Land and Property Relations of the Republic of Bashkortostan dated 09.26.2016 №1419.

The main type of economic activity of "Assy" Sanatorium LLC is sanatorium and resort activity, f*igure 1*. For the implementation of the main activity, the sanatorium uses natural factors, the main of which is mineral water.

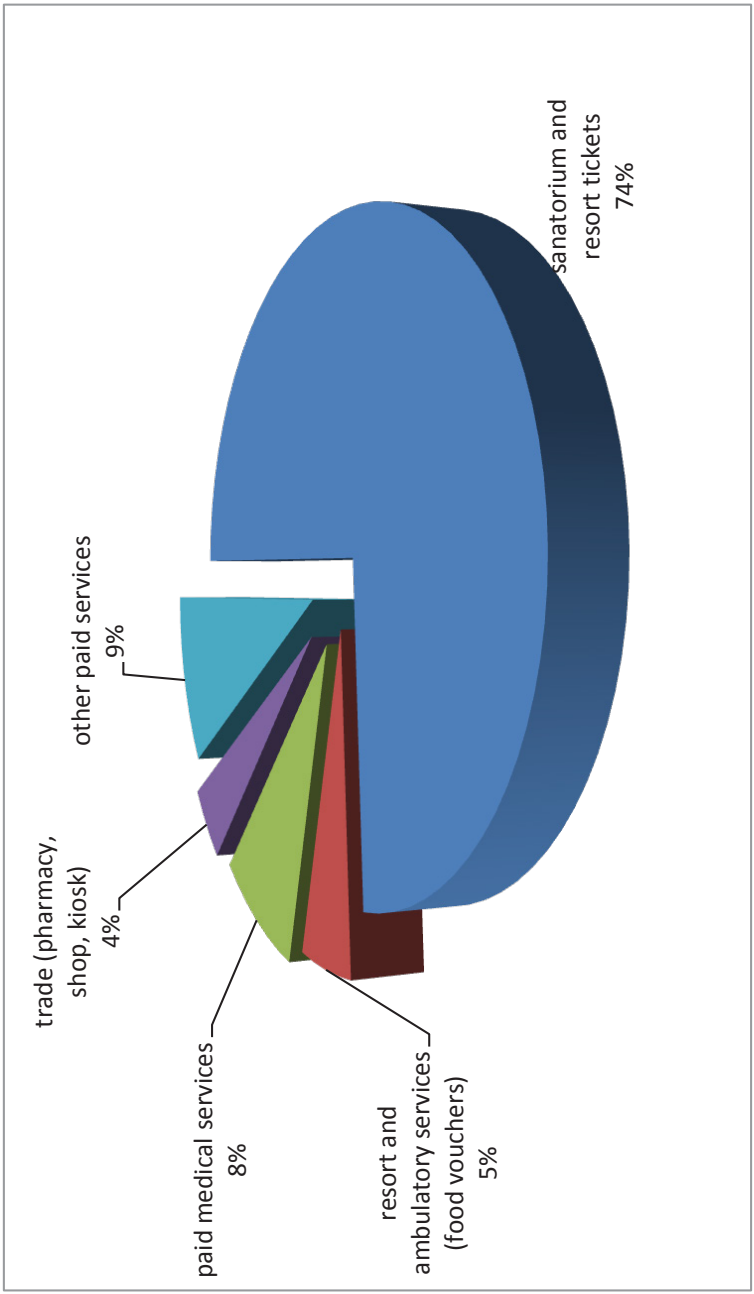

Figure 1. *Activities of "Assy" Sanatorium LLC*

For five years, almost all the health resorts in the region faced the occupancy problem, and the only exceptions in this regard were the health resorts Krasnousolsk and Yangan-Tau, *figure 2*.

The system for the implementation of sanatorium vouchers consists of two parts: direct sale of vouchers by the sanatorium itself and the conclusion of purchase and sale agreements, agency agreements, and agreements with insurance companies.

"Assy" sanatorium - is one of the successfully functioning sanatoriums, constantly generating profit and providing services at a modern level. At a fairly high level is the medical base. The medical staff is highly qualified, which is constantly being improved. The sanatorium takes families and children on vacation (from 4 years old). At the same time, the cost of a children's ticket is 20% of the cost of an adult ticket [24].

To carry out the main activity, the sanatorium uses natural factors, the main of which is mineral water. To date, 190 places are involved in the sanatorium. The occupancy rate of the "Assy" Sanatorium in 2018 amounted to 97%, which is 7% more compared to the same period last year. This is due to an increase in the number of vacationers. The average cost of 1 bed-day in the Sanatorium for 2018 was 2586 rub. which compared to the same period last year increased by 1%.

In order to maintain competitive advantages, "Assy" Sanatorium LLC should adhere to the model of comprehensive attractiveness of services, which will take into account the interests of all market entities, provide for a variety of parameters that affect competitiveness, plan and implement promotion and marketing strategies so that services are successful in the market, and the company's efforts are aimed at increasing competitiveness.

The competition between rival organizations that provide services especially during the summer period has a great influence. Competition arises from the fact that one or more organizations have the opportunity to better meet the needs of consumers or the need to improve their activities. The strengths and weaknesses, opportunities and potential external threats of "Assy" Sanatorium LLC based on a *SWOT-analysis* are presented.

The strengths of the sanatorium include: a favorable image of the sanatorium; average cost of services offered in comparison with competitors; availability of a system of discounts; the presence of a clearly articulated strategy: increasing the range of services offered (there is a park and beach area), improving the quality of service.

From the above analysis, one can single out the following serious problems for "Assy" Sanatorium LLC: weak marketing and advertising policies; seasonality problem; slow replacement of old equipment; poor leisure program.

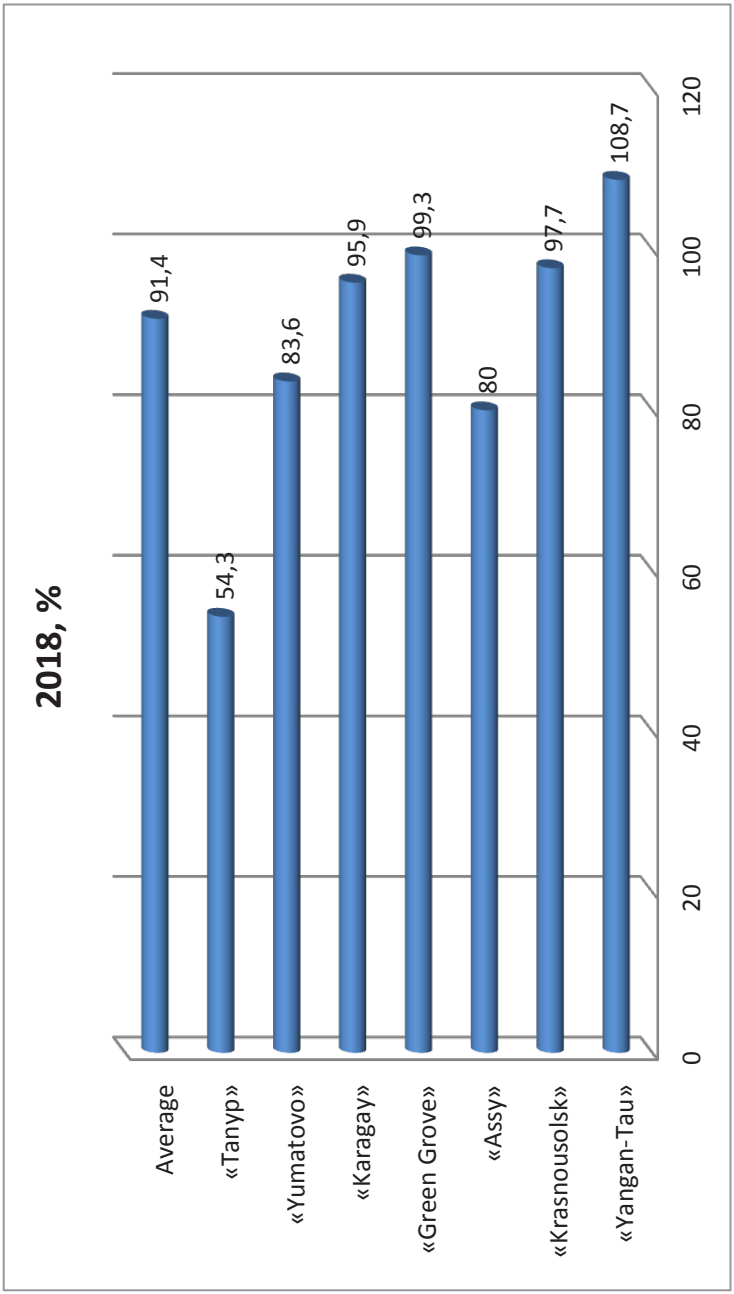

Figure 2. *Occupancy of the sanatoriums of the Republic of Bashkortostan in 2018 (%)*

In general, the implementation of the proposed science-based projects will increase the competitiveness of the entire sanatorium and resort complex of the Republic of Bashkortostan and create conditions for its sustainable development in the face of fierce competition in the domestic and international health tourism markets.

Conclusions:

1. The profound economic transformations taking place in the Russian Federation are accompanied by fundamental changes in the sphere of sanatorium and health services in the form of a progressive decrease in the financing of sanatorium treatment from social insurance funds and own funds of institutions, the lack of centralized management and investments, and a decrease in the solvency of the population.

2. In conditions of increasing competition in the sanatorium of the Republic of Bashkortostan, it was necessary to develop urgent measures aimed at improving the financial and economic situation, the most complete use of their medical potential, the expansion of activities and the provision of wellness services.

3. The role of the state in regulating the sanatorium and resort complex should be to create equal and transparent conditions for the development of competition.

4. The competitiveness factors of SRC organizations include: Technologies for sanatorium and resort activities (compliance of sanatorium and resort technologies with modern standards of hotel and resort business, including international ones); natural and recreational resources (a variety of natural healing and recreational resources of resort and recreation territories and their involvement in the process of sanatorium and resort activities); marketing (the effectiveness of the promotion system of sanatorium and resort services, the use of marketing research methodology in the study of consumer requests, etc.); personnel (professionalism and qualifications of medical and service personnel of sanatorium and resort organizations and infrastructure entities); finance (solvency, financial stability of sanatorium and resort organizations and infrastructure entities, investment attractiveness of sanatorium and resort organizations).

5. Assessing the competitiveness of "Assy" Sanatorium LLC allowed us to identify the following problems: weak marketing and advertising policies; seasonality problem; lack of animators. The strengths of the sanatorium include: a favorable image of the sanatorium; the presence of unique natural factors, a loyal pricing policy.

6. To increase the competitiveness of "Assy" Sanatorium LLC, it is necessary to strengthen the identified weaknesses, namely: to increase the effectiveness of the implementation of policies in the field of quality of service and provided services; to improve the activities of the marketing and service department of the sanatorium; expand the information space of the enterprise by more actively using the communication capabilities of the Internet; to improve the enterprise information system by introducing an automation program specialized for sanatoriums and boarding houses and capable of not only simplifying the work of staff, but also attracting additional customers by improving the quality of service; to develop and maintain animation services for vacationers in the sanatorium.

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在芬兰举办大型公共活动，体育比赛，壮观的商业比赛或政治会议的腐败风险及其缓解策略

CORRUPTION RISKS IN ORGANIZING LARGE PUBLIC EVENTS, SPORTS COMPETITIONS, SPECTACULAR COMMERCIAL COMPETITIONS OR POLITICAL CONFERENCES IN FINLAND AND THEIR MITIGATION STRATEGY

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抽象。本文讨论了大型公共活动，体育比赛，文化娱乐或政治会议中的腐败风险。反腐败措施的组织可以确定优先次序和分配权力。在公共活动领域开展反腐败斗争需要国际合作，以就引渡和司法互助向联合国成员国提供咨询和援助。大型国际公共活动的组织并非没有公务员，机构和公共当局的广泛参与，大量的公共和私人资金以及公共财产的使用。在筹备的各个阶段，甚至在国际活动结束之后，都有很多腐败的机会，这不仅会损害整个活动的成功，而且会损害组织国的权威。通过建立分析方案，发现问题和传播有关良好做法的信息，以在国家一级建立能力，建立信任与合作以建立反腐败机构之间的联系，包括通过使用电子工具和技术，促进国家之间的经验交流。处理系统并跟踪国际援助请求。在公共活动中全面反腐败的组成部分是明确的国家立法，该立法为国家提供了更多机会，包括在有效预防和打击腐败领域加强能力建设和建立机构，以及加强国际合作和技术援助。预防腐败和与腐败作斗争，包括提供法律机制，通过没收和执行外国法令归还所揭露的腐败收益。

关键字：腐败监测，公共活动，体育比赛，舞弊行为，滥用职权，商业贿赂。

Abstract*. The article discusses corruption risks in large public events, sports competitions, cultural and entertainment or political conferences. Organization of anti-corruption measures allows to determine priorities and distribute powers. The fight against corruption in the field of public events requires international cooperation to provide advice and assistance on extradition and mutual legal assistance to UN member states. The organization of a major international public event is not without widespread involvement of public servants, institutions and public authorities, significant public and private funds and the use of public property. At all stages of preparation and even after their completion of the international event, there are numerous opportunities for corruption, which can jeopardize not only the success of the entire event, but the authority of the organizing state. Facil-*

itating the exchange of experience between states by building analytical schemes, identifying problems and disseminating information on good practices to build capacities at the national level, to build trust and cooperation to establish links between anti-corruption bodies, including through the use of electronic tools and processing systems and tracking international requests for assistance. An integral part of the comprehensive fight against corruption in public events is clear national legislation that provides increased opportunities for the state, including by strengthening the capacity and creating institutions in the field of effective prevention and fight against corruption and strengthening international cooperation and technical assistance in preventing corruption and the fight against it, including the provision of legal mechanisms for the return of the revealed proceeds of corruption through confiscation and enforcement of foreign decrees.

***Keywords**: corruption monitoring, public events, sports competitions, malpractice, abuse of authority, commercial bribery.*

Corruption in all its forms is no longer a national issue, but increasingly acquires transnational elements and embraces various types of corruption, including in the field of international public events. At the same time, a significant part of illegal proceeds from corruption crimes is transferred to foreign banks, mainly to the accounts of offshore companies. Corruption is of particular importance not only from a legal and economic perspective, but also from a social perspective. Therefore, the responsibility for combating corruption lies with all sides of civil society, the government or any other structure, including the private sector. Maintaining a culture of honesty and integrity in the field of international public events should be in the interest of the private sector.

The main areas of corruption risk in Finland are the construction sector, public procurement and tenders, urban planning, political decision-making and financing. Also key areas vulnerable to corruption are foreign trade, sports and public sporting and entertainment events, including cultural and political conferences and forums.

Business-related corruption may include, as a condition, the need to pay so-called “kynnysraha,” or “kickbacks,” to organizers of public events, for receiving large, highly profitable government contracts or other favorable terms.

The organization of major international public events, sporting events, cultural shows or political conferences, especially international ones, is associated with a high risk of corruption crimes. The inevitability of corruption risks is due to significant investments, both public and private, including venture capital, as well as the complexity of organizational measures and fixed time conditions. So, only in 2015, about one billion euros of venture capital was invested in Finnish startups, and many of the transactions were concluded as part of Slush conferences. All this

makes it possible to commit fraud and violation of the law on cost control, as well as anti-corruption standards and monitoring of corruption.

Corruption monitoring, opinion polls and regular police reports on corruption risk studies during public events are a source of information on the causes and factors that cause corruption in this area and help identify mechanisms for combating corruption crimes.

It is necessary to emphasize the role of the United Nations Convention against Corruption, which is a universal mechanism for the development and implementation of anti-corruption protective measures at high risk in organizing major international public events and the opportunity to communicate with leading world business experts, politicians, business technology leaders and influential representatives of a high international level.

The UN is actively developing and promoting internationally recognized principles, standards and norms related to the prevention of corruption crimes. In particular, in 2013, the United Nations Office on Drugs and Crime-UNODC published the brochure "Left Out of the Bargain: Settlements in Foreign Bribery Cases and Implications for Asset Recovery". Using the lens of the United Nations Convention against Corruption (UNCAC), the Stolen Asset Recovery Initiative (StAR) undertook the study Left Out of the Bargain to answer these questions and provide policy makers, practitioners, and others with greater understanding of the nature of settlements and, in particular, their implications for asset recovery. The StAR Initiative hopes that this study will spur a more informed and sharper discussion on settlements and asset recovery[1].

UNODC continues to develop and distribute manuals, guides and other textbooks. So, in September 2019, more than 25 publications were posted on the Internet with further re-publication and distribution on a regular basis.

UNODC calls on participating States to ensure that there is a legal and institutional framework for criminal prosecution of corruption, to identify cases of illegal acquisition and transfer of assets derived from corruption, including illegal assets of politicians. The provision of legal mechanisms for the return of revealed proceeds of corruption through confiscation and the enforcement of foreign orders are the main requirements for the implementation of the UN Convention against Corruption.

According to Article 2 (a) of the UN Convention against Corruption, the definition of "public official" covers most of the people directly involved in organizing a major event on behalf of the host government, as well as any person who performs any public function or provides any public service. In order to combat corruption, each State Party shall endeavor to apply, in the framework of its institutional and legal systems, codes or standards of conduct for the correct, conscientious and

[1] Left Out of the Bargain: Settlements in Foreign Bribery Cases and Implications for Asset Recovery. International Bank for Reconstruction and Development / The World Bank. URL: https://star.worldbank.org/sites/star/files/9781464800863.pdf.

proper performance of public functions.

The organization of a major international public event is not without widespread involvement of public servants, institutions and public authorities, significant public and private funds and the use of public property. At all stages of preparation and even after their completion of the international event, there are numerous opportunities for corruption, which can jeopardize not only the success of the entire event, but the authority of the organizing state.

In this regard, it is extremely important that all participants in the processes of preparing and conducting a major, especially international event, have a sufficient idea of the corruption risks that arise in this case, as well as how to reduce them.

Unfortunately, this is not always possible. The implemented anti-corruption measures and monitoring of their effectiveness are not always based on the best international practices and do not always comply with accepted norms and regulations.

For example, in Finland, only one company, Me Studio Oy (Management Events Studio Oy), which is part of the international Management Events Group with offices in 13 countries, has a wide network of partners and holds about 200 events a year in Finland and abroad. In 2018, the annual turnover of the company amounted to about 3 million euros with a loss of about 192,000 euros compared with revenue in 2017 of about 135,000 euros with an annual turnover of 3.3 million euros.

The investigation, identification and assessment and determination of corruption risks during the preparation of a public event require focused efforts and monitoring at each stage of the preparation of the event. According to a study by the higher police school, the risks of small-scale corruption usually combine with larger corruption and often arise at the interface between business and government officials[2].

An example of international anti-corruption efforts is the operational unit of the Federal Anti-Corruption Bureau, which uses the European Police (Europol) Office's Secure Information Exchange Network Application. This platform allows the exchange of operational and strategic information about crimes with employees, analysts and experts of the Member States of the European Union, as well as with third parties with whom Europol has cooperation agreements, although there are exceptions.

For example, the Russian Federation reported that requests were denied in cases where, in addition, suspects with assets located in one European Union member State had refugee status in another European Union member State or when suspects no longer owned the assets in question.[3]

[2] Johanna Peurala & Vesa Muttilainen. Korruption riskikohteet 2010-luvun Suomessa. Poliisiammattikoulu Tampere 2015. Juvenes Print, Tampere 2015.

[3] Conference of the States Parties to the United Nations Convention against Corruption.20 March 2019. CAC/COSP/EG.1/2019/2. Art..48

Notably, many requests involving seizure, restraint and confiscation took much longer to complete, as the United States had to identify and gather evidence of the assets and observe due

process requirements under domestic law. China thus suggested holding advance consultations with requested States, with a view to understanding the applicable laws and legal requirements[4].

It should be recognized that the problem is cooperation with some "offshore" jurisdictions, and in the existing multilateral treaties this issue is not given sufficient attention.

In this regard, the position of the Prosecutor's Office of the Russian Federation should be noted, which expressed the view that the effectiveness of international cooperation can be improved by concluding bilateral agreements with offshore jurisdictions on the tracking, freezing, seizing and confiscation of assets representing crime proceeds, and the sharing of such confiscated assets[5].

The main legislative conventions against corruption are Council of Europe Criminal Law Convention on Corruption (ETS 173) with the additional Protocol (ETS 191), the OECD Convention on Combating Bribery of Foreign Public Officials in International Business Transactions, the EU Convention on the Protection of the European Communities' Financial Interests with additional protocols, the EU Convention on the Fight against Corruption Involving Officials of the European Communities or Officials of Member States of the European Union, and the Inter-American Convention against Corruption comprehensive national legal frameworks to fight match-fixing. Also the national laws do not cover the same range of sports competitions and bribery is still considered as the most common criminal offence in this area.

According to the United Nations Conventions against Corruption (UNCAC) "Match-fixing" can appear in a form of six corruption criminal offences:

- Active and passive bribery in the public sector;
- Active and passive trading in influence; and
- Active and passive bribery in the private sector"[6].

For example, Article 14, the UNCAC requires State Parties to develop comprehensive measures to prevent money laundering. Some of the measures are of mandatory nature, others are not.

In Article 23, the UNCAC sets forth an obligation for States Parties to criminalize the "laundering of proceeds" derived from offences established by the Convention. Article 23 refers to direct intent for money laundering and enables State Parties to exclude self-laundering from the scope of incrimination.

[4] Ibid. Art. 51 and 39.

[5] Eighth session of the Conference of the States Parties to the United Nations Convention against Corruption. Abu Dhabi, 16-20 December 2019. CAC/COSP/2019/7. Art. 97.

[6] Criminalization approaches to combat match-fixing and illegal/irregular betting: a global perspective. UNODC. Lausanne / Vienna. July 2013. Chapter 3.2.

Finnish law does not penalize unlawfully affecting the outcome of an official sports competition or spectacular commercial competition.

For example, a county court sentenced the goalkeeper of the Atlantis FC First Division football squad to 14 months in prison for receiving 1,500 euros for having unlawfully influenced the outcome of an official sports competition under an article for taking a bribe in entrepreneurial activity[7].

The organization and holding of sports competitions is associated not only with corruption risks, but also with the practice of holding match-fixing, which is fraud and may be transnational in nature.

Manipulating sports results or contractual matches is a dangerous form of crime, therefore, it is necessary to outline the ways of international cooperation and identify criminal law instruments at the national and international level in the fight against these crimes.

At the same time, these risks can be aggravated many times by the insufficient effectiveness of regulations and anti-corruption systems in the host country. But even where they exist and operate effectively, it should be remembered that the process of preparing a major event itself serves as a source of additional corruption opportunities. Their identification and, accordingly, the identification, assessment and control of emerging risks requires focused and skillful actions.

Finland has been participating since 2010 in hosting annual world-class business conferences of world level, both in Finland, and in Sweden and Norway. According to official statistics, the total annual attendance of such conferences has grown from 700 people in 2010 to 7655 visitors in 2019. The number of Internet visitors in the Nordic Business Forum social networks has grown from 1000 to 21500 people with t the ability to communicate in chat rooms..

Participation in the Nordic Business Forum 2019 in October 2019 cost 1290-1990 euros with access to the Brella networking application. For 2,990 euros, seats in the front rows and in the Lounge area were attached with a photo shoot with the founder of the media and technology sector Randi Zuckerberg. 7655 people visited the exhibition pavilion.

It is important to note the role of Networking as part of the corporate culture, and, undoubtedly, the main driver in deciding to participate in the event, a tool for communication and attracting the number of participants and involving the audience of forums and conferences. With the Brella networking application, 3,000 meetings and business acquaintances were organized and scheduled during the conference with the founders of media theories and Blockchain technologies at the Nordic Business Forum 2019 alone.

Since 2008, the annual Slush conferences on startups and high technologies have been held in Helsinki. The number of participants during this time increased

[7] Judgment of District Court of Helsinki on 18 December 2007.

from 300 to 25,000 participants from around the world in November 2019, including entrepreneurs, investors, students and faculty of Aalto University, and representatives of the media.

In Helsinki, Slush 2019 was attended by 25,000 speakers and guests, 4,000 startups and 2,000 investors.

The conduct of such public and entertainment events was influenced by modern business culture, the topic of seminars and cultural programs became wider, for example, with the inclusion of fights with virtual sabers in Singapore.

Over the past five years, Slush has grown into the world's largest venture capital association. In 2018, more than 1800 investors joined Slush, which amounted to more than $ 200 billion in asset management.

In addition to Helsinki, Slush events are now also being held in other cities, except in the above mentioned Singapore, in Tokyo, London, Berlin, Trondheim, Stockholm, Paris, New York, in more than 40 cities, which undoubtedly complicates the fight against corruption in foreign countries with different national fundamental principles of the legal system and accountability in managing public finances and criminal law and approaches to investigating financial crimes related to corruption and money laundering.

In this regard, it is necessary to highlight a number of key tools that organizations and government agencies are encouraged to implement in order to effectively prevent corruption, taking into account that holding public events is associated with the risk of bribing officials, including foreign ones. Also, the prevention of corruption in choosing business partners and building relationships with them reduces the likelihood of building relationships with non-trusted partners and their intermediaries.

To do this, it is necessary to simplify the relevant procedures and take appropriate measures so that the issue of mutual recognition of an act as a crime does not create an obstacle for mutual legal assistance to the participating states if the relevant behavior is not criminally punishable in both the requesting and requested state parties.

Undoubtedly, the fight against corruption in the field of public events is impossible without international cooperation to provide advice and assistance on mutual legal help.

Facilitating the exchange of experience between states by building analytical schemes, identifying problems and disseminating information on good practices to strengthen capacities at the national level will help build trust and cooperation to establish links between anti-corruption bodies, including through the use of electronic tools and processing systems and tracking international requests for assistance.

It is necessary to additionally create existing mechanisms to facilitate the re-

ceipt of signals from public servants and the public about alleged facts of corruption, abuse and conflict of interest, as well as mechanisms to return the revealed proceeds of corruption.

The basis of a successful corruption prevention strategy is the principle of risk management and their maximum reduction during the entire period of preparation and holding of a major event. The organization of a major event requires a mandatory strategic study of corruption risks and their mitigation, and should also be carried out on the basis of clear procedures defined by the Government, its various departments and all participants at all stages of preparation for a major international event and tender procedures for choosing the organizer of a public mass event.

The fight against corruption at the national level in Finland is carried out by increasing openness, awareness and enhancing cooperation and increasing resources for those who coordinate and conduct anti-corruption work.

Summing up, it should be noted that an integral part of the comprehensive fight against corruption is clear national legislation that provides increased opportunities for the state, including by strengthening the capacity and creating institutions in the field of effective prevention and fight against corruption and strengthening international cooperation and technical assistance in preventing and combating corruption, including providing legal mechanisms for the return of revealed proceeds of corruption through confiscation and the enforcement of foreign decrees.

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在商业部门中履行违反租赁的民事责任的特征
FEATURES OF THE IMPLEMENTATION OF CIVIL LIABILITY IN VIOLATION OF THE LEASE IN THE BUSINESS SECTOR

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抽象。 本文讨论了商业领域中违反租赁义务的民事责任问题。 作者提出并证明了这一立场，据此，租赁义务的复杂性质包括其他两种类型的义务–监管性和保护性衍生金融义务。 还规定了对犯罪者不利的物质后果的法律形式的特殊化。

关键词：企业家活动，民事责任，合同义务，交易对手，债务人，债权人，房东，租户，损失，财产。

Abstract. *The article discusses the problems of civil liability in violation of rental obligations in the business sector. The authors put forward and justified the position according to which, the complex nature of the lease obligation includes two other types of obligations - regulatory and protective derivative monetary obligations. Also specified is the particularization of legal forms of adverse material consequences for the offender.*

Keywords: *entrepreneurial activity, civil liability, contractual obligations, counterparties, debtor, creditor, landlord, tenant, losses, property.*

Entrepreneurial activity that has a significant impact on the quality of life of people, under the conditions of legal nihilism of contractors of rental and other transactions, poses serious problems, and the result is civil liability, which establishes the consequences of unlawful behavior and, at the same time, is a way of protecting the rights and interests of bona fide participants. The peculiarity of this method is the application of measures using state coercion

The issue of civil liability is controversial in legal science. The fact is that the proposed conclusions on problems relating to the concept of "civil liability" depend on the chosen aspect of this concept and on the scope of its objectification.

Civil liability, as a kind of legal responsibility, has a certain specificity, namely:

- property content, and its measures are of a property nature;
- it is the responsibility of one counterparty to another, the responsibility of the offender to the victim;
- equivalently paid nature of commodity-money relations;
- has a restorative, compensatory, educational and stimulating character.

Touching on the quintessence of signs of civil liability in the framework of the characteristics of the practical aspects of this concept related to the application of the relevant legal norms, the latter provide liability for violation of a contractual obligation, which entails a violation of the contract.

In this case, civil liability is considered as an obligation to compensate the counterparty for the losses incurred and to pay the penalty established by law or stipulated by the contract.

Under a lease, both the lessor and the lessee are equally liable. It seems that more attention needs to be paid to the mechanism for protecting the rights of the parties. In this regard, the Civil Code of the Russian Federation provided for a number of grounds for the liability of the lessor and, in particular, liability for the shortcomings of the property leased.

In accordance with Art. 611 of the Civil Code of the Russian Federation, the lessor is obligated to provide the lessee with property in a condition that meets the terms of the contract and its purpose. In addition, in the place with the main property that is the subject of the lease, its accessories must be transferred, unless otherwise provided by the contract. In particular, when renting a property, for example, to an individual entrepreneur, it is necessary to simultaneously provide the documentation related to this property: data sheet, documentation on safety rules, operating rules, etc. If the main property is not provided simultaneously with the relevant documentation, and without it is impossible to use the property to the extent that is necessary for the tenant on the basis of the contract, the tenant has the right to demand either the provision of the specified documentation or termination of the contract. Moreover, regardless of the solution to the problem, the lessee has the right to demand compensation for losses or lost profits caused by improper fulfillment of contractual obligations by the lessor, which in the field of business relations is often not difficult. However, if the subject of the contract is a vehicle, then the tenant's claims for compensation for lost profits will be legitimate "in case of the availability of a license to carry out transport activities" [1].

If the lessor evades the provision of property within the time period established by the parties or within a reasonable time, the lessee has the right to choose an alternative to behavior, fixed by law. It is possible to reclaim property through the judicial authorities in a forced manner, while the latter has the right to recover losses from the lessor resulting from a delay in fulfilling the obligation. Another option is to demand termination of the contract with compensation for losses caused by non-fulfillment of contractual obligations. Compensation for losses may include: first, real damage (additional costs incurred by the tenant in connection with the rental of similar property from another person); secondly, lost profit (due to downtime because of untimely receipt of the leased item) [2].

The lessor is also liable for the shortcomings of the leased property that impede or prevent the use of it in accordance with the terms of the lease. Moreover, liability arises when there are hidden flaws, that is, when the contract was concluded, the landlord did not know about them.

In this case, the lessee may require:

1) gratuitous elimination of deficiencies;

2) a commensurate reduction in rents;

3) upon elimination of deficiencies by the tenant, to demand reimbursement of these expenses; one of the options is withholding a certain amount, equivalent in whole or in part to the degree of expenses incurred, with a preliminary warning to the lessor;

4) termination of the lease.

However, an alternative model of behavior is proposed by the legislator and the landlord. In particular, notified of the tenant's intention to eliminate the deficiencies at the lessor's expense, the latter can either eliminate the defects free of charge, or replace them with similar property in a condition suitable for use.

C.2 Art. 621 of the Civil Code of the Russian Federation contains some exceptions to the general rule of liability of the lessor. In accordance with this provision, the lessor is not responsible:

1) for those shortcomings that were agreed upon at the conclusion of the lease or were previously known to the lessee;

2) for those deficiencies that should have been discovered during the inspection or examination of the working condition of the property being leased. The purpose of this exemption is the need for a sufficiently careful verification of property received under the contract, as well as the protection of the lessor from the claims of an unscrupulous counterparty.

As you can see, liability is the result of unfair performance of obligations under a lease. The distribution of responsibilities between the parties regarding the maintenance of the property, its proper use and the implementation of both major and current repairs is of certain importance. In accordance with Art. 616 of the Civil

Code of the Russian Federation, overhaul is the responsibility of the lessor, and the current one is the lessee, but unless otherwise provided by law or contract. This provision is essential for rental contracts, rental vehicles, rental companies. For example, when renting a vehicle without a crew, overhaul and maintenance is the responsibility of the lessee (Article 644 of the Civil Code of the Russian Federation), while renting a vehicle with crew this responsibility is assigned to the lessor (634 Civil Code of the Russian Federation).

If this obligation is not fulfilled, one of the parties has the right, at their option, to produce:

1) overhaul and collect from the counterparty its cost or, if it is a tenant, set off against the rent or demand a commensurate reduction in rent;

2) prematurely terminate the contract with a claim for damages.

Termination of the lease can also be considered as a type of liability for improper fulfillment of obligations by the tenant. The participants in the lease transaction are interested in the lease agreement being properly executed by the parties and expire due to the expiration of its term. But in life, situations often arise when early termination of the contract is required. As a rule, early termination of a transaction is an extreme measure applied by a party whose rights have been violated [3]. Since the tenant is mainly the debtor under the lease, the grounds for early termination of the transaction most often relate to cases of improper performance of duties by the latter. For example, due to late payment more than two times.

When terminating the lease, the general rule works: 1) if the termination of the contract was a material violation of the terms of the contract of one of the parties, the other party has the right to demand compensation for losses caused by the termination of the contract (Clause 5 of Article 453 of the Civil Code of the Russian Federation), therefore, by fair remark B. A. Khokhlov, if other circumstances are discovered, the contract should not be terminated, for example, "if the damage from the violation is significant, but the creditor is not deprived of the calculated good. If the relevant circumstances occurred during the presentation of the claim, but were no longer pending its consideration, it is also impossible to satisfy the creditor's claims "[4]; 2) if losses have occurred due to changed circumstances, the consequences go beyond liability and are determined by the court "based on the need for a fair distribution between the parties of the expenses incurred by them in connection with the execution of this agreement" (Clause 3 of Article 451 of the Civil Code of the Russian Federation).

The Civil Code of the Russian Federation provides the lessee with the right to conclude a lease agreement for a new term upon the expiration of the contract with the lessor. However, the exercise of this right is possible only subject to a number of conditions.

1. The preemptive right to conclude a lease for a new term is reserved only to the tenant who has properly performed his duties.

2. The tenant's pre-emptive right to conclude a lease for a new term may be exercised by him only if it is a matter of transferring property to a third party for lease.

3. Since in Art. 621 of the Civil Code of the Russian Federation refers to a lease for a new term, it should be recognized that at its conclusion the parties are not bound by the terms of the previously existing contract.

Sometimes the landlord, having offered the former tenant some conditions for renting a property for a new term, which the tenant did not like, after his refusal, signs a lease with another person on completely different conditions or refuses the previous tenant to conclude a contract for a new term for reasons that he is not going to transfer the property for rent, but at the same time, within a year from the date of expiration of the contract, concludes a new lease agreement with another person. Such behavior of the lessor can also serve as the basis for the tenant to appeal to the court for the protection of his rights, and the lessee has the right to choose the method of protection: he has the right to demand the transfer of the rights and obligations under the concluded contract and compensation for losses or only compensation for losses.

The rules for granting a tenant's pre-emptive right to renew a lease agreement do not apply to lease agreements for certain types of property, for example, to a rental agreement (clause 2 of article 627 of the Civil Code of the Russian Federation), lease agreement for a vehicle with a crew (clause 2 of article 632 of the Civil Code of the Russian Federation), lease agreement for a vehicle without a crew (clause 2 of article 642 of the Civil Code of the Russian Federation).

At the end of the lease, the tenant must return the property taking into account normal depreciation or in the condition determined by the contract (we are talking about repair, reconstruction, etc.). If the property is not returned within the prescribed period, the tenant is obliged to pay the delay time, and if the amount of the rental payments does not cover the losses incurred by the lessor, he is entitled to demand compensation from the tenant for these losses. Art. 622 of the Civil Code of the Russian Federation provides for a penalty: if a penalty is provided for an untimely return of property under the contract, losses may be recovered beyond the penalty, that is, in full. But if the contract provides for an offset penalty, then the prevailing condition is the contractual.

At the same time, it is obvious that in case of violation of lease obligations, a monetary obligation arises, which is a “civil relationship, the content of which is the right of the creditor to claim and the debtor’s corresponding legal obligation to make a payment or payment, i.e. action (or actions) to transfer a certain (definable) amount of money (currency) ”[5]. The study of the existence of the responsibility of the lessor and the tenant, "arising" from improper or untimely fulfillment of rental obligations is not in doubt.

Thus, we can conclude that these obligations fulfill the role of protective obligations, since they are aimed at restoring the property status of the victim, which existed before the violation, and the nature of the derivatives is determined by the fact that they arise as a result of violation of one of the parties to the rights of the other. Moreover, if the obligation to compensate for the damage is not of an unambiguous monetary nature (because it is possible to compensate the damage in kind), then the obligation to compensate for losses, pay a penalty and interest exist within the framework of monetary obligations.

All of the above does not exclude the existence of a certain new obligation of the inflicter of harm and the right of the victim corresponding to it in the framework of the lease obligation, referred to in paragraph 1 of Art. 307 and paragraph 2 of article 308 of the Civil Code of the Russian Federation. Then, if the lease obligation acts as the main obligation, then the monetary obligation is characterized as derivative, while it is an integral part of a complex obligation covering the totality of the rights and obligations of the lessor and the lessee. Consequently, the landlord's obligation to provide property (movable or immovable) in a condition consistent with the terms of the contract and its purpose corresponds to the tenant's obligation to pay the rent on time, where the latter is not an independent obligation, but the existence of a monetary obligation between the parties is obvious. In this case, we are talking about regulatory monetary obligations, i.e. monetary liabilities encircling the proceeding actual property relations [5; S. 34].

Thus, a lease liability, being a complex obligation, includes two other types of obligations:

1) regulatory monetary obligations;

2) in the case of civil liability - protective derivative monetary obligations or as “protective secondary monetary obligations”, not at all questioning the significance of the legal regime of its lease relations.

At the same time, we pay attention to the problem of specifying the legal forms of adverse material consequences for the offender.

This specification may occur either as a result of an agreement with the victim, or as a result of a court decision. In addition to protective obligations, there are other obligations, the amount of which is determined by fixing in a certain amount of monetary units. Accordingly, without a specific amount of debt, there is no obligation to pay precisely this amount, in other words, "a monetary obligation has not been formed." But is that so? After all, the legal form of a monetary obligation can be specified much earlier than a court decision. D. Saveliev confirms this point of view, believing that it is more expedient “to connect the occurrence of a monetary obligation with the presentation by the injured party of claims for damages in cash, since the court only confirms the legality of the plaintiff’s claims, establishes the existence of a monetary obligation” [6].

The basis for applying civil liability is also the delay in the payment of funds (rent), which is, in accordance with the provision of the norm of Art. 405 of the Civil Code of the Russian Federation, violation of the deadline for the performance of civil liability.

The safeguard obligation “does not provide for a period for its fulfillment and does not contain conditions allowing to determine this period” (paragraph 1 of clause 2 of article 314 of the Civil Code of the Russian Federation). Therefore, in accordance with the Dispositive Norm paragraph 1 clause 2 article 314 of the Civil Code, the obligation "must be fulfilled within a reasonable time after occurrence." Moreover, if the obligation is not fulfilled within a reasonable time, “the debtor is obligated to fulfill within seven days from the day the creditor submits a demand for its execution, if the obligation to fulfill at another time does not follow from the law, other legal acts, conditions of the obligation, customs of business or the essence of the obligation” (paragraph 2, clause 2, article 314 of the Civil Code of the Russian Federation). A different term is not determined either by a legal act, or by the custom of business turnover, or by the very essence of the obligation. Therefore, the application of the dispositive norm of clause 2 of article 314 of the Civil Code of the Russian Federation, which provides for a seven-day period from the day the creditor submits his claim, is the most relevant to the essence of the protective obligation.

Summarizing the above, we can conclude that civil liability is one of the forms of state coercion, characterized by a restorative, compensatory, educational, stimulating character; consisting in the court recovering from the offender in favor of the victim of property sanctions, assuming unfavorable property consequences for the offender; based on equal rights of counterparties.

Consequently, the primacy of the objective formalization of civil liability over the general principle of the dispositiveness of private law is that the parties to the lease have a certain margin of appreciation, both in establishing and using liability measures, which are applied, as a general rule, only to the extent that the injured party to the lease stated its claim to their application. At the same time, the submitted claim concretizes the regulatory monetary obligation by the amount and the parallel existing security derivative in form, and, accordingly, allows calculating the interest for the delay in its execution.

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无主房地产作为地方政府的市政财产
OWNERLESS REAL ESTATE AS AN OBJECT OF MUNICIPAL PROPERTY OF LOCAL GOVERNMENT

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抽象。 本文讨论了对无主房地产的市政所有权的识别，核算和注册问题，这是地方当局解决当地重要问题的职责之一。 对法理进行了分析，从而可以确立地方政府的义务。 查明地方当局对无主房地产进行会计和注册的问题以及解决这些问题的方法。

关键词：无主房地产；市政预算收入；无主财产的核算；无主房地产对象的市政财产登记。

Abstract. *This article discusses the issues of identification, accounting and registration of the right of municipal ownership to ownerless real estate as one of the responsibilities of local authorities in solving issues of local importance. The jurisprudence is analyzed, which allows to establish the obligation of the local government. Identified problems of accounting and registration of ownerless real estate by local authorities and ways to solve these problems.*

Keywords: *ownerless real estate, budget revenues of the municipality, accounting for ownerless objects, registration of municipal property for ownerless real estate objects.*

Municipal property includes not only the property of urban and rural settlements, but also finances, which are allocated as a separate component and represent a combination of funds that are generated and used to solve local issues.

Article 50 of the Federal Law of 06.10.2003 № 131-FL "On the General Principles of the Organization of Local Self-Government in the Russian Federation" contains a rather extensive list of property that may be in the municipal ownership of a local government. The local government has the right to acquire real estate in various ways. One of these methods is the acquisition of ownership of ownerless real estate.

Each municipality has abandoned and ownerless real estate objects on its territory, and these are not only buildings and structures, but also objects of social infrastructure (heating networks, electric networks, etc.).

The primary task for local authorities in the field of municipal property management is the identification of such objects and their registration in municipal property. If we talk about objects of engineering infrastructure, then this is also a necessity, since the absence of a proprietor and owner of such objects poses a security risk.

The difficult economic situation that is developing in our country at present is not properly reflected in the revenue side of the budgets of municipalities. Therefore, the high-quality and well-coordinated work of local authorities with objects of ownerless real estate will significantly increase revenues in the revenue of the municipal budget.

If we analyze the regulatory legal acts of local authorities, we conclude that municipalities are intensifying their work on the issue of ownerless real estate and are drawing more and more objects of ownerless property into the economy [1].

However, not everything is going so smoothly in solving the issue of accounting for ownerless real estate. Many municipalities face a lot of problems.

The main problem is the lack of a clearly structured system for obtaining operational information about these objects.

First of all, it becomes known about the property that has low liquidity - metal garages, advertising structures and other facilities, registration of rights to which is carried out in court. When applying to the court, local authorities must provide the individualizing characteristics of these objects, which can only be obtained through a technical inventory. Carrying out a technical inventory requires considerable financial costs, which, as usual, were not provided for by local budgets. The court will also need to prove the owner's refusal of ownership of such objects, or to confirm the fact that the owner could not be established. It is also necessary to conduct a market assessment of the ownerless object in order to establish the value of the object, which will be the price of the claim. And this procedure also requires considerable financial costs.

With regard to ownerless real estate, which is more in demand, the most difficult is the process of identifying such property. Judicial practice shows that local governments either lose their rights to such property or are drawn into lengthy lawsuits with other persons (copyright holders) who are trying to illegally take ownership of immovable property.

All of the above not only does not contribute to the activation of the work of local authorities on registration of rights to ownerless real estate, but also delays it.

Another important problem of registration of ownerless objects is the absence in the current legislation of a specific indication of the obligation to register objects of ownerless property by local authorities.

Let us turn to judicial practice, which is ambiguous in this matter.

The appeal ruling of the judicial board for administrative cases of the Astrakhan Oblast Court of October 28, 2015 in case № 33a-3508/2015 [2] tells us that local authorities are only granted the right to appeal to the court with a statement recognizing the right of municipal property to ownerless property, but not oblige it to make such demands.

But the decision of the Novgorod District Court of June 7, 2012 in the case № 2-1239/2012 and the decision of the Third Arbitration Court of Appeal of December 13, 2012 No. 03AP-4149/0\2012, A69-1089/2012, on the contrary, establish the obligation of the authorities local governments to register and formalize in municipal ownership ownerless real estate located in the territory of these municipalities [3].

The disposition of Article 225 of the Civil Code of the Russian Federation provides the local government only with the right of the municipality to appeal to the court for registration of municipal property for ownerless real estate [4].

Nevertheless, most of the court decisions made allow us to conclude that local governments are nevertheless obliged to formalize municipal property rights to ownerless real estate objects.

Studying the problems of identifying ownerless real estate, we can conclude that the main reasons contributing to the emergence of such a large number of ownerless real estate were:

- under-demarcation of property in 1991-1995, when all procedures were carried out to a minimum;
- regular changes in the norms and rules of registration of property rights;
- reorganization and bankruptcy of collective farms and state farms in 1991-1992, when many housing facilities were to be transferred to the ownership of local authorities, and other real estate was simply deducted from the balance sheet as a non-core infrastructure.

Often, documents for ownerless real estate have not been preserved at all. Typically, such objects are simply fixed on the balance sheet of operating organizations without registration of ownership of them. However, the following problems arise:

- misuse of funds to maintain such networks;
- subject of compensation for losses from the operation of networks;
- decisions of the organization responsible for emergency response at such facilities.

In order to resolve issues that arise with local self-government bodies, in the identification and registration of objects of ownerless real estate, it is necessary in the current legislation:

- to establish the obligation of registration and registration of the right of municipal ownership of objects of ownerless real estate by the local government;

- to simplify the procedure for registration of an ownerless real estate property, emphasizing the reduction of financial costs of local budgets related to registration of such objects;

- to consolidate the responsibility of the local government for inaction in resolving issues of registration of ownerless real estate;

Only when constructing a clear strategy in the work of local authorities in matters of accounting and registration of the right of municipal ownership to ownerless real estate objects, it is possible to increase the revenue of the local budget of the municipality and to adequately solve the problem of combating various negative consequences and emergency situations.

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15-16岁曲棍球运动员心律调节类型不同的心理生理特征
PSYCHOPHYSIOLOGICAL FEATURES OF 15-16 YEAR OLD HOCKEY PLAYERS WITH DIFFERENT TYPES OF HEART RATE REGULATION

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抽象。目的－确定年度训练大周期动态中15-16岁曲棍球运动员HRV的心理生理特征。

工作方法和工作安排：七月，十二月和二月三个阶段检查了15至16岁的优秀曲棍球运动员。通过标准方法评估心率变异性，确定心律调节的类型。我们研究了视觉运动反应的速度和准确性，感觉运动水平和运动的自愿协调性，中枢神经系统（CNS）的功能状态。心理状态由八色Luscher测试确定。这项工作使用了软硬件联合体“ NS-Psychotest”（俄罗斯）。

结果。仅在准备阶段开始时才发现15-16岁曲棍球运动员不同心律调节类型的心理生理状态指标的组间差异。在具有主要的心律调节中心机制（I － II型）的曲棍球运动员中，心理生理状态的特征在于稳定性。在具有自主机制（III-IV型）占主导地位的参与者群体中，皮层神经中枢的兴奋性集中过程得到加强，这有助于提高干扰条件下的响应率。在整个运动训练的宏观周期中，中枢神经系统的功能状态和情绪状态保持稳定。

关键词：心率变异性，心理生理状态，心律调节类型，冰球

Abstract. *Purpose* –determine the psychophysiological characteristics of the HRV of 15-16 year old hockey players in the dynamics of the annual training macrocycle.

Methods and organization of work: Elite hockey players (15-16 years old) were examined in three stages: July, December and February. Heart rate variability was evaluated by standard methods, the type of heart rhythm regulation was determined. We studied the speed and accuracy of visual-motor reactions, the level of sensorimotor and voluntary coordination of movements, the functional state of the central nervous system (CNS). Mental state was determined by the eight-color Luscher test. The software and hardware complex “NS-Psychotest” (Russia) was used in the work.

Results. Intergroup differences in indicators of the psychophysiological status of 15-16 year old hockey players with different types of heart rhythm regulation were revealed only at the beginning of the preparatory period. In the group of hockey players with a predominance of central mechanisms of heart rhythm regulation (type I – II), the psychophysiological status is characterized by stability. In the group of players with the predominance of autonomous mechanisms (type III - IV), the processes of concentration of excitation in the cortical nerve centers are intensified, which contributes to an improvement in the response rate in conditions of interference. The functional state of the central nervous system and emotional state are stable throughout the macro cycle of sports training.

Keywords: *heart rate variability, psychophysiological status, type of heart rhythm regulation, ice hockey*

Introduction

Heart rate variability (HRV) is a generally accepted method for assessing the state of the mechanisms of regulation of the activity of the visceral systems of the human body. [1; 4; 7]. In recent decades, in the literature in assessing HRV indicators and its dynamics, much attention has been paid to the typological approach. According to the results of many years of research, in the scientific school of N.I. Shlyk (2009-2019) identifies four types of regulation of the heart rhythm, which have the features of predicting the success of adaptation to physical activity [10].

In addition to the state of regulation of visceral systems, the successful functioning of functional systems of organization of movements of 15-16 year old hockey players is largely determined by their psychophysiological status [6; 11]. The formation and variability of motor skills (technical and tactical actions) ensures the plasticity of the nervous system. The speed, coordination of muscle work, strength and speed-strength abilities at the level of the central nervous system are determined by the threshold of excitation, lability and mobility of the nerve centers, the degree of balance of the nervous processes. An increase in the influences of disturbing environmental effects, including factors of a psychogenic nature, can lead to discoordination in the work of higher structural and functional levels of organization of movements. Early sports specialization, an increase in the number of competitive games, and increased team competition [3] at the age of 15-16 increase the psychogenic load and can contribute to the development of emotional stress. Based on the unity of neuro-humoral connections in the body, apparently, there should be features of the dynamics of psychophysiological indicators in 15-16 year old hockey players with different types of regulation.

Purpose – determine the psychophysiological characteristics of the HRV of 15-16 year old hockey players in the dynamics of the annual training macrocycle.

Research Methods and Organization

The study was carried out on the basis of a specialized school of the Olympic reserve in ice hockey (SSOR "Tractor"). Hockey players aged 15-16 years participated in the work (Role: forwards, defenders). The organization of work was carried out in three stages: July - the beginning of the preparatory period for preparation (n = 36), December - the middle of the competitive period (n = 19), February - the end of the competitive period in which preparation for the Final of the Russian Championship was organized (n = 34). The work observed the principles of the Helsinki Declaration.

The study of the psychophysiological characteristics of elite hockey players was carried out using the hardware and software complex “NS-Psychotest” (Russia, Neurosoft). The functional state of the central nervous system (CNS) was determined by the criteria of T.D. Loskutova [8], sensorimotor integration - in terms of time and accuracy according to the Whipple coefficient (WC) of various types of visual-motor reactions: simple visual-motor reaction (SVMR), selection reaction (SR), reaction to a moving object (RMO) and reactions under interference [8]. The level of sensorimotor and voluntary coordination of movements was calculated by the ratio of tremorometry parameters [8]. The mental state of hockey players was assessed using the eight-color Luscher test [8]. Based on the results of the choice of colors, the following indicators were calculated: “Total deviation from the autogenous norm” and “Alarm”.

The study of heart rate variability was carried out in compliance with international standards for electrocardiographic studies to assess HRV in a short ECG recording [5]. The background recording of the electrocardiogram (ECG) was carried out using the “VNS-MICRO” software and hardware complex (“Neurosoft”, Russia). HRV analysis was performed using recognized methods [2; 4; 5; 9]. The express method of determining the type of regulation Shlyk N.I. was applied. [10] in modification taking into account the research of R.M. Baevsky [2]. According to the classification (N.I. Shlyk, 2009), there are two types with centralization in the regulation of heart rhythm (type I - moderately pronounced centralization and type II - significantly pronounced centralization) and two types with autonomization (type III - moderately pronounced autonomization and (IV type - significantly expressed autonomy), which have specific characteristics of HRV indicators.In the work, all hockey players were united by regulation types into two groups: I – II type and III – IV type.

Statistical processing of the results of the study was carried out using the Mann-Whitney test in the Statistica 10.0 program.

Research results and discussion

Intergroup differences in psychophysiological indicators for different types of regulation of heart rate variability were recorded only at the beginning of the

training process (July) for only two indicators. Firstly, by the number of "RMO (delayed)" (I - II type: 19.60±2.60%; III - IV type: 11.93±1.50%; p = 0.022) For hockey players of the I - II type of regulation, the processes of inhibition are more pronounced when predicting the trajectory of movements of a significant stimulus due to an increase in the refractory period in cortical neurons. Most of the delayed reactions among hockey players of the I – II type of regulation, apparently, are characteristic only for the teenage period of development, including 15-16 years of age, since according to the literature for more older players - 17-21 years (type I – II), the number of delayed reactions is minimized [11]. Secondly, typological features include differences in criteria of the CNS functional state (SVMR). According to the results of the study, hockey players of the I – II type of regulation relative to the athletes of the III – IV type in July according to all the criteria of T.D. Patchwork, defined in simple conditions of activity - SVMR, hockey players of I - II type are worse in level relative to players of III - IV type. The functional level of the system (FLS SVMR) is 3.65 ± 0.56 cu (I - II type), 4.62±0.16 cu (III - IV type), p = 0.016; reaction stability (RS SVMR) - 1.36 ± 0.27.e. (I - II type), 2.05±0.12 cu (III - IV type), p = 0.014; level of functional capability (LFC SVMR) - 2.71 ± 0.45 cu (I - II type), 3.66 ± 0.16 c.u. (III - IV type), p = 0.019. An interesting fact is that there are no differences in the values of "FLS", "RS" and "LFC" under conditions of interference and indicators of the emotional state of players of type I – II regulation relative to hockey players of type III – IV with simultaneously reduced indicators of the functional state of CNS cortical centers (in simple operating conditions). Apparently, a specific feature of cortical nerve centers in players with a predominance of centralization processes (type I – II) in the work of the ANS is a high mobilization activity of the cortical nerve centers in response to significant stimuli and a high degree of resistance to the development of protective inhibition with the simultaneous action of various exogenous irritants. In the competitive training period - December and February, all intergroup differences in psychophysiological indicators are leveled.

During the period July-February, hockey players of the I – II type of heart rhythm regulation did not have intra-group differences in all psychophysiological indicators. Stability was characteristic both for indicators of sensorimotor integration (time and accuracy of simple and complex visual-motor reactions), and coordination of movements. All psychophysiological indicators of the functional state, including emotional, during the preparatory and competitive periods of preparation (July-February) also did not change. Unlike hockey players of the I – II type of regulation, hockey players of the III – IV type in the dynamics of the process of sports training revealed statistically significant changes in some intragroup psychophysiological indicators (Table 1-2). Relative to July-December to February, the values of the time of a simple visual-motor reaction and selection reactions increase (Table 1).

Table 1 - *Dynamics of speed indicators and accuracy of hand-eye reactions of hockey players of 15-16 years old with the predominance of autonomous mechanisms of heart rhythm regulation (III - IV type)*

Indicator	July M±m; σ n=32	December M±m; σ n=22	February M±m; σ n=25	p
SVMR (reaction time), ms	197,75±2,91 16,49	192,71±4,16 15,55	203,67±3,47 17,01	p_1=0,303 p_2=0,266 p_3=0,050
SVMR (WC), cu	0,94±0,01 0,07	0,95±0,01 0,04	0,96±0,01 0,03	p_1=1,000 p_2=0,281 p_3=0,330
SR (reaction time), ms	293,00±14,01 39,62	297,50±4,21 14,59	319,04±7,02 34,38	p_1=0,330 p_2=0,063 p_3=0,032
SR (WC), cu	0,89±0,02 0,07	0,90±0,02 0,03	0,91±0,01 0,06	p_1=0,769 p_2=0,357 p_3=0,260
Interference immunity (reaction time), ms	321,48±3,89 21,63	314,21±3,82 14,30	308,54±4,29 21,03	p_1=0,325 p_2=0,050 p_3=0,445
Interference immunity (WC), cu	0,93±0,01 0,04	0,88±0,07 0,25	0,96±0,01 0,05	p_1=0,762 p_2=0,023 p_3=0,152
RMO, ms	-1,71±1,32 7,24	-0,50±1,65 6,18	-1,13±1,07 5,26	p_1=0,606 p_2=0,829 p_3=0,800
RMO (amount of precise reactions), %	56,68±2,14 11,70	53,07±2,55 9,56	51,04±3,82 18,71	p_1=0,288 p_2=0,364 p_3=0,964
RMO (amount of leading reactions), %	31,40±2,11 11,57	31,21±3,16 11,83	34,29±4,30 21,05	p_1=0,813 p_2=0,789 p_3=0,988
RMO (amount of delayed reactions), %	11,93±1,50 8,23	15,64±2,09 7,82	14,71±2,48 12,16	p_1=0,164 p_2=0,586 p_3=0,345

p_1- statistical significance between indicators “july”-“december”; p_2- statistical significance between indicators “july”-“february”; p_3- statistical significance between the indicators "december"-"february"

Table 2 - *Dynamics of indicators of the functional state of CNS hockey players of 15-16 years old with a predominance of autonomous mechanisms of heart rhythm regulation (type III - IV)*

Indicator	July M±m; σ n=32	December M±m; σ n=22	February M±m; σ n=25	p
FLS (SVMR), s^{-2}	4,62±0,16 0,91	4,59±0,36 1,36	4,63±0,21 1,02	p_1=0,375 p_2=0,495 p_3=0,622
RS (SVMR), s^{-1}	2,05±0,12 0,65	2,20±0,21 0,79	2,11±0,12 0,59	p_1=0,388 p_2=0,675 p_3=0,580
LFC (SVMR), s^{-2}	3,66±0,16 0,88	3,76±0,32 1,20	3,70±0,18 0,89	p_1=0,388 p_2=0,724 p_3=0,580
FLS (interference),s^{-2}	3,23±0,40 2,20	3,38±0,51 1,90	3,43±0,38 1,85	p_1=0,696 p_2=0,635 p_3=0,964
RS (interference),s^{-1}	1,55±0,21 1,14	1,37±0,25 0,93	1,43±0,18 0,86	p_1=0,489 p_2=0,394 p_3=0,917
LFC (interference),s^{-2}	2,41±0,30 1,66	2,31±0,37 1,39	2,38±0,27 1,33	p_1=0,552 p_2=0,414 p_3=0,940
Excitation concentration, %	38,26±0,95 5,30	38,52±2,10 4,20	35,39±2,02 9,88	p_1=0,919 p_2=0,025 p_3=0,026

p_1- statistical significance between indicators “july”-“december”;
p_2- statistical significance between indicators “july”-“february”;
p_3- statistical significance between the indicators "december"-"february";

From December to February, the level of concentration of excitation increases, but despite this, in the cerebral cortex, the tendency to irradiation of excitation processes continues.

Conclusion

Thus, in July, hockey players aged 15-16 have intergroup differences in terms of psychophysiological status, due to the type of regulation of the heart rhythm, which are completely leveled for the competitive training period. However, there are intra-group differences. The predominance of central mechanisms in the regulation of heart rhythm (type I - II) is accompanied by the stability of indicators of psychophysiological status throughout the entire competitive training period, while the predominance of autonomous mechanisms is reduced by the response time in the face of interference against the background of an increase in the time

of a simple visual-motor reaction and choice reaction. There are no typological differences between hockey players in terms of CNS functional status and emotional state. However, it should be noted that the shift in the ratio of "irradiation of excitation processes to concentration of excitation processes" in the direction of increasing concentration, which contributes to an improvement in the response rate in conditions of interference.

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甲基乙烯乙基甲醇合成氨基酚胺的新衍生物

SYNTHESIS OF A NEW DERIVATIVE OF AMINOCOLCHAMINE WITH METHYLETHYLENETHYLCARBINOL

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抽象。　提出了一种用甲基乙烯乙基甲醇合成氨基酚胺的新衍生物的方法，并通过薄层和纸色谱法在4-（氨基酚氨基N / 1,1-甲基乙基丁丁-2）甲醇上鉴定了合成的化合物。　红外光谱和PMR光谱数据证实了合成的秋水仙碱衍生物的结构。根据获得的IR光谱数据，发现合成的物质与起始化合物的酯和羰基不同。

关键词：氨基酚胺，炔丙基，甲基乙基乙炔基甲醇，4-（氨基酚氨基N / 1,1-甲基乙基丁二-2）甲醇。

Abstract. *A method is proposed for the synthesis of a new derivative of aminocolchamine with methylethylenethylcarbinol and the synthesized compound is identified on 4- (aminocolchamino N / 1,1-methylethylbutin-2) carbinol by thin-layer and paper chromatography. The structures of the synthesized colchamine derivative are confirmed by the data of IR and PMR spectra. Based on the obtained data of IR spectra, it was found that the synthesized substance differs from the starting compounds from the ester and carbonyl groups.*

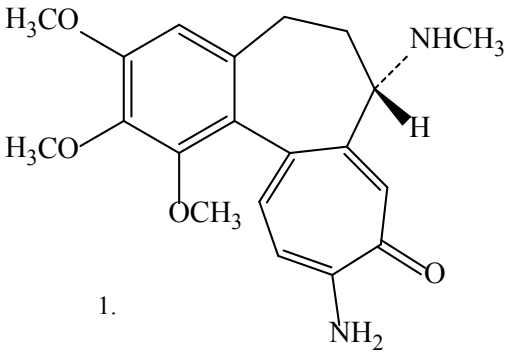
Keywords: *aminocolchamine, propargyl, methylethylethynylcarbinol, 4- (aminocolchamino N / 1,1-methylethylbutin-2) carbinol.*

Colchamine is one of the alkaloids isolated from the corms of the Colchicum marius (Colchicum SpeciosumStev.), Fam. Liliaceae (Liliaceae). The second alkaloid contained in these corms is colchamine (Colchicinum). Both alkaloids have similar pharmacological properties, while colchamine is less toxic (7-8 times). Both drugs have anti-mitotic (anti-cell division) activity, have a karyoclastic (anti-cell division) effect, and inhibit leuko- and lymphopoiesis (the formation of white blood cells and lymphocytes).

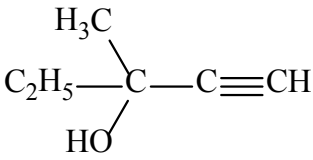
Among the numerous chemical compounds with antitumor activity, much attention is paid to tropolonlilium alkaloids. In order to find less toxic compounds in this series, a large number of derivatives of colchicine and colchamine were synthesized.

It is known that the introduction of acetylene bond groups into the drug molecule significantly reduces their toxicity. Due to the fact that such work in the field of colchicine alkaloids has not previously been carried out, we synthesized derivatives of aminocolchamine (1) with methylethylethynylcarbinol (2) [1].

Starting compounds for the synthesis of acetylene derivatives of aminocolchamine.



1.



2.

The condensation reaction of aminocolchamine with acetylene compounds was carried out according to Mannich [2], in equimolecular ratios of the reagents:

The main starting compound, colchamine (1), was synthesized from the Colchicum luteum baker in the Surkhandarinsky region for the syntheses.

As a result, we synthesized; 4- (aminocolchamino N / 1,1-methylethylbutin-2) carbinol (3) [3].

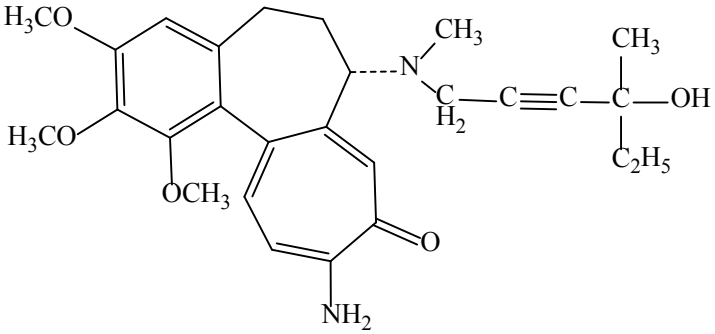
The compounds obtained are light yellow powders with R_f values close to each other. At the same time, they differ greatly in chromatographic mobility from the original aminocolchamine, having a high R_f value.

A characteristic feature of all acetylene derivatives is the presence of a two-proton doublet from the bridging N-CH_2 group in their NMR spectra, which appears in the region of 3.32-3.38 ppm. The bridge OCH_3 group present in compounds 4-5 forms a narrow two-proton doublet in the region of 4.53-4.70 ppm.

The structures of the synthesized compounds are confirmed by the data of IR and PMR spectra. The IR spectra of compounds with an ester moiety (3-4) show absorption bands of the carbonyl group (1735-1730 cm^1).

The colchamin fragments of the synthesized compounds in the 1H-NMR spectra do not differ significantly: the signals of the N-methyl group appear at 2.20-2.22 ppm, the methoxy groups at 3.56-3.60 (at C-1) and 3.82 -3.85 ppm (at C-2, C-3 C-10), proton H-4 - at 6.44-6.51 ppm, H-8 - 7.90-7.96 ppm, H- 11 - 6.68-6.75 ppm. and H-12 - 7.17-7.22 ppm.

Synthesized Acetylene Derivatives



The experimental part. Acetylene alcohols and amino alcohols and their various derivatives exhibit biological and pharmacological activity [4,5].

The individuality and authenticity of the substances was controlled by PC and TLC methods.

a) Derivatives of aminocolchamine with methylethylethynylcarbinol. A portion of 1.0 g of aminocolchamine was dissolved in 17 ml of dried and freshly distilled dioxane, and 0.12 g of paraform, 0.01 g of hydroquinone and 0.03 g of copper monochloride were added to the solution. After adding another equimolecular amount of methylethylethynylcarbinol to the solution, the contents of the flask were mixed well. Reaction conditions table 1.

Table 1.

Reaction conditions of methylethylethynylcarbinol with colchamine

№	Reagent	Estimatedamountofreagent	Reagenttaken	Productyield (%)
1.	Aminocolchamine	0,74	1,0	91

The reaction mixture was heated in a glycerin bath under reflux at 70-90°C for 4-6 hours. The end of the reaction was determined by thin layer chromatography of the reaction mixture.

After the practical completion of the reaction, insoluble in dioxane substances were separated by filtration and the solvent (dioxane) was distilled off on a rotary unit. The residue was dissolved in 20-30 ml of chloroform, the resulting very dark chloroform solution was extracted three times with 20 ml of 5% acetic acid.

The acetic acid extract contains unreacted aminocolchamine, which was isolated by alkalizing the acidic solution with ammonia and extracting it with chloroform.

The chloroform solution of the reaction product, after separation of the starting aminocolchamine, was dried over anhydrous sodium sulfate, the sulfate was filtered off and the filtrate was passed through a small layer (5-7 g) of aluminum oxide. In this case, the dark extract is greatly clarified. The solvent was distilled off and the reaction product was dried in a vacuum desiccator.

The final reaction products are obtained as non-crystalline light yellow powders.

4- (aminocolchamino N / 1,1-methylethylbutin-2) carbinol (3).

IR spectrum: 1120, 1170, 1720, 2570, 2950, 3410, 3540 cm^{-1}.

NMR spectrum: 1.26; 1.45; 1.49 (CH_3CH_2), 1.98 (CH_3), 2.16 (N-CH_3), 3.58; 3.85 x2, 3.88 (3H x 4, ss, 4OCH_3), 5.16 (OH), 6.48 (H-$_4$), 6.94 (H-11), 7.24 (H-12 and H-8) ppm.

Findings.

1. Synthesized new derivatives of aminocolchamine with methylethylenethylcarbinol.

2. The synthesized compounds are confirmed by PMR and IR spectral data.

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丙烯酸炔丙酯合成秋水仙碱和氨基链香素的新衍生物

SYNTHESIS OF NEW DERIVATIVES OF COLCHAMINE AND AMINOCOLHAMIN WITH PROPARGYL ESTER OF ACRYLIC ACID

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抽象。 合成丙烯酸的丙烯酸4-（kolhaminoN-butyn-2-yl）羊酸酯和丙烯酸的丙烯酸4-（氨基colhamino-N-butin-2-yl）羊酸酯。 通过IR和PMR数据证实了合成化合物的结构。

关键字：Kolhamin，氨基colhamine，炔丙基，丙烯酸。

Abstract. *Synthesized 4- (kolhaminoN-butyn-2-yl) ovine esters of acrylic acid and 4- (aminocolhamino-N-butin-2-yl) ovine esters of acrylic acid. The structures of the synthesized compounds were confirmed by IR and PMR data.*

Keywords: *Kolhamin, aminocolhamine, propargyl, acrylic acid.*

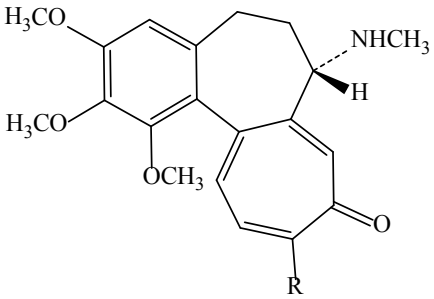
Introduction

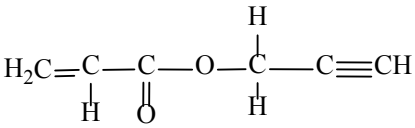
Recently, propargyl ethers have attracted attention due to a wide range of beneficial properties (propargyl ethers exhibit biological activity, contribute to the inhibition of corrosion and promote the flotation of rare metals, increase the energy intensity of complex rocket fuels). However, until now there are practically no generalized reviews in the literature on the methods of synthesis, physical, chemical, and applied properties of this class of heteroatomic acetylenes [1].

Among the numerous chemical compounds with antitumor activity, much attention is paid to tropolone alkaloids of lilac acids. In order to find less toxic compounds in this series, a large number of colchicine and colchamine derivatives have been synthesized.

It is known that the introduction into the molecule of drugs of groups containing the acetylene bond, significantly reduces their toxicity. Due to the fact that such work in the field of colchicine alkaloids has not previously been carried out, we synthesized colchamine derivatives with acrylic acid propargyl ester (3) [2].

The starting compounds for the synthesis of derivative acetylenickolhamina (1) and aminokolhamina (2):





3.

1.R=OCH_3
2.R=NH_2

The condensation reaction of colchamine with acetylene compounds was carried out according to Mannich [3], in equimolecular ratios of the reactants:

The main starting compound, Kolhamin (1), for the syntheses carried out, was isolated from the Colchicum luteum baker growing in the Surkhandarin region.

Materials and methods

a) Derivatives, kolhamina esters of organic acids. A portion of 1.0 g of colchamine was dissolved in 17 ml of dried and freshly distilled dioxane, and 0.12 g of para-form, 0.01 g of hydroquinone and 0.03 g of copper monochloride were added to the solution. After that, adding an equimolar amount of acrylic acid propargyl ester to the solution, the contents of the flask were mixed well.

b) Derivatives of aminocolchaminos esters of organic acids. A weighed portion of 1.0 g of aminocolhamin was dissolved in 17 ml of dried and freshly distilled dioxane, and 0.12 g of para-form, 0.01 g of hydroquinone and 0.03 g of copper monochloride were added to the solution. After that, adding an equimolar amount of acrylic acid propargyl ester to the solution, the contents of the flask were mixed well.

Table 1.

Reaction conditions of acrylic acid propargyl ester with kolhamin and aminokolhamin

№	Reagent	Estimatedamountofreagent	The amount of reagent taken	Productyield (%)
1.	Kolhamin	0,33	0,50	72
2.	Aminocolhamine	0,35	0,51	78

The reaction mixture was heated on a glycerin bath under reflux at 70-90 ° for 4-6 hours. The end of the reaction was determined by thin-layer chromatography of the reaction mixture.

After the practical completion of the reaction, insoluble substances in dioxane were separated by filtration and the solvent (dioxane) was distilled off on a rotary unit. The residue was dissolved in 20-30 ml of chloroform, the very dark chloroform solution obtained was extracted three times with 20 ml of 5% acetic acid.

The acetic extract contains unreacted kolhamin, which is isolated by alkalizing an acidic solution with ammonia and extraction with chloroform.

The chloroform solution of the reaction product, after separating the starting colchamine, was dried over anhydrous sodium sulfate, the sulfate was filtered, and the filtrate was passed through a small layer (5-7 g) of alumina. At the same time, the dark extract is strongly clarified. The solvent was distilled off and the reaction product was dried in a vacuum desiccator.

The final reaction products are obtained in the form of non-crystalline light yellow powders.

Results and discussion

As a result, we synthesized; 4- (kolhamino N-butin-2-yl) acrylic esters of acrylic (4) aminocholamine-4- (aminocholamino-N-butyn-2-yl) acrylic esters of acrylic (5) (Table 2) [4].

During the hydrolysis of esters 4, 4- (colchamino-n-butin-2-yl) alcohol 6 is formed.

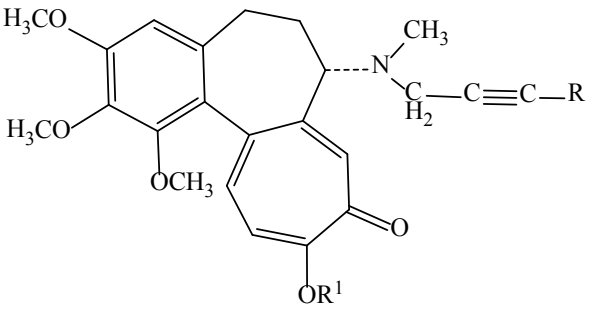
The compounds obtained are light yellow colored powders, about close to each other values of R_f. At the same time, by chromatographic mobility they are very different from the original collamide and aminocolhamin, having high R_f values.

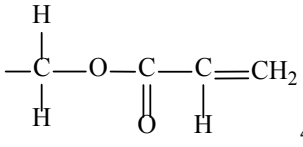
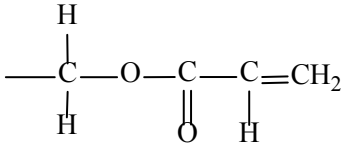
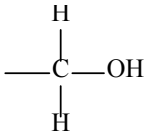
The structures of the synthesized compounds were confirmed by IR and PMR data. In the IR spectra of compounds with an ester group (3-4), absorption bands of the carbonyl group (1735-1730 cm^{-1}) appear.

The Kolchamin and Aminocolchamin Fragments of the synthesized compounds do not differ significantly in the PMR spectra: the signals of the N-methyl group appear at 2.20-2.22 ppm of methoxyl groups - 3.56-3.60 (at C-1) and 3 , 82-3.85 ppm (at C-2, C-3 C-10), proton H-4 - at 6.44-6.51 ppm, H-8 - 7.90-7.96 ppm, H- 11 - 6.68-6.75 ppm and H-12, 7.17-7.22 ppm.

Table 2.

Synthesized acetylenic derivatives



R	R^1
 4.	OCH_3
 5.	NH_2
 6.	OCH_3

Characteristic of all acetylenic derivatives is the presence in their PMR spectra of a two-proton doublet from the bridging N-CH_2 group, which manifests itself in the region of 3.32-3.38 ppm. The bridge OCH_3 group present in compounds 4–5 forms a narrow two-proton doublet in the region of 4.53–4.70 ppm.

The signals of C-alkyl groups appear in the strongest spectral field (1.4-2.0 ppm) and are easily decoded. Olefinic protons of acrylic esters resonate at 5.98 ppm. (cis-) and 3.48 ppm (trans-protons). The most complex spectra of colchamine and aminocolchamin with propargyl ester are acrylic acid propargyl ester, in which the signals of the protons of two benzene rings overlap.

4- (colchamino N-butyn-2-yl) acrylic ester esters (4).

IR spectrum: 1090, 1250, 1480, 1570, 1590, 1655, 1730, 2225, 2800, 2840, 2935, 2950, 3500 cm^{-1}.

^{1}H NMR spectrum: 2.20 (3H, s, N-CH_3), 3.34 (N-CH_2), 3.58 (3H.s., -OCH_3), 3.82; 3.84; 3.85 (3H x 3, ss, 3OCH_3), 4.70 (OCH_2), 6.48 (H-4), 7.38-7.56 (H-4, H- 11, $H_{\beta, \beta, \gamma}$, phenyl radical), 7.80-8.00 (H-8, H-12, Hα, α-phenyl radical), 8.16 (methane proton, hemanal to cyan group) ppm.

Due to the alkyl (and not acyl) nature of the substituents introduced into the amino group, the derivatives obtained retain to some extent basicity (especially with the pyridine ring), which makes it difficult to separate the colchamine impurity from the reaction products. Therefore, for this purpose, the method of chromatography on alumina (eluents mixture of ether-acetone, acetone and acetone-methanol) was used.

4- (aminocolchamino-N-butyn-2-yl) acrylic acid esters (5).

IR spectrum: 1100, 1170, 1720, 2570, 2950, 3400, 3540 cm^{-1}.

HMR spectrum: 1.26; 1.45; 1.49 (CH_3CH_2), 2.16 (N-CH_3), 3.58; 3.85 x 2, 3.88 (3H x 4, ss, 4 OCH_3), 5.16 (OH), 6.48 (H-4), 6.94 (H-11), 7.24 (H –I 2 and H-8) ppm

Conclusion.

1. Synthesized derivatives of kolhamine and aminocolhamin with propargyl ester of acrylic acid.

2. The structures of the synthesized compounds were confirmed by IR and PMR spectra.

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Transbaikalia的Gusinoozerskaya仓库的Selenga套件岩性的新数据
NEW DATA ON THE LITHOLOGY OF THE SELENGA SUITE OF THE GUSINOOZERSKAYA DEPOT OF TRANSBAIKALIA

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Batueva Anna Alexandrovna
Engineer of the Geological Institute of the SB RAS, Ulan-Ude

抽象。 介绍了有关Gusinoozersky凹陷Selenga套件岩性的新数据。 首次在这里识别出陆源性沉积物的巨大而巨大的倾斜分层，特征，确定了各种类型的喀屯和结节，确定了形成条件，比较了Gusinoozersky凹陷和Osha凹陷的Katunos地层，以及 制作了蒙古东部戈壁的Khara-Khutul山。 指示了白垩纪岩石的深度侵蚀，磨损和再沉积的迹象。 在河流和洪水（洪水）条件下的沉积率极高。 结论是，第三纪期间，东特贝卡卡利亚，蒙古的戈壁沙漠以及其他地方发生了水灾。

关键词：Selenga套件，白垩纪沉积，大斜层，Katuns，结核，水灾。

Abstract. *New data on the lithology of the Selenga suite of the Gusinoozersky Depression are presented. The large and gigantic oblique stratification of terrigenous sediments, various types of katuns and nodules identified here for the first time were characterized, the conditions for their formation were determined, comparisons of the Katunos strata of the Gusinoozersky Depression and the Osha Depression, as well as the Khara-Khutul Mountain in East Gobi in Mongolia were made. Signs of deep erosion, galling and redeposition of Cretaceous rocks are indicated. Extremely high sedimentation rates in river and flood (flood) conditions. It is concluded that a water disaster occurred during the Tertiary time in East Transbaikalia, in the Gobi Desert in Mongolia and possibly in other places.*

Keywords: *Selenga suite, Cretaceous deposits, large oblique stratification, Katuns, nodules, water disaster.*

The lithology of the Selenga suite, as well as the entire Gusinoozersky series in the Selenginsky Depression (Western Transbaikalia), has been studied quite fully in connection with its coal content and is described in detail in the fundamental work of Skoblo, Lyamina et al. (Skoblo et al., 2001). This article describes some exotic lithological formations of the Selenga suite, which, in our opinion, are extremely important for understanding the conditions for the formation of deposits

not only of the Selenga suite, but also of the entire Gusinoozersky series as a whole. We are talking about the so-called lithological nodules in terrigenous sediments of the suite and the series as a whole. Among them, we identified the actual nodules, various katuns and coprolites of dinosaurs. Various types of nodules in the composition of the goose-ozersky series of suites are indicated and briefly described in the works of Skoblo, Lyamina, Butova and other paleontologists (Skoblo et al., 2001). The dinosaur coprolites that we first found in Russia and the new finds and collections of dinosaur bones on Goose Lake were characterized and published in 2018 (Roshchektayev, Batueva, 2018) and are not given here. This work is mainly devoted to the katuns identified for the first time. Their characteristic is given below.

Katuns were found in the summer of 2019 on the southeastern shore of Lake Gusinoy near the village of Khayany and traced in the lower part of the coastal cliffs from the village of Naberezhny to the Holboginsky coal mine for 6 km. In geological terms, they are confined to the lower sub-formation of the Selenginsky suite (see the Geological map of the Selenginsky series of V.V.Koshkin, 2018, preliminary version).

Fig. 1. *Exposure of brownish-gray sandstones near the village of Khayany at the very bottom of the cliff in the lower part of the section of the Selenga suite (1). Here they are overlapped by fading gray-yellow sandstones of this suite (2), in which brownish-gray sandstones are located (see Fig. 1-3)*

At this place, a layer of brownish-gray, coarse-grained, oblique, gravelly sandstones with an incomplete thickness of 3-5 m is fragmentarily exposed. In color, composition, granularity and oblique stratification, they are similar to sandstones, exposed on the opposite shore of the lake and composing the lower brownish-brown sandy member of the Selenga Formation (Fig. 2). In the village of Khayany, upstream of the formation, they are replaced by fawn, light gray, fine-grained, sometimes gravel, polymictic sandstones with katuns. The power of the Katunos pack is 50-60m. The rocks are oblique with a thickness of intersecting oblique series from 0.3 to 1.5 m, and oblique bundles up to 5.0 m. The thickness of the advanced layers reaches 20 cm (Fig. 15). The slope angles are gentle - up to 20°, the puffs flatten to the bottom, ending with s-shaped waves, under which only degraded sandstones are visible to the lower boundary of the oblique series.

Fig. 2. *Intersecting oblique stratification in brownish-gray sandstones of the lower member of the Selenginsky suite on the northwestern shore of Lake Goose.*

Fig. 3. *Large and gigantic oblique stratification in fawn sandstones of the Selenginsky suite near the village of Khayany, holes from the fallen katuns are visible*

Fig. 4. *The oblique layering of the Selenga suite with very gentle, concave advanced layers (10-20°) and loss of layering in the bottom part of the oblique series (3). Where are 1-2-stratified series*

Fig. 5. *The oblique series of the Ubukun suite, underlying and replacing the Selengin suite, the advanced puffs are flattened to the bottom and acquire an S-shaped undulation (explanation in the text)*

This is a large and gigantic oblique stratification, with limiting sedimentation rates of water flow, characteristic of catastrophic floods.

With a large number of Katuns, the thickness of yellow sandstones enclosing them acquires a very remarkable, peculiar honeycomb texture (Fig. 6). The weathering forms of such rocks, due to katuns falling out of them, have bizarre outlines similar to the faces of animals or even people. This feature turned out to be quite stable not only in the area of Goose Lake, but also far beyond its borders, for example, in the Gobi Desert. In 1956, I.A. Efremov drew attention to this, studying the Lower Cretaceous deposits of Mongolia in the Osh basin, although he singled out katunas

as nodules. Here is his description: “At the foot of the cliffs there is a striking chaos of stone - nodules of dark brown sandstone. Balls, wheels, shafts, sausages, pipes, some ham - everything dark and dead lay on low mounds. Above the stone was becoming lighter - red, yellow, light gray. Its outlines on steep walls and ledges took the form of a living: scary faces, birds, animals looked frowning from a height ... at the eastern end of the Central outlier stood two four-meter stone idols ... The human resemblance of these weathering figures was simply amazing ... Below the canyons of the Central outlier, less steep ravines branched separated by wide and flat spaces.

Fig. 6. *Honeycomb textures in fawn gray sandstones. Bizarre forms of rocks with nests (honeycombs) from falling Katuns and various "faces" casts of Katun textures, prepared by weathering (explanation in the text)*

The surface of these small plateaus, as well as the bottom of the gorges, was littered with regular balls of dark sandstone the size of an average human head. The blackened balls from the deserted tan looked amazingly like cannonballs, and the terrain looked like an unusually fierce battlefield ”(Efremov, 2019, P. 403-404, see also Fig. 7.8).

The above description is very similar to the exposure of the Selengin suite near the village of Hayany. The same change of deposits from darker at the bottom to lighter at the top. A large number of brown katuns of brownish-gray sandstone at the foot of the cliffs that fell out of the lighter layer of sandstones, which because of this acquired a honeycomb texture of rocks with bizarre outlines of the outliers. This similarity of coeval Cretaceous formations cannot be accidental and speaks of the very large scale of the event at which they formed (see more on this below).

Forms of katuns, conditions of their occurrence and formation. Katuns in the Selengin suite are found only in light yellow sandstones. In the underlying - brown, brownish-gray they were not observed. In Mongolia, katuns are also noted only in the upper light (red, yellow, light gray) sandstones and in the underlying - brown ones are not indicated. They are composed exclusively of brownish-gray (or brown, as in Osh) sandstones from the underlying layers. These Katuns in the form of irregular balls, with sizes from several cm to 0.5 m., Are often observed in a row along the layers containing their yellow sandstones (Fig. 7), or randomly scattered in them (Fig. 8), indicate a deep erosion of the thickness of brownish-gray sandstones and the formation of katuns from them (see below).

Fig. 7. *Katuns (1) - of reddish-gray sandstones, laid out in a row along a layer of fawn-gray sandstones (2).*

Fig. 8. *Katuns scattered throughout the thickness of yellow sandstones*

In total, we distinguished three types of katuns: 1 - rounded fragments of rocks and fragments of layers, 2 - rounded nodules and 3-actually katuns or real katuns.

1. Katuns of the first type – rounded fragments of rocks and large fragments of layered strata (Fig. 9-12). They are represented by poorly rounded balls, angular "pillows", dumbbell-shaped and layered bodies, irregular inherited forms. Their distinctive feature is the preserved primary layering of the rocks from which they were formed. A large number of them are observed near the village of Khayany, where they are adjacent to other forms of katuns, occupying the boundary part of the section between the upper stratum of fawn sandstones and brownish-gray sandstones underlying it and gravelly sandstones of the lower part of the Selenga suite. At this point, all the stages of initial rolling (golting) of the layers, separation of the layer fragments from the parent rocks, their transformation into katuns, their pulling and burial throughout the overlying thickness of yellow sandstones are observed (Fig. 7-8). A few meters above this contact, in the thickness of yellow sandstones, well-rounded brownish-gray sandstones are noted.

Fig. 9. *The initial stage of rolling the layers, turning the protruding parts and their partial separation from the adjacent layer. 1 - light gray (fawn) sandstones, 2 - brownish-gray sandstones partially separated from the upper layer of the same sandstones (3).*

Fig. 10. *The final stage of rolling (golting) is the separation and isolation of the layer section and its transformation into a katun (1), 3-containing light gray (fawn) sandstones*

Fig. 11. *Katuns of complex shape formed from layered rocks: 1 - a layer of siltstones, 2 - a layer of coarse-grained sandstones*

Fig. 12. *Katun irregular, inherited form in yellow sandstone*

Among this group of katuns, remarkable formations were found, similar to wicker buns from dough (Fig. 11) or intertwining "sausages". However, these "sausages", although rounded, like a paste squeezed out of a tube, have their own parallel layering that does not obey the curves of "sausages". It turns out that the layered stratum or, more precisely, a fragment of this stratum was turned into a sand-gravel mixture. At the same time, softer and more flexible rocks are turned more than harder and form depressions in the rocks. In these Katuns, no traces of their separation from the mother layer were preserved. They are smoothly rounded on all sides. This suggests that the pieces of rock were in suspension, as when golling in a drum. They rotated, rubbed against each other, grinded with sand and rounded off taking into account the physical condition of the fragments and their composition.

Unlike a drum golotovka, where water and sand spin in a confined space, in a flood stream, water flows in the same general direction along the bottom or along the surface of the earth. Golotovka occurs during turbulent movement of a hydroplastic material with rolling of the katuns and the formation of oblique series of host deposits. As already mentioned, the shape of such katuns is round spherical, gross with biconical endings and, often, irregular with a sharpened inherited initial shape (Fig. 9,12).

Another variety of this group of katuns - large, scattered fragments of layers of brownish-gray sandstones found 1 km north-west of the village of Khayany. Here, in the thickness of fawn sandstones, katuns reach a width of 1.5-2.0 m. and in length 3.0 - 5.0 m. (Fig. 13,) with a layer thickness of 0.5 - 0.7 m., and Fig. 14 shows a ribbon-like fragment of a layer of brownish-gray sandstones with a width of about 10 m. and more than 30 m long, divided into transverse shafts sticking out of the rock, like splayed fingers. The fact that these are katuns, and not layers lying in place, is evidenced by their roundness from all sides - from above, from below

and from the sides (Fig. 13, (2-3), both on the open surface and on the closed under destroyed host rocks.This indicates that the fragments of the layers were isolated by dipping and rounded in sand and gravel water flows in a suspended and mobile state.This, by the way, prevents us from attributing the observed forms to weathering processes only, they are all inherited, i.e. primary forms in these strata.

Fig. 13. *Large fragments of layers of gray and brownish-gray coarse-grained gravelly sandstones (2) in the thickness of fawn-gray oblique sandstones (1). It is clearly seen that a fragment of the layer of gray sandstones is rounded not only from above, but also from below (3). The sole is tuberous, the same as its roof*

Fig. 14 - *large is visible - more than 30m. a fragment of a layer of buty-gray sandstones, apparently also torn off and moved by very powerful streams (floods).*

Large "katuns" each have their own individual structural features and in form resemble just little katuns (balls). At their core, they are blurred xenoliths in new formations. Their difference from olistostromes, olistoliths and olistoplak lies in the method of formation. The olistostromes are, in the final analysis, the formation of landslides (Geological Dictionary, Volume 2, p. 32), and the Katuns and Xenoliths are the result of erosion, irrigation and redeposition of sediments and rocks. Perhaps large layered xenolith Katuns could be moved not only by rolling, but also by displacement. In hydroplastic floods heavily loaded with sand, they could possibly float downstream.

Fig. 15. *Katuns (1), lying among the advanced layers of oblique stratification (2). It can be seen that the katuns were destroyed before they were buried in an oblique stratum. Three zones are clearly visible in the left katun (in the center): a - a weakly expressed core surrounded by a radial-radiant zone (b) and a concentric - zonal peripheral part (c)*

High flux density is also indicated by the fact that relatively small katuns buried in slanted series are often found among the advanced layers in their middle, and not in the lower bottom parts. They could not slide to the foot of the crest of the ripples, and were stuck on its slope (Fig. 15). This indicates a large load of water with sand and a non-free, but related movement of the katuns in the hydroplastic layer. At the same time, the katuns themselves were not yet sufficiently solid. They partially collapsed, folded into blanks or bifurcated (see Fig. 9-15) during movement.

2. Katuns of the second type. Rounded nodules. They have signs of both their nodule formation and rolling. At the same time, there are katuns with signs of initial contraction of the material with their subsequent rolling and there are - with signs of initial rolling, and then contraction of rocks in separate parts of the katun. So in fig. 16-17 it is seen that the Katuns formed from a layered rock. In Fig. 16, it is three-layer - two layers of fine-grained sandstones (1), separated by a layer of gravelites (2), and in Fig. 17 - two-layer - in the upper part of the Katun - a layer of siltstones, in the lower - sandstones. In both cases, radial nodules are well expressed only in fine-grained siltstones and fine-grained sandstones. In coarse-grained sandstones they are absent. There is only one way to explain such a texture of katuns: at first, a piece in which there was no radiant contraction had broken off from the layered rock. Otherwise, a piece of sandstone during pelletizing would crumble along these cracks (see Fig. 15). Contraction formed already in Katun and most likely after the completion of movement during compaction and lithification of the rock.

In Figure 18-19, the Katuns have a completely radiant nodule structure. Their isolation from the parent rock and pelletizing occurred already in the form of nodules.

Fig.16. *Katuns with signs of initial rolling, and then nodule contraction. Moreover, the Katun in Fig. 16 consists of three layers: siltstones in the upper part (1), gravelites in the middle, and fine-grained sandstones in the lower part*

Fig. 17. *Katun consists of two layers: in the upper part there are fine-grained siltstones, in the lower part there are coarse-grained sandstones. Signs of concentric contraction are well expressed only in siltstones*

Fig. 18.

Fig.19.

Fig. 18 and 19. *Katuns with initial acquisition and subsequent rolling. It can be seen that the Katuns, composed of brownish-gray sandstones, are foreign bodies in pale yellow sandstones and partially destroyed in them during rolling, which means that their nodules contracted in other rocks and in another place i.e. before rolling*

3. Katuns of the third type (real or actual Katuns, fig. 20-22). Observed relatively rarely. These are "real" katuns formed during rolling and successive (like a snowball) sticking of concentric layers of sand onto each other (Fig. 20). It is evident that at first the katun rolled in reddish-gray rocks and collected them on itself (1), then in gray sandstones (2). In other words, the katun twisting began in the reddish-gray sands (hydroplastic mobile sediments), and continued in gray. This can only be in two cases: either the sediment composition of the hydroplastic layer changed from reddish sands to gray, or the katun rolled away from the place of deposition of reddish sands into the region (more precisely, into the stream) of gray deposits. The second is more likely. It is noteworthy that the top layer of the katun is slightly different in color from the rocks containing the katun i.e. it was formed not from yellow sandstones that buried it, but from some other sediments in another place. Real katuns are usually well rounded, have the shape of balls, round blanks and shafts with biconical endings (Fig. 21).

Fig. 20. *Concentrically - layered katuns, true katuns formed when layers stick to each other like a snowball during their rolling in sandy-clay sediments*

Fig.21. *In fig. the spherical Katun (1) and the shaft with a cone-shaped end (2) are visible*

Fig. 22. *Spherical layered Katuns*

The formation of katuns in layered strata. Formation of katuns is considered by M.S. Shvetsov to be associated with floods occurring “during heavy rains in clay ravines, along the bed of which fragments of rocks roll like snowballs, growing and taking a spherical shape” (Shvetsov, 1958, p. 182). In our case, it was not a stream in a ravine, but a wide and powerful flood that rolled Katunas in the whole region, more than 6.0 km wide. From the village of Naberezhny to the Holboginsky quarry. The scale of this phenomenon can be estimated from given by I.A. Efremov (2019) data on Mongolia, where the same katuns were found in the Lower Cretaceous sandstones of the same age as the Selengin suite, with the same stratigraphic sequence of closely coeval deposits - darker coarse-grained rocks are formed below, light-grained fine-grained katuns at the top buried.

As mentioned above, katuns formed 1 of fragments and large fragments of layers during deep erosion of the lower stratum of brownish-gray sandstones, 2 of newly formed nodules and 3 by rolling and growing, like snowballs of still loose sandstones. Large layer rejectors (xenoliths) could not only roll, but also crawl along the shallow-lying layers or slopes of eroded rocks, as well as swim in high-density flows - floods.

The segregated pieces and fragments of the layers were poured during their movement in powerful multidirectional and rapidly changing, heavily sand-loaded hydroplastic flood flows with the formation of oblique rock stratification at a water velocity that is maximum for sediment deposition. This process is best called the term “goltovanie".

Nodules. In the Selengin suite, as well as in the whole Gusinoozyorsk series, many researchers noted various nodules divided by composition and texture into ferruginous-carbonate, carbonaceous siderite, clayey-siderite, calcareous, siliceous, sandy nodules with a zonal or radiant structure and lamellar in siltstones. One of the varieties of radiant nodules is the katuna of the nodule structure (see above). But more often zonal nodules are found consisting of two zones (Fig. 23-25) - the inner, fine-grained siltstone yellow and the outer gray fine-grained sandstone.

It must be said that there is a distribution of various nodules in the suite of the goose-ozersky series of various lithological composition. So in the conglomerate Murtoy suite siliceous-carbonate nodules prevail. They are practically not rounded, often many-headed, with inclusions of rock fragments and organic residues (Fig. 24). In the Selengin suite, katuns with a nodule internal structure, consisting of various sandstones and siltstones, are widespread (Fig. 16-19). In the Holboginsky suite, numerous densely packed loaf-shaped nodules are often observed, consisting of gray clay siltstones (Fig. 25. For us, the most interesting are the katuna-nodules of the Selengin suite. It was in such formations in Mongolia that I. A. Efremov found animal bones including dinosaurs, for example, on the Khara-Khutul mountain in the Lower Cretaceous sediments, he saw huge nodules - contraction made of sandstone as granite, similar to large wheels. A separate vertebra of a giant dinosaur was enclosed inside each “wheel” In addition to the vertebrae, there were separate parts of the skull, massive bones of limbs in some places, and almost whole skulls of carnivorous dinosaurs (Efremov, 2019, p. 270).

"Big wheels" here indicate that in the beginning it was shafts, or rather, "sausages", then decayed onto wheels i.e. on the katuns. Separate vertebrae for each wheel indicate that they (vertebrae) cemented sand around themselves - each of their own, which contributed to the separation of the "sausage" into parts. And this, in turn, indicates that the vertebrae were sticky, otherwise the sand would not stick to them i.e. they were pieces of flesh. In other words, the animals were torn apart during the flood by a hydroplastic flow or landslide.

In addition to the bones of dinosaurs I.A. Efremov in nodules from the tertiary sediments of the Red Ridge indicated the bones of ancient mammals, fish and aquatic turtles. Regarding the method of nodule formation with these bones, Efremov says the following: “An even greater increase in the velocity of the bringing flows caused the deposition of a gravel and many bones of the second lower horizon. The current was so strong that it eroded loose gravel sediments, leaving only the areas cemented around the bones untouched. Thus, layers of nodules with mammalian bones were formed. These streams carried many corpses of large fish and aquatic turtles, buried with nodules ”(Efremov, 2019, p. 521). The question is also relevant here: why did cementation of sand occur around the bones, and not

everywhere? Efremov explains this only by the speed of the flows that brought the bones, but probably here, as in the case of dinosaurs, there is another, more compelling reason for the cementation of sand around the bones - sticking of sand to the flesh and blood of a dead animal, torn to pieces.

I.A. Efremov discovered and pointed out the paleontological contradiction, which is that the remains of mammals and dinosaurs are close to each other, almost in the same layers: “An incomplete skeleton of a large predatory dinosaur lay right under the red tertiary rocks” (Efremov, 2019, p. 516). Elsewhere on the western remnants of the "Tertiary" Red Ridge, many dinosaur bones were found. “It seemed strange, almost unbelievable, to such paleontologists (that is, Efremov and others) that such an accumulation of remains of giant dinosaurs in the immediate vicinity of the location of tertiary mammals” (ibid.). In the end, Efremov explained this by the erosion and large interruption of sedimentation in this place. The erosion reached the middle horizons of the Upper Cretaceous era, while the “channels of the Tertiary streams that deposited the Red Ridge crossed the more ancient large channel of the Cretaceous period. Thus, two cases of burial of extinct animals met, separated in time by an interval of twenty million years ”.

Thus, following Efremov, we must assume either two catastrophes recorded in the shallow Paleogene deposits of Mongolia; the first in the Lower Cretaceous (Katuns with dinosaur bones in the sediments of the Khara-Khutul mountain), the second - in the Tertiary time, recorded in nodules from the gravels of the Red Ridge; or a single powerful Paleogene catastrophe that eroded the Tertiary and Upper Cretaceous sediments to the upper parts of the Lower Cretaceous inclusively. Given the widespread development in the Cretaceous and Tertiary sediments of Mongolia of a large and even gigantic oblique stratification “as if sewing together” all of these different age deposits, the authors of this article are inclined to crawl the second assumption - the existence in the Tertiary time of a powerful water disaster that eroded and redeposited Cretaceous sediments at least up to and including the Lower Cretaceous.

Returning to the Selenginsky suite and, in general, to the Gusinoozyorsk series in the eponymous trough, it should be said that the finds of katuns and the widespread development of large and gigantic oblique stratification in the upper part of the Murtoy, Ubukun and Selengin suites indicate an extremely high catastrophic rate of accumulation of sediments with large and deep erosion and erosion of sediments. According to these characteristics, they are almost identical to the Cretaceous deposits of the Gobi Desert - the same katuns, wide oblique stratification, deep erosion and washouts, and evidence of the death of a large number of animals during this catastrophe (including dinosaurs during Murtho time, see Skoblo et al. 2001), which makes impossible the idea of a gradual and slow formation of their whereabouts and burials at that time. Given the rate of accumulation of modern

river sediments - up to several meters per day (see Reinak and Singh, 1981 p. 221; Roshchektayev, 2018, p. 125), this catastrophe could not be long. At least not tens of millions or even millions of years. The geological time of the disaster can only be determined by the principle of lower and upper age limits. The lower age limit can be taken according to the stratigraphic erosion depth - as lower Cretaceous, the upper one is not defined.

Fig. 23. *Siliceous-carbonate nodules of the Murtoy suite*

Fig. 24. *A fragment of Fig. 23 - nodules with inclusions of rock fragments and petrified organic residues in the germinal part*

Figure 25: *Tightly packed nodules in the dark gray siltstones of the Holbogins suite*

Conclusions on the article.

1. Katun is a characteristic and widespread, but little studied lithological feature of Cretaceous terrigenous deposits. In addition to the Gusinoozersky Depression of Transbaikalia, they were established in Mongolia in the Gobi Desert, in Kazakhstan on Mangyshlak, in flysch deposits of the Caucasus and in other places.

2. They occur in oblique sediments, often with large and gigantic oblique series, characteristic of catastrophic floods.

3. According to the composition of the rocks composing them, they are represented by heterogeneous, often gravelly and stratified sandstones and siltstones, both from the underlying sediments of local suites and strata, and from older formations washed out somewhere in the distance, including metamorphic and igneous.

4. Katuns were formed in three ways: 1 - breaking up the already formed layers into parts (pieces) and then kneading them in hydroplastic turbulent flood flows, while pieces and scraps of layers can reach large (several tens of meters) sizes; 2-twisting and rolling sand-silt-clay material into balls and shafts according to the method of snowballs; 3-contraction of sedimentary material in the nodule and their subsequent run-in in streams.

5. When weathering on the surface, the Katuns fall out of the sediment enclosing them, forming an easily recognizable cellular texture characteristic of the Lower Cretaceous sediments of Transbaikalia and Mongolia. Such formations should be expected in other places.

6. A large number of Katunas in the composition of the Selengin suite sediments scattered throughout its lower sub-suite indicates that deep and extensive erosions and washouts of already deposited sediments occurred during the formation of this thickness. All this is very different from the ideas about their formation in lake-bog conditions.

7. The great similarity of the katunosnoy sequence of the Selenga Depression with the coeval katunosny sediments of the Gobi Desert brings them together, and the universally developed large-scale oblique stratification in these sediments testifies to the gigantic scale of this phenomenon. Such a scale of this event is indicated by the Polish researcher Richard Gradzinski, a member of the Polish-Mongolian paleontological expedition from 1969 to 1972. Based on oblique stratification, he came to the conclusion that the territory of the Gobi desert in the Upper Cretaceous was covered by a huge river such as the modern Amazon, which deposited thick strata of sandstones, gravelites, clays and conglomerates (Martinson, 1980, p. 118-120)

8. The established wide development of katuns and large, displaced xenoliths of sedimentary rocks in the Selenga suite indicates not just a river, but a gigantic water disaster that occurred during the Cretaceous-Paleogene time in Transbaikalia, Mongolia and, obviously, in other regions.

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煤层开采在邻近岩石中形成的透气性
FORMATION OF GAS PERMEABILITY IN ADJOINING ROCK DUE TO COAL SEAM MINING

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抽象。 本文讨论了煤层开采过程中层间岩石渗透性的形成方式。 在这种情况下，基础是渗透率，地层负荷及其气体饱和度的相互联系，表示为通过实验确定的功能依赖性。 可以从地质力学问题的解决方案中获得地层载荷，该解决方案描述了阵列中应力应变状态随空间增大的变化。 在这种情况下，存在来自初始应力的卸载区域，这些区域负责出现或增加渗透率。 反过来，地层的气体饱和度是根据对地层和地层间甲烷中甲烷的质量转移的相应问题的解决方案来确定的。

关键词：渗透率煤层夹层岩瓦斯饱和度应力–应变状态卸荷传质

Abstract. *The article discusses the patterns of permeability formation in interbedded rocks during mining of a coal seam. In this case, the basis is the interconnectedness of permeability, formation loading and its gas saturation, expressed as a functional dependence determined experimentally. The formation loading can be obtained from the solution of the geomechanical problem, which describes the change in the stress-strain state of the array with increasing space. In this case, there are unloading zones from the initial stresses, which are responsible for the appearance or increase of permeability. In turn, the gas saturation of the formation is determined from the solution of the corresponding problem of the mass transfer of methane in the formation and inter-formation rocks.*

Keywords: *permeability, coal seam, inter-layer rocks, gas saturation, stress-strain state, unloading, mass transfer*

Introduction

In order to evaluate the gas recovery of coal seams and inter-bed rocks into degassing wells and the mined space during coal seam mining, it is necessary to know the real values of permeability in the entire area of influence of mining operations.

The experimental determination of permeability under natural conditions is associated with significant methodological difficulties and allows one to obtain only effective permeability i.e., averaged over a certain section of the formation, although this may be sufficient for practical needs. Attempts to quantify the permeability of coal seams raised the question of developing special methods for determining the corresponding permeability in the conditions of their natural occurrence based on the solution of some problems of mass transfer in a filtering medium.

Such solutions are based on the use of ratios linking permeability acting in a stress array and the amount of methane adsorbed by coal. The obtained patterns can be used to determine the distribution of permeability in the rocks of the roof and soil of a coal seam being mined based on the solution of the geomechanical problem of the distribution of stresses near the mined out space.

Earlier, a sufficiently detailed description was given of a conceptual model of fluid mass transfer in a permeable medium, including in coal [1]. It was emphasized that the most important and determining parameter governing mass transfer in a permeable medium is its permeability. The complexity of the problems associated with the fact that this parameter is not a constant val-ue characterizing the filter material, but largely depends on the loading of the material σ and its sorption abilities Q, if any. It is known that coal in large quantities is capable of sorbing methane. Initially, a ton of coal can contain tens of cubic meters (under normal conditions) of methane, which under certain conditions can be desorbed and released into the atmosphere.

Tensions near the employed space when exploiting a coal layer

In connection with all of the above, we consider the features of the redistribution of stress-es in the array during mining of an inclined coal seam.

Figure 1 schematically shows the position of the formation and its depleted part, shows the parameters of the problem and two coordinate systems used with a common beginning in the middle of the span of development, one of which is tied directly to the formation 0xy, and the other $0x'y'$ to the horizontal and vertical planes.

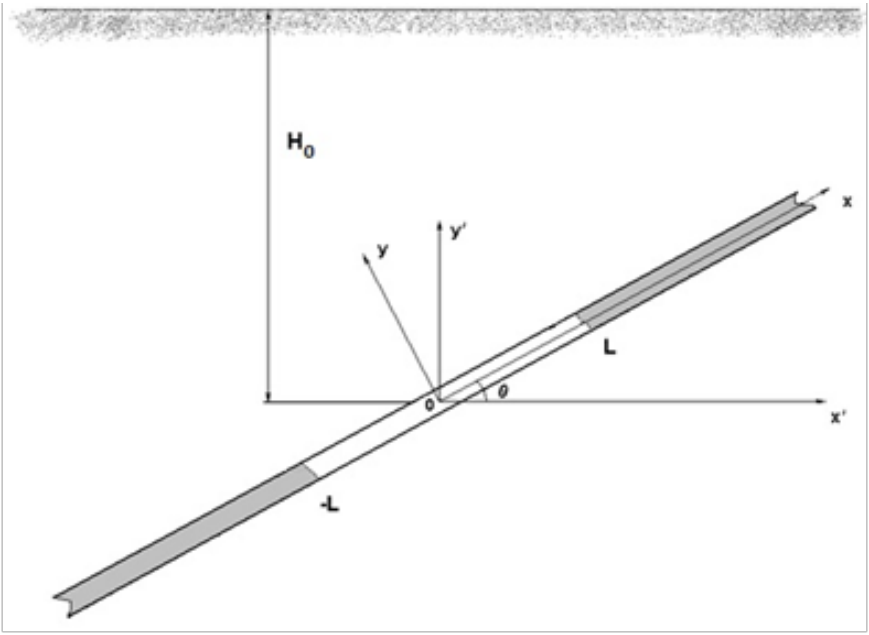

Figure 1 - *Schematic representation of an inclined formation and coordinate systems used*

In this case, the coordinates *xy* and *x'y'*, as well as the stress components σ_x, σ_y, σ_{xy} and $\sigma_{x'}, \sigma_{y'}, \tau_{x'y'}$ at the sites parallel to the corresponding coordinate planes, are interconnected by equations [2]

$$x = x'\cos\theta + y'\sin\theta, \quad y = -x'\sin\theta + y'\cos\theta \tag{1}$$

$$\sigma_x = \sigma_{x'}\cos^2\theta + \sigma_{y'}\sin^2\theta + 2\tau_{x'y'}\sin\theta\cos\theta$$

$$\sigma_y = \sigma_{x'}\sin^2\theta + \sigma_{y'}\cos^2\theta - 2\tau_{x'y'}\sin\theta\cos\theta \tag{2}$$

$$\tau_{xy} = (\sigma_{y'} - \sigma_{x'})\sin\theta\cos\theta + \tau_{x'y'}(\cos^2\theta - \sin^2\theta)$$

The solution will be formulated for a flat statement of the problem. In the considered case, due to the absence of voltage symmetry in the half-planes y> 0 and y <0, i.e. in the roof and soil of the formation will vary. Moreover, they will be different for all fours of the plane x <> 0, y <> 0.

When setting the task, it is believed that the depth of the formation, at least its spent part, H_0 is large enough not to take into account the influence of the day surface on the stress-strain state of the mass near the workings.

As for the initial stresses, we will assume that in the coordinate system 0x/ y/ they are writ-ten in the form of ratios

$$-\sigma_{x'}^{0} = \alpha\gamma\left(H_0 - y'\right), \quad -\sigma_{y'}^{0} = \gamma\left(H_0 - y'\right), \quad \tau_{x'y'}^{0} = 0 \tag{3}$$

which, generally speaking, in solving geomechanical problems is realized only at infinity. In these relations, γ - is the average specific gravity of the rocks, α - is the lateral pressure coefficient, which we consider constant when the depth changes in a rather large range. Such a statement of the problem almost completely excludes the possibility of taking into account the geological processes of the formation and development of the carbonaceous stratum with the formation of folds, raising and lowering rock layers, etc. Nevertheless, for definiteness, we will consider it fair (3).

It is obvious that the magnitude of the tangential stresses $\tau_{x'y'}^{0}$, acting in the plane of the formation, regardless of the history of its formation, is limited by the strength properties of coal, which should be taken into account when analyzing the state of the massif.

Both presented systems are completely equal, and each of them has its own advantages. Say, the initial stress field is more clearly written in the 0x/ y/ system, whereas for writing the relations of the theory of complex potentials it is necessary that the roof and soil of the depleted space be free of stresses, which is done in the 0xy system.

Within the framework of the accepted restrictions, additional stresses in the framework of the theory of complex potentials near the depleted section of the formation with a hanging roof are expressed by ratios [3]

$$\begin{aligned} X_x + iX_y &= \overline{\Phi(z)} + \Phi(z) - \overline{\Omega(z)} - (z - \bar{z})\overline{\Phi'(z)} \\ Y_y - iX_y &= \overline{\Phi(z)} + \Phi(z) + \overline{\Omega(z)} + (z - \bar{z})\overline{\Phi'(z)} \end{aligned} \tag{4}$$

where for the upper half-plane

$$\begin{aligned} \Phi(z) &= \Phi_1(z) + \Phi_2(z) \qquad & \Omega(z) &= \Omega_1(z) + \Omega_2(z) \\ \Phi_1(z) &= \frac{\gamma_y}{2} S(z) \qquad & \Omega_1(z) &\equiv 0 \\ \Phi_2(z) &= -i\frac{\gamma_{xy}}{2} S(z) \qquad & \Omega_2(z) &= -2\Phi_2(z) \end{aligned} \tag{5}$$

$$\gamma_y = \gamma\left[1 - (1-\alpha)\sin^2\theta\right], \quad \gamma_{xy} = \gamma(1-\alpha)\sin\theta\cos\theta$$

$$S(z) = (H_0 - z\sin\theta)\left(1 - \frac{z}{\sqrt{z^2 - L^2}}\right) - \frac{L^2\sin\theta}{2\sqrt{z^2 - L^2}}$$

$$z = x + iy$$

Similarly, for the lower half-plane we have the same relations (5), but in the formula for *S(z)* instead of the variable z its conjugate value $\bar{z}$, is used, i.e.

$$S(\bar{z}) = (H_0 - \bar{z}\sin\theta)\left(1 - \frac{\bar{z}}{\sqrt{\bar{z}^2 - L^2}}\right) - \frac{L^2 \sin\theta}{2\sqrt{\bar{z}^2 - L^2}} \qquad (6)$$

Thus, the functions $\Phi(z)$ and $\Omega(z)$ are completely determined and, therefore, in accordance with (4) the stresses in the entire plane.

Figure 2 shows, for example, the distribution contours of the first invariant of the stress tensor for the dip angle in 60° at L = 100m, H_0 = 1000m, α = 0.5. Note that, since σ - is an invariant of the stress tensor, its value does not depend on the coordinate system, and it can be calculated using both σ_x, σ_y, and $\sigma_x^{/}$, $\sigma_y^{/}$.

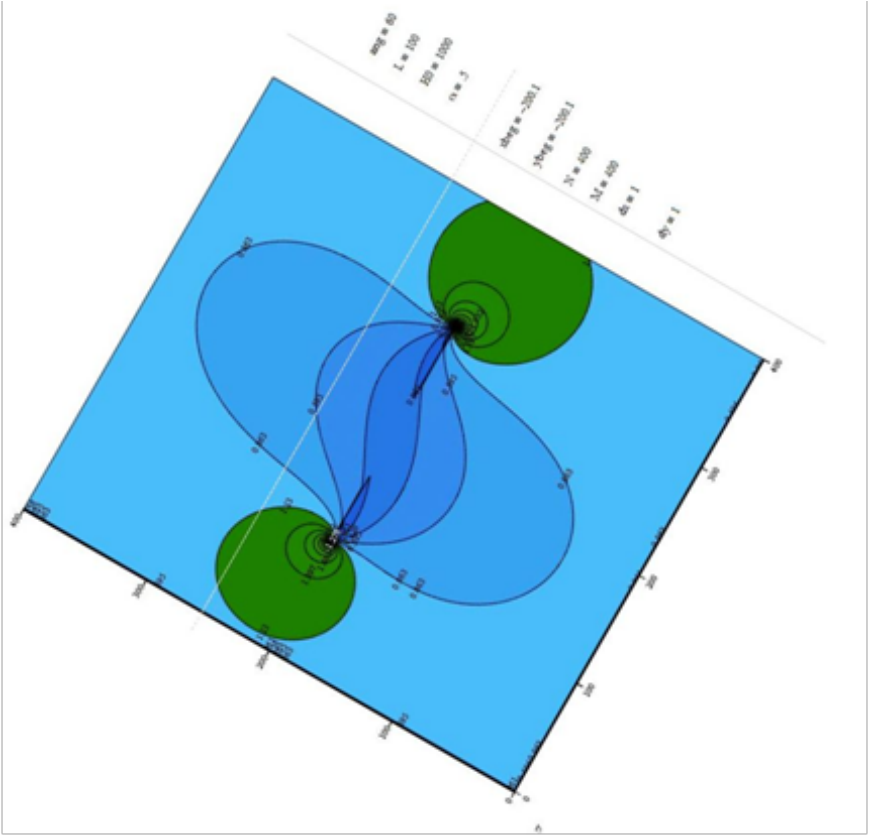

Figure 2 - *An example of calculating the parameters of the stress-strain state (the first invariant of the stress tensor) in the roof and soil of an inclined formation*

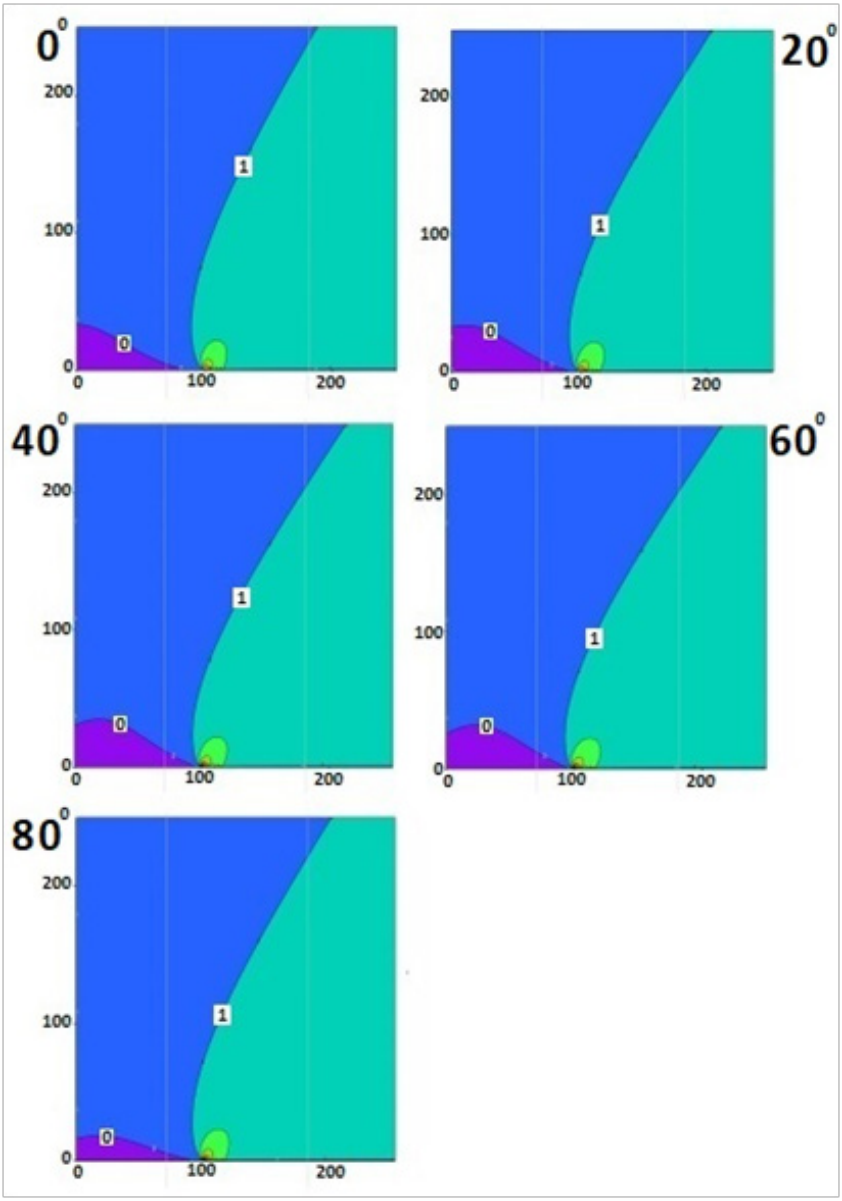

Figure 3 - *Unloading zones in the roof of an inclined formation (formation angles are indicated)*

Figure 3 shows the discharge zones with respect to σ and the zones of negative values of σ for different values of the inclination angle of the formation in the 0xy coordinate systems associated with the formation. These zones are limited by isolines "1" and "0", respectively. The length of the hanging roof is 2L=200m, depth H_0=1000m, α=0.5, specific weight of rocks γ=2400 kg.m^3. To the right of the σ=1 line is a load zone with a concentration near the point x=100m. The contours were drawn at intervals of 1, which made it possible to visualize the location and configuration of the zones of interest to us. In [4], some regularities were obtained for a horizontal formation, namely, the configuration of the discharge zone and the distribution of the discharge level in it, depending on the length of the depleted space for various determining parameters.

An analysis of these figures allows us to conclude that in the local coordinates 0xy all these zones, especially the unloading zones, practically coincide, i.e. the distribution of discharge in the massif, and, consequently, permeability, is invariant with respect to the inclination of the formation.

This means that the configuration calculated for a horizontal formation for an inclined formation simply rotates relative to the origin by an angle θ. Note that this applies only to a certain neighborhood of the depleted space, since in the far zone the stresses in the array must go to the original, identical for all options (0°, 20°, ...), regardless of the angle θ.

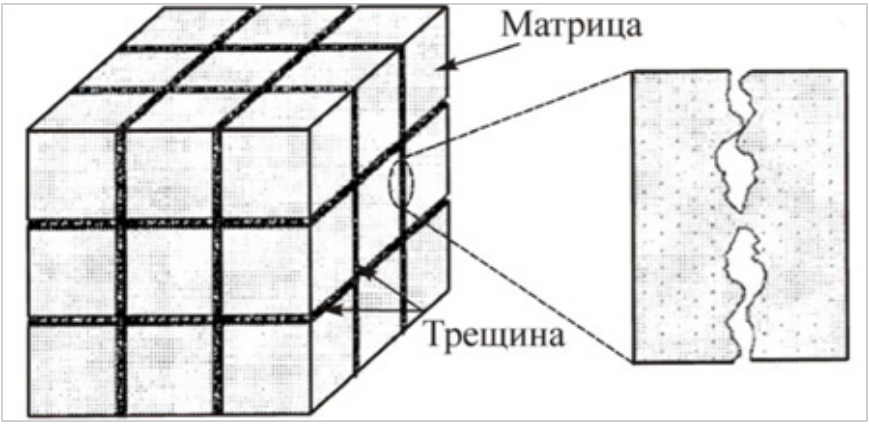

Figure 4 - *Conceptual block model of the structure of coal*

About permeability of rock of the intermediary close to the depleted space

Let us now consider the relationship between permeability and current stresses and coal saturation with methane. At present, the conceptual block model of the structure of coal is considered fair, according to which natural endo- and exo-drainage cracks, connecting directly between themselves, break the coal into separate structural elements - blocks that are a porous medium and contain pores of various sizes from micropores of several angstroms (< 30 Å) to submacropores measuring 10^3 – 10^4Å. Blocks, due to the developed microporosity, represent the main formation of sorbed gas. At equilibrium, its amount is due to the pressure of free gas in the contouring cracks in accordance with the laws of adsorption. When methane moves along the coal seam fracture system to the well, it inflows from the well influence region in accordance with Darcy's law, while methane is released into the coal fracture system from blocks regulated by the Fick law [5]. Experimental studies have established that the gas permeability of coal is completely determined by its fracture system and rock pressure, and the rate of diffusion of methane from coal largely depends on the size of the primary coal blocks bounded by cracks. Simplified models, consisting of a set of cubes of the same size (Fig. 4), for which porosity and its change under the influence of external loads are quite simple, are widely used [6].

The following assumptions are made: - coal at the macro level is considered a continuous isotropic elastic medium; - deformations are small, therefore, members of the second and higher orders in the relations used can be neglected and deformations caused by various factors, can be considered additive; - The interaction of methane with coal has a twofold nature. Firstly, methane located in the cracks and freely filtered through them compresses coal blocks. Secondly, methane adsorbed by coal leads to deformations (swelling, shrinkage of coal), which causes a change in block size. Based on the model given in [6], after a number of simplifications, a relation is obtained that describes the change in permeability depending on external loads, gas pressure in cracks, the amount of gas sorbed by coal, and temperature. As a rule, in such models, the change in porosity is initially calculated under the influence of all acting factors, and the permeability is considered proportional to the third degree of change in porosity [7]:

$$\frac{k}{k_{init}} = \{1 - A[(\sigma - \sigma_0) - (p - p_0)] - B(Q - Q_0) + C(T - T_0)\}^3, \quad (7)$$

where *A, B, C* — constant values characteristic of a particular type of coal;
σ — first stress invariant; Q — amount of methane sorbed by coal;
T — formation temperature; Q_0, T_0, σ_0, p_0 — initial values of the corresponding parameters for which $k = k_{init}$. In the model under consideration, the change in porosity is linearly related to increments of the parameters by means of the coefficients A, B, C.

Relation (7), the specific form of which is to be experimentally determined, relates the permeability and stress state of the mass at each point of the coal-mass massif. Thus, in order to determine the mass transfer of methane in this mass, it is necessary to know the stress distribution in it and to identify the unloading zones. After that, using (7), the distribution of permeability in the array will be determined and, by solving the corresponding mass transfer problem, the directions of methane flows and their intensity will be determined.

Conclusions

Thus, as a result of the simulation of stress redistribution in the side rocks of a coal seam during its development, both with a hanging roof and during its landing, configurations of unloading zones in a coal-bearing massif at various stages of development of treatment operations are obtained. In addition, the distribution of the discharge level over the entire massif falling into the area of influence of treatment operations in the coal seam was determined. In fact, the unloading zone from the initial stresses extends over considerable distances, up to the day surface. In this case, zones of tensile stresses arise near the hanging roof of the worked-out space. Moreover, in accordance with the described model, permeability zones appear.

Thus, the mutual influence of filtration and deformation processes occurs during the development of the depleted space, i.e. when changing the geometry of the considered region and its stress-strain state.

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使用池塘生态系统生物量的饲料培育澳大利亚癌症的经验
EXPERIENCE IN GROWING AUSTRALIAN CANCERS USING FODDER FROM BIOMASS OF POND ECOSYSTEMS

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抽象。 开发了用于喂养澳大利亚红小龙虾Cherax quadricarinatus的饲料的实验配方（发酵剂饲料和生产性饲料）。 配方的独特性是由于根据幼虫和幼体（复杂的幼体后阶段，即几丁质蜕皮和快速形成的时刻）和育种者（在繁殖生殖的过程中）的营养需要从当地原料中添加的添加剂而提供的 系统以产生可行的后代）。 用饲料中的矿物质代替自来水时，实验批次的饲料具有以下特点：高质量，对象的营养饲料活性- 100%，饲料的适口性- 100%，饲料颗粒不被侵蚀和沉淀，负浮力 。 基于当地原料的饲料比市场上出售的澳大利亚小龙虾的饲料便宜数十倍。

关键字：澳大利亚小龙虾，饲养，育种，配方，饲料，盆地，池塘。

Abstract. *The experimental formulas of feed (starter feed and productive feed) intended for feeding Australian red crayfish Cherax quadricarinatus are developed. The uniqueness of the developed formulations is provided due to additives from local raw materials according to the nutritional needs of larvae and juveniles (a complex post-larval period – at the moment of molting and rapid formation of chitin) and breeders (while developing the reproductive system to produce a viable offspring). Experimental batches of feed when replacing the tap water for mineral one in the preparation meet the following characteristics: high quality, nutritional feed activity of the objects – 100 %, palatability of feed – 100 %, feed pellets are not eroded and deposited, negative buoyancy. Feed based on the local raw materials in tens times cheaper than the feed for the Australian crayfish, presented on the market.*

Keywords: *Australian crayfish, feeding, breeding, formulas, feed, basins, ponds.*

Introduction . Currently, Australian crayfish Cherax quadracarinatus are fed using expensive universal feeds, and there are no specialized feeds from Russian manufacturers at all. As a result of this, during the transition of mass production of crustaceans to various cultivation systems, including intensive ones, one of the main problems was the small assortment of compound feeds and their high cost, which naturally entails a rise in the cost of marketable products of Russian aquaculture enterprises.

This problem, which occurs in the cultivation of Australian red and red crayfish Cherax quadricarinus, caused the main emphasis in this work - to develop effective formulations and feeding technologies and, in addition, to create a line of starting and production feeds based on t The development of the feed formulation is based on the physiology of the cultivated object — Australian red claw crayfish Cherax quadricarinatus — a promising, economically viable freshwater aquaculture object with excellent consumer qualities [1].hem that are more effective than "universal" formulations.

Material and methods. During the feeding of the tench with the experimental L – 1 food, its active behavior was observed, the food was eaten predominantly in the locations: stagnant zones of the aquarium, which confirms the preference of the tench to stay at the bottom, to be in the pits. At the feed Tetra pond (protein nutrient content - 31.0%, fat - 4.5%, fiber - 2.0%) there was a refusal of food, presumably imported food caused communicative toxicosis.

Tetra pond feed contains (%): protein - 31.0, fat - 4.5, fiber - 2.0, moisture - 7.0. Vitamins: Vitamin A - 28900 UI / kg, Vitamin D3 - 1800 UI / kg, E5 Manganese - 100 mg / kg, E6 zinc - 60 mg / kg, Iron E1 - 39 mg / kg, E3 cobalt - 0.7 mg / kg

During this period, an imported water conditioner enriched with vitamins was used for prophylaxis and therapeutic effect, which increased the survivability of farmersand stopped the line withdrawal during the quarantine period.

As a result of the experiments, data on food preference were obtained in relation to the developed experimental L-1 coma feed (Table 1) and Tetra pond food.

Table 1 - *The average daily growth rate of the line when grown on various feed options*

p / p	Floor	Daily average growth rate (%)
	Tetra pond	
1	♂	0,10±0,3
2	♀	0,9±0,1
	Experimental feed L-1	
3	♂	0,13±0,2
4	♀	0,14±0,4

The calculation was carried out in accordance with the nutrient content in the feed components of the feed and the percentage in optimized formulations, bringing the level of protein and fat to certain values.

Thus, the nutritional efficiency and the growing process itself was evaluated by the main indicator of the average daily growth rate of the lines. The indicators are shown in table 1. The best growth rate among producers was shown by a group of females on experimental feed with the addition of biomass of pond ecosystems, with a partial replacement of fishmeal with bloodworms and tubule makers, unlike

males. This is due to physiological characteristics, since females require a greater accumulation of nutrients for the formation of the reproductive system for the transition to the mature stage. Females, unlike males, spend an additional amount of nutrients on the formation of the reproductive system. For this reason, food is needed that will be effective during this period.

During the experiments, the survival rate of Australian crayfish was 100% when kept on experimental feed and 50% on a proprietary Tetra pond.

According to biological growth and survival, we can talk about a positive result of the content of the Australian crayfish in the experimental feed L-1. Also, at the end of cultivation, it was noted that it is fundamentally permissible to completely switch to feed from local raw materials, the possibility of replacing fish meal with bloodworms and tubifex, biomass of pond ecosystems and vitgrass as a source of vegetable protein has been confirmed. Such a substitution will significantly reduce the cost of feeding, not only not affecting survival, but not slowing down in most cases also the growth rate.

Results. The results of the study convince of the effectiveness of the application of optimized feeding technology for producers and young Australian crayfish, a positive effect on fish-biological and physiological indicators. This confirms the 100% survival rate of the objects, the satisfactory condition of the body and the high growth rate of males and females: 0.5-0.6% on the experimental production feed and 0.8% on the experimental starting feed. Feed based on local raw materials is ten times cheaper than the feed for Australian crayfish on the market.

In the course of the research practice, the basic methods of studying the content and feeding of Australian crayfish were studied. The developed experimental feed formulations with partial replacement of fishmeal with bloodworm and tubule, with the introduction of vegetable protein - vitgrass for these objects turned out to be effective and fully meet all the necessary requirements.

During the internship, skills were obtained for calculating complete feed for the necessary components (including plant and animal origin) that are part of a complete feed recipe. The skills of acclimatizing wild forms of linear species and transferring them to artificial feeding were also acquired, the eatability of the experimental and experimental feed was calculated, and it should be noted that the eatability of the experimental feed was better than the control.

Based on the foregoing, we can conclude that it is possible to use experimental feed in the maintenance of such objects as tench and Australian cancer.

Conclusion

In the course of the research practice, the basic methods of studying the content and feeding of Australian crayfish were studied. The developed experimental feed formulations with partial replacement of fishmeal with bloodworm and tubule, with the introduction of vegetable protein - vitgrass for these objects turned out to be effective and fully meet all the necessary requirements.

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在高性能系统中发展新型水产养殖
GROWING NEW TYPES OF AQUACULTURE IN HIGH-PERFORMANCE SYSTEMS

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抽象。 在本文中，公开了在快速开发的小型模块化水族系统中用于综合生产环保型新鲜产品的温水水产养殖物种（丁香，Cerax quadricarinatus）的种植前景。 通过研究结果，制定了生物学标准。

关键词：产品，超高效系统，水产养殖。

Abstract. *In the article the prospects of cultivation of warm-water aquaculture species (Tinca tinca, Cherax quadricarinatus) in the fast-developed small-sized modular aquaponic systems for the integrated production of environmentally friendly fresh products are disclosed. By results of researches biological standards are developed.*

Keywords: *products, super-efficient systems, aquaculture.*

Introduction. The development of “urban agriculture” (“city farming”) is recognized as one of the priority areas of scientific research and practice-oriented technologies, both in Russia [9] and in the world as a whole, in particular, in connection with the development of organic directions of agricultural production.

In order to increase the level of food security, it is necessary to review and update the approaches to agricultural production, modernize and increase the effectiveness of existing common solutions and practices [10]. One of the effective ways to solve the problem of creating alternative additional internal sources of food production in cities can be aquaponics - integrated aquaculture and crop production. Aquaponic systems can be compact enough to be placed not only in the buildings of large enterprises or public institutions (including schools and other educational institutions, hospitals, etc.), but also in residential or office premises. In this case, the main requirements for the operation of such systems will be: - compliance with sanitary standards; - ease of maintenance; - high autonomy of work;

- stability of work; - food production productivity; - environmental friendliness of production; - economic profitability.

To create a highly efficient aquaponic installation are used:

- structural components of hydroponic systems (hydroponic modules, racks, etc.) and aquaponics (tanks, pools);
- equipment for water treatment and water purification (pumps, filters);
- sensors, sensors and their corresponding automated systems for collecting, storing and analyzing data;
- systems, elements of climate control and maintaining specified environmental conditions (heating / cooling);
- automatic system for monitoring environmental parameters, including a forced air exchange system (forced ventilation / exhaust);
- energy-efficient sources of artificial lighting;
- automated feeders and injectors of nutrient solutions (with the combined "double-circuit" aquaponics system)
- a system for collecting and returning to the system through a biofilter of water condensate (optional, for some system designs).

Sustainability requires prompt response to the following risks:
interruptions in the supply of oxygen (compressor malfunction);

- violation of water exchange (pump malfunction, lack of fresh water);
- power outages;
- lack or error of measurements of the state of the environment (chemical indicators);
- biofilter malfunction;
- wrong feeding.

Sustainability is achieved by constructive and other solutions, including, in particular:

- duplication of important work nodes;
- creating the possibility of replacing work units with ready-made spare "repair kits";
- creation of a backup source of electrical power, a backup container with fresh water (topping up);
- achievement of speed of elimination of the main malfunctions within 12-24 hours without critical consequences for living systems.

Under hydroponic conditions, as a rule, rapidly growing types of crops are grown - leafy greens and other herbs. It quickly pays off and is economically viable.

The most common aquaculture objects that are grown in aquaponic installations in different countries are tilapia (Tilapia), barramundi (Lates calcarifer), clari catfish (Clarias gariepinus), common freshwater cole-tail (Tandanus tandanus), jade perch (Scortum barcoo) Lepomis macrochirus), as well as carps and trout [8]. Other aquatic organisms that grow well in aquaponic systems are mussels, freshwater shrimps and crayfish.

At present, in Russia, interest from private companies, entrepreneurs and city farmers has arisen and there is a growing demand for the use of rapidly deployable small-sized modular aquaponic systems for the integrated production of environmentally friendly fresh products (fish, vegetables and fruits) in urban and suburban areas. In our opinion, in aquaponic systems, the growth of thermophilic cyprinids (Tinca tinca tench) and crustaceans (Australian crayfish Cherax quadricarinatus) is promising. In the first case, the choice was made in favor of a fish species familiar to the consumer with high consumer value, commercial qualities, profitability, and, importantly for cultivation in closed systems, high resistance. In the second case, the choice was associated with high consumer value and economic efficiency of the object.

Thus, the aim of the work was to study the possibility of efficient production of selected objects in small-sized modular aquaponic systems in polyculture tench (Tinca tinca) and Australian cancer (Cherax quadricarinatus). The goal determined the task: to develop, based on standard fish-biological and physiological and biochemical parameters, the optimal biological norms for the content, norms, density of planting and feeding on previously developed feeds.

Material and methods. In the conditions of the innovation center "Bioaquapark - STC Aquaculture" the main experimental part was completed. Data collection and office processing were performed in the period 2017-2019. on the basis of the department "Aquaculture and Fisheries" of the Astrakhan State Technical University. The objects of study were thermophilic species - individuals of tench (Tinca tinca) and Australian crayfish (Cherax guadricarinatus).

The objects were contained in the basic module of an energy-efficient aquaponic system, built on the basis of standard common containers, "Eurocubes" ("Intermediate Bulk Container", "IBC" - a medium-capacity container) that satisfy food standards with a volume of 1000 liters while maintaining optimal hydrochemical conditions: T water - 26^0C, pH - 7.4, O_2 - 6.5, volume of water losses and topping - 25%. In the experimental work, feeds of our own formulation developed earlier were used.

Before deciding on the most effective landing density used for the modular aquaponic system, a series of experiments were conducted to simulate situations with different landing densities and feeding rates. The complex of applied methods was carried out according to the guidelines of hematological and fish-biological surveys; the state of the organism under modeling conditions was assessed using the physiological and biochemical composition of the blood, in particular, the mechanism for changing the limits of the reference values of the homeostasis constants using the total protein content in the blood and lymph, since this indicator is the most informative bio-indicator in terms of actual conditions for growing objects.

Research results. During the experimental work, the survival rate of Australian crayfish in a modular aquaponic installation was 100%. As a result of the analysis of the studied experimental groups (juveniles, sexually mature females and males), the reference values of the homeostasis constants vary widely - from 26.7 to 40.8 g / m^3. In terms of the total protein in hemolymph, the leading juveniles were grown, grown at a planting density of up to 1000 pcs / m^2 by 1.3 times compared with the control (with a planting density of up to 1500 pcs / m^2), which amounted to 20.7 + 2.2 g / l against the control - 15.8 + 3.2 g/l.

The total protein in the hemolymph of individuals transferred from natural conditions to the aquaponic module at a planting density of up to 500 pcs / m^2 was 1.1 times higher than the control (at a planting density of up to 700 pcs / m^2): 38.7 + 4.0 g / l versus 34.4 + 4.5 g / l, respectively.

Commodity Australian crayfish grown with a planting density of up to 200 pcs / m^2 contained a high level of protein, females - 31.6 + 4.1 g/l, males - 40.8 + 2.7 g/l against 30.7 + 5 , 0 g/l and 29.4 +. 4.0 g/l in the control group (with a planting density of up to 300 pcs / m^2), respectively. This increase of 1.0-1.3 times in comparison with the control group indicates a high viable level of the organism, ready for the production of future offspring.

The total protein content of Australian crayfish of different ages showed differential dependence on gender and age.

Thus, the assessment of the quality of the growing conditions determined an acceptable planting density of females and males - up to 200 pcs/m^2, which ensures a satisfactory physiological condition of the cultivated objects and the readiness of the females for the reproductive phase, high physiological status, providing active molting and chitin formation processes at a planting density - up to 1000 pcs/m^2, high adaptive ability to transfer from natural to artificial conditions provides individuals with a landing density of up to 500 pcs/m^2.

Independently assessing the state of the body under simulating conditions of detention, which determines the quality of the grown products, can be done according to the supply of fish tissue with hemoglobin, since the parameters of gas exchange, its effectiveness and, ultimately, the level of metabolism depend on the level of hemoglobin. So, no significant differences were found in juvenile tench, the indicator in the control group (planting density 200 pcs / m^2) was 52.9 ± 10.3, and in the experimental group (planting density up to 150 pcs / m^2) 64.3 ± 9,1 g / l.

The erythrocyte sedimentation rate (ESR) was in the range 1.4 - 2.8 mm / h, the highest value of this indicator was recorded with increased planting density, the lowest - in the variant with reduced planting density, which excludes the presence of an inflammatory process, which is recorded at more than 5.0 mm / h.

The lipid levels recorded in the experiment were within the normal range.

When studying the bio indicator of the confirming growing conditions, a change in the serum protein content was detected at an increased density of 33.9 g / l and in the variant with a reduced density of 35.3 g / l, a marked increase in the total serum protein (in 1.5 times) corresponds to a landing density of up to 150 pcs / m2 and indicates its effectiveness.

A second study of blood biochemical parameters with a search for the total serum protein in the line during quarantine turned out to be significantly higher in the line group with a planting density of 15 pcs / m^2 ($p < 0.05$) - by 5.1 g / l in comparison with the control and 4,7 compared with the group grown at a planting density of 20 pcs / m^2, which indicates a high resistance of the body and adaptive capabilities at the stage of transfer to artificial conditions during quarantine.

The erythrocyte sedimentation rate (ESR) was in the range of 1.75-4.50 mm /h, the highest value of this indicator was recorded in the control group, the lowest - at the normative planting density, cholesterol and lipid parameters were characterized by values of the same order, which was confirmed statistically. no significant differences were found in hemoglobin level.

Table 1 *Biological norms of cultivation in the highperformance systems*

p/p	Process	Indicators
maintenance of individuals Cherax quadricarinatus		
1	IBC-based energy-efficient aquaponic system module	up to 0.5 - 0.7 m^3
2	Water temperature, ^0C	26
3	pH	7.4
4	O, mg / L	6.5
5	amount of water losses and topping,%	25
landing density in the module of an energy-efficient aquaponic system based on IBC		
6	carp *: from 50 gr. <50 gr. <100 gr.	150 pcs / m^2 15 pcs / m^2
7	crayfish ** <1 g <5 g <45 g	up to 1000 pcs / m^2 up to 500 pcs / m^2 up to 200 pcs / m^2

*** food with protein content - 29.0%, ** food with protein content - 40.0%**

Conclusion The work established the possibility of efficient production of the proposed objects of tench (Tinca tinca) and Australian cancer (Cherax quadricarinatus) under certain conditions of living objects (table 4) in aquaponic systems.

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NOTES

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