ECONOMIC AND SOCIAL CHANGES:

FACTS, TRENDS, FORECAST

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Federal State Budgetary Institution of Science Vologda Research Center of the Russian Academy of Sciences (VolRC RAS) is the only unit of the Academy on the territory of the Vologda Oblast. The history of the Center started in 1990 from a Department of the Institute for Economic Studies of the Kola Science Centre of RAS on studying the problems of socio-economic development of the Vologda Oblast. Since then the Center has undergone manifold transformations. In 1993 it became an independent subdivision – the Vologda Scientific Coordinating Center of RAS. In 2009 it transformed into the Institute of Socio-Economic Development of Territories of RAS (ISEDT RAS).

In 2017 the socio-economic research was supplemented by agricultural issues. ISEDT RAS was joined by the Northwestern Dairy and Grassland Farming Research Institute, and was reorganized into the Vologda Research Center of the Russian Academy of Sciences.

In 2019 the Center continued expanding having launched the Laboratory of Bioeconomics and Sustainable Development within the framework of the national project "Science". The Laboratory is engaged in scientific research aimed at introducing biotechnologies into the practice of agriculture.

The VolRC RAS Director is Aleksandra A. Shabunova (Doctor of Economics). The Academic Leader of the Center is Vladimir A. Ilyin (RAS Corresponding Member, Doctor of Economics, Professor, Honored Worker of Science of the Russian Federation).

MAIN RESEARCH DIRECTIONS

In accordance with the Charter, the Vologda Research Center carries out fundamental, exploratory and applied research in the following fields:
- problems of economic growth, scientific basis of regional policy, sustainable development of territories and municipalities, and transformations of socio-economic space;
- regional integration into global economic and political processes, problems of economic security and competitiveness of territorial socio-economic systems;
- territorial characteristics of living standards and lifestyle, behavioral strategies and world view of different groups of the Russian society;
- development of regional socio-economic systems, implementation of new forms and methods concerning territorial organization of society and economy, development of territories' recreational area;
- socio-economic problems regarding scientific and innovative transformation activities of territories;
- elaboration of society's informatization problems, development of intellectual technologies in information territorial systems, science and education;
- development of scientifically based systems of dairy cattle breeding in the conditions of the North-Western region of Russia;
- development of new breeding methods, methods and programs for improving breeding work with cattle;
- development of scientifically based feed production systems, norms, rations and feeding systems for cattle in the conditions of the North-Western region of Russia;

- development of zonal technologies for the cultivation of agricultural crops;
- development of technologies for the creation, improvement and rational use of hayfields and pastures in the conditions of the North-Western region of Russia;
- development of technologies and technical means for agricultural production in the North-Western region of Russia;
- assessment of biodiversity in the North-Western region of Russia;
- development and implementation of biotechnologies in agricultural production;
- improvement of breeding methods and creation of new varieties of forage crops.

INTERNATIONAL TIES AND PROJECTS

VolRC RAS is actively developing its international activities. It is involved in joint international grant projects and regularly holds international conferences and workshops. The Center has Cooperation agreements and Memoranda of understanding with research organizations:

2007 – Cooperation agreement is signed with the Institute of Sociology of the National Academy of Sciences of Belarus , Center for Sociological and Marketing Investigations at the "International Institute of Humanities and Economics" (Belarus, 2008).

2008 – Memorandum of agreement is signed with Alexander's Institute at the Helsinki University (Finland, 2008).

2009 – Cooperation agreement is signed with Center for System Analysis of Strategic Investigations of NAS (Belarus, 2009).

2010 – Cooperation agreement is signed with the Institute of Economics of the National Academy of Sciences of Belarus (Minsk, Belarus, 2010).

2011 – Cooperation agreements are signed with National Institute of Oriental Languages and Civilizations (Paris, France, 2011), Institute of Business Economy at Eszterhazy Karoly College (Hungary, 2011), Republican research and production unitary enterprise "Energy Institute of NAS" (Belarus, 2011). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (China, 2011), Research and Development Center for Evaluation and Socio-Economic Development and the Science Foundation of Abruzzo region (Italy, 2011).

2012 – Cooperation agreement is signed with Center for Social Research at the Dortmund Technical University (Germany, 2012).

2013 – Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2013). July 2013 – The application for research performance by international consortium involving ISEDT RAS within the 7th Framework Programme of European Community.

2014 – Cooperation agreement is signed with Center for System Analysis and Strategic Research of the National Academy of Sciences of Belarus (Belarus, 2014). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (Mao Zhiyong, China, 2014), National Institute for Oriental Studies INALCO (Julien Vercueil, France, 2014).

2015 — Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2015). Cooperation agreement is signed with the Institute of Sociology of the National Academy of Sciences of Belarus (Belarus, 2015).

2016 — Cooperation agreements are signed with the Center for the Study of Industrialization Modes of the School of Advanced Studies in the Social Sciences (EHESS) (Paris, France, 2016); Institute of Philosophy, Sociology and Law of NAS RA (Yerevan, Armenia, 2016); Yerevan Northern University (Armenia, 2016), Yerevan State University (Armenia, 2016). Memoranda of understanding are signed with Jiangxi Academy of Social Sciences (China, 2016).

2018 — Cooperation agreements are signed with the Department of Agrarian Sciences of the National Academy of Sciences of Belarus (Belarus, 2018); the Republican Unitary Enterprise "Scientific and Practical Center of the National Academy of Sciences of Belarus for Agricultural Mechanization" (Belarus, 2018). Memorandum of understanding is signed with the European School of Social Innovation (ESSI) (Germany, 2018).

2019 — Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2019).

2020 — Memorandum of understanding is signed with Jiangxi Academy of Social Sciences (China, 2020).

CONTENT

EDITORIAL

© Ilyin V.A., Morev M.V.

Trends in Public Opinion Regarding the Effectiveness of Public Administration. Presidential Cycles 2000−2021

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Abstract. Since 2008, in the Editorial section of the journal, we have been monitoring the effectiveness of public administration; this helps us to analyze the consistent steps that the President makes in order to build new foundations of the Russian statehood, which was, in fact, completely destroyed in 1991. Besides, we assess the effectiveness of the President's decisions from the point of view of the broad strata of the Russian population (voters), whose opinion is one of the main criteria for the effectiveness of the public administration system and the work of the head of state. In order to form an objective and unbiased view of the events and processes taking place in Russia and abroad, we use assessments obtained from a wide range of specialists in various fields: political analysts, economists, sociologists, philosophers, representatives of civil society. No less important is our regular access to a significant number of statistical, sociological,

Russian and foreign databases; by using them comprehensively, we can look at the situation in the country and assess the effectiveness of public administration from the point of view of not only individual experts, but also voters. The main information source of sociological data in our research is the public opinion monitoring that we have been conducting in the Vologda Oblast since 1996. Regularly, once every two months, we carry out a survey covering 1.5 thousand residents of the region, thus obtaining an average annual "cross-section" of public opinion based on the estimates of nine thousand voters representing the main social strata and groups that differ in income, territory of residence, employment, marital status, education and many other socio-demographic characteristics. Due to a monitoring nature of the research, we can observe how, in the course of time, the events and decisions taken by the head of state are lined up in a clear, consistent, logically verified line, which many experts can see. But the majority of voters who observe "with the naked eye" the situation in the country and the actions of the authorities, do not see this line, because it is perceived on a subconscious and routine level, that is, based on the general opinion prevailing in their environment and stereotypes that people develop through their own life experience, the experience of relatives and friends (including negative life experience of the 1990s). This is why our editorial articles often supplement the analysis of latest events and processes in Russia and abroad with a retrospective look at the management decisions that preceded them. We pay special attention to the principle of historicism, and in this regard it is important for us to build a chronology of events. The current article is the last one in 2021; it briefly summarizes the analysis of public administration effectiveness in the context of Vladimir Putin's presidential terms, with an emphasis on the first four years of the fourth presidential cycle (2018−2021).

Key words: public administration effectiveness, monitoring, presidential cycles, public opinion.

A brief overview of the results of the work of the President of the Russian Federation and the system of public administration he created in the period from 2000 to 2018

During his first three presidential terms (2000–2018), Vladimir Putin managed not only to move the country away from the edge of the abyss after the collapse of the USSR and the period of the "turbulent" 1990s, but also to make it a key center of the multipolar world. This happened, among other things, due to the almost complete restoration of the military-industrial complex and bringing it to a new level, in line with the most advanced technologies of the 21st century; Russia's solid position in the foreign policy arena, effective participation of the Russian armed forces in international military campaigns. Vladimir Putin's Munich Speech in 2007, his speech at the Valdai Forum in 2013, the Crimean Spring of 2014, Russia's participation in the Syrian conflict (2016), the latest speech of the head of state at the Valdai Forum in October 2021 − all this is far from a complete list of the President's specific actions and public speeches that ensured a stable and consistent growth of Russia's geopolitical status.

In addition, we cannot but mention the successful energy policy of Russia: construction of main gas pipelines[1], active cooperation with OPEC

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[1] Main gas pipelines of Russia according to the chronology of the beginning of construction:
2010 − Nord Stream;
2015 − Power of Siberia;
2016 − Nord Stream 2;
2017 − TurkStream.

countries that control a significant share of world oil exports and reserves. In the first half of 2020 (during the first "wave" of the epidemiological crisis caused by the COVID-19 pandemic), as well as in the second half of 2021 (when the energy crisis in Europe flared up), the Russian Federation has clearly proven the global importance of national energy policy by confirming its informal status as an "energy superpower", which was once assigned to it by Secretary General of the World Energy Council Christoph Frei[2].

Naturally, the growth of Russia's international authority as a geo-political player could not suit the United States (and its allies), who are trying to preserve their power in a gradually transforming, but still unipolar, world. This led to a hybrid war against our country, which resulted in the creation of a stable background of anti-Russian sentiment in the West, especially after Crimea and Sevastopol became part of the Russian Federation in 2014 as a result of a nationwide referendum.

The stronger Russia became, the greater was the circle of unfriendly countries forming around it (thanks to the aggressive information foreign policy of the United States), including Eastern European states, Ukraine, Georgia... To the President, this could not but become an objective obstacle in solving many of the most important internal problems of the country.

Nevertheless, during the period from 2000 to 2018, the head of state managed to achieve significant results in the domestic political arena as

well. Perhaps his key achievements, according to many experts, were as follows: establishing a strong vertical system of state administration; bringing Russian civil society to a new level of development through, for example, decisions such as the establishment of the Civic Chamber (2005), the All-Russian Popular Front (2011), as well as regular appeals to the general population as the main "evaluators" of the effectiveness of the authorities and, in general, the implemented course of national development (during live televised phone-in programs, annual Addresses to the Federal Assembly, internal meetings with Government members, etc.).

What the President failed to do (in our opinion, based on the assessments of many experts) was to overcome negative consequences of the liberal-capitalist development vector, which Russia was pursuing after the collapse of the USSR. First of all, this concerns the ruling elites, among whom the system of "oligarchic capitalism" (which began to be built up under Boris Yeltsin[3]) has become stronger, and the "lack of spirituality" as **"an environment in which the ruling elite, who do not possess spiritual qualities, feels very good and comfortable, guided only by their immorality"**[4].

Along with objective external circumstances, the course of national development implemented by Vladimir Putin has long been hindered by the so-called "fifth" and "sixth" columns. And if the President managed to cope with the "fifth" column (non-systemic opposition) relatively successfully

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[2] The World Energy Council called Russia an energy superpower. *RIA-novosti*. March 24, 2019. Available at: https://ria.ru/20190324/1552060830.htmll

[3] See more in: lyin V.A. "Crony capitalism" – a source of social inequality in modern Russia. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2017, vol. 10, no. 6, pp. 9–23.

[4] Mamychenko A.V. *Replacement of the Elites. New People of the Creative State. Professional Parliament. Book* 2. P. 90.

[5] "The sixth column includes liberals in power, oligarchs and a significant, if not the main, part of the Russian elite, which, being formally loyal to the patriotic course of President Putin, is organically connected with the West and is immensely burdened by this course... (Source: Dugin A. Geopolitics of Novorossiya 7 years later. Official website of the Izborsk Club. April 9, 2021. Available at: https://izborsk-club.ru/20918*)*.

(especially after the adoption in 2021 of the law on restricting the right of extremist organizations to participate in elections), then the "sixth"[5] column continues to strengthen its position among Russia's ruling elites, largely due to the system of "oligarchic capitalism" it has created with its own hands.

The results of the activity of the "sixth" column can be seen only when "large" time series are analyzed. The results are barely perceptible, always accompanied by exemplary reporting to the President and Russian society through the mass media, but in fact they are deep, systemic, contrary to the nationally oriented course of development pursued by Vladimir Putin and, in our opinion, extremely negative.

We will list only some of them, which, in our opinion, are the most complex and important ones.

1. First of all, it is *poverty and inequality* — perhaps the main "sore spots" of a modern (post-Soviet) Russian society, which experts have been paying attention to for a long time and which the President himself recognized as "our main enemy ..., a threat to stable development, to the demographic future"[6].

Regular revisions of the methodology for calculating poverty; unpunished failure to achieve the targets laid down in the May Decrees and national projects[7]; specific reforms, such as the monetization of benefits (2005), and amendments to pension legislation (2018) — all this, unfortunately, is part of the public administration system created by the President of the Russian Federation, and leads to the fact that the problem of social injustice becomes dominant in public opinion assessments, and poverty acquires special, specific features that determine its relevance compared to the situation in developed countries.

M.K. Gorshkov: **"The problem of social injustice and inequality ranks first in the list of social contradictions... Over 25 years of reforms, it has penetrated into all the pores of society and has become typical of the relations in almost all social segments.**

Poverty and injustice in Russia are associated with the group of the working poor. In the developed countries, in general, these terms are incongruous, they cause confusion: "How can you be poor if you work?... If a person works, by definition they cannot be poor". But they can in our country...

What can hinder us on the way to this bright future? First of all, an extremely low level of governance in the country. The managerial culture is bad: the volume of inadequately made decisions is large, there is a lack of miscalculation of the consequences (social, political, moral and psychological) of the decisions made.

Today, the key contradiction in Russia is not even the contradiction between the rich and poor, but **the contradiction between the need for qualitative growth of the public administration system at all levels,** the need for professional decision-making with a calculation of its variant consequences, **and the actual level of governance, which is demonstrated today by both federal and regional bodies"**[8].

[6] Vladimir Putin's speech at a meeting with deputies of the State Duma of the eighth convocation. *Official website of the President of the Russian Federation*. October 12, 2021. Available at: http://www.kremlin.ru/events/president/transcripts/66905

[7] See more in: Ilyin V.A., Morev M.V. "Intellectual feebleness" of the ruling elites and the "deep people" of the "long state". *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2019, vol. 12, no. 2, pp. 9–35.

[8] Gorshkov M.K. "Injustice and poverty are felt equally acutely" (an interview to the newspaper *Kultura*, June 8, 2017). Available at: https://portal-kultura.ru/articles/person/162230-mikhail-gorshkov-my-znaem-obshchestvo-v-kotorom-zhivem/

"In 2020, real disposable incomes decreased by 2.8% by 2019, the accumulated decline by 2013 – the point of the absolute post-Soviet maximum – has reached 9.7%. The average disposable income in constant prices last year did not even reach the level of 2010, so, **judging by income statistics, the past seven years appear to be lost for the Russian consumer"**[9].

According to official statistics, the number of Russians living below the poverty line, in fact, has not changed over the past eight years *(Fig. 1)*.

At the same time, in 2006–2020, the number of dollar billionaires in Russia increased from 60 to 102 people, and their welfare increased from 153 to 278 billion dollars *(Tab. 1)*. Even during the pandemic, which had a comprehensive negative impact on

Figure 1. Number of population with monetary incomes below the subsistence level

Population with monetary incomes below the subsistence level, million people
Population with monetary incomes below the subsistence level, % of the total population
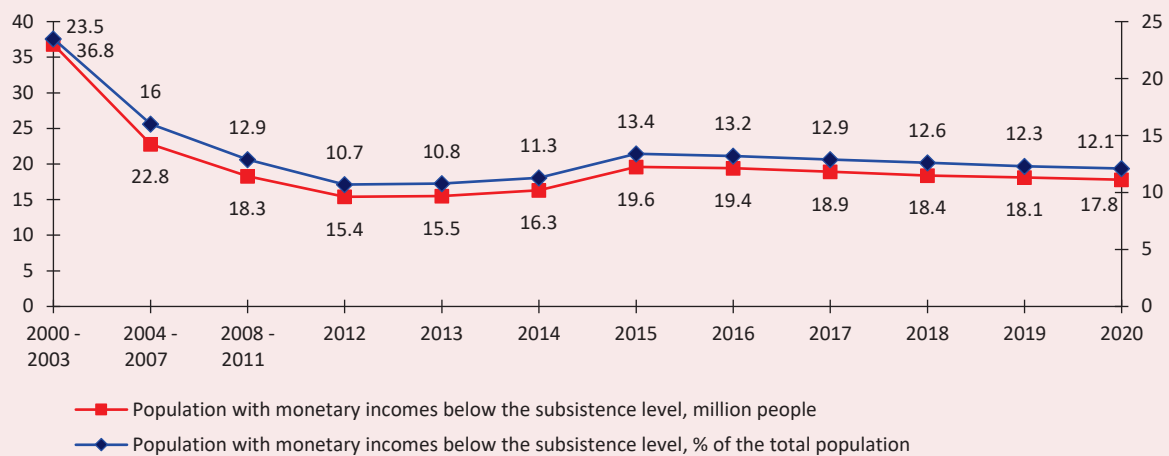
* 2000–2003: Vladimir Putin's first presidential term. 2004–2007: Vladimir Putin's second presidential term. 2008–2011: Dmitri Medvedev's presidential term.
Source: Federal State Statistics Service.

Table 1. Dynamics of the number and fortune of Russian dollar billionaires

Number/fortune		2006	2012	2018	2019	2020	2020 to 2006, %	Average annual data for 2006–2020
Number, people		60	110	106	100	102	1.70	89
Fortune	billion USD	337.3	426.8	417.7	425.1	392.3	1.16	367.4
On average per billionaire		5.6	3.9	3.9	4.3	3.8	0.7	4.1
Fortune	billion rubles*	9168.4	13269.2	26189.8	27504.0	28371.1	3.09	16335.9
On average per billionaire		152.8	120.6	247.1	275.0	278.1	1.82	177.6

* The fortune indicated in *Forbes* in US dollars has been converted into rubles at the exchange rate set by the Bank of Russia.
Sources: *Forbes*; VolRC RAS calculations.

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[9] Misikhina S. Features of national consumption. *Ekspert*, 2021, November 15. Available at: https://expert.ru/expert/2021/47/osobennosti-natsionalnogo-potrebleniya/

Table 2. Comparative analysis of the amount of dividends and own revenues of consolidated budgets of the regions, in which the corporations are located, average for 2015–2019

Indicator	PAO Severstal (Vologda Oblast)	Magnitogorsk Iron & Steel Works PJSC (Chelyabinsk Oblast)	PAO NLMK (Lipetsk Oblast)
Dividends to the main shareholder, billion rubles	68.4	32.9	71.6
Own revenues of the region's consolidated budget, billion rubles	65.3	154.2	55.5
Ratio of dividends to the main shareholder to the own revenue of the region's consolidated budget (Item 1 to Item 2), %	104.7	21.3	129.0
Source: calculated according to the accounting statements of corporations and the statements of the Federal Treasury of the Russian Federation.			

the state of the Russian economy, the number of dollar billionaires in Russia continued to increase: according to Forbes, in 2021, the number of dollar billionaires in the country increased from 98 to 117 people[10].

In some system-forming corporations (PAO Severstal, PAO NLMK), the amount of dividends of the main shareholders exceeds the own revenues of consolidated budgets of respective regions *(Tab. 2)*.

All this suggests that at the legislative level there emerge conditions for a purposeful "separation" of the stratum of super-rich people from a significant proportion of Russians with low and medium incomes, that is, in fact, for increasing inequality.

2. The second important problem that we would like to draw attention to is *the transformation of the education system into a service sector*; as a result, the educational element was lost, there was a sharp decline in the authority of the teacher as a mentor and educator. The long-lasting consequence is that the new, younger generations of Russians "can no longer succeed without abandoning moral guidelines"[11].

"The decline in secondary and higher education is a direct consequence of cultivated inequality in all spheres of life. Young scientists have to work in laboratories and workshops for only about 20 thousand rubles a month. And all sorts of top managers receive an official salary of about several hundred thousand or million rubles. **This injustice, among other things, leads to the degradation of our science, school education, culture and the general level of relations…**

The trouble is that the majority of today's schoolchildren do not want to study, they do not read literature, are not interested in poetry or the exact sciences. And it's not enough just to urge them to learn! **In reality, they see other examples: one achieves welfare and success not by virtue of knowledge, but in spite of it. The most boorish, out-of-control, but able to adapt and fulfill any orders of the authorities, have more chances to achieve something than the "nerds" with intelligence and knowledge. And in general, the richest people today are football players and mixed martial arts fighters, corrupt officials and code-bound thieves.**

All this is largely a consequence of the fact that the status of the teacher has declined significantly over the past decades. The profession itself has ceased to be prestigious and worthy. It is not the promises of the authorities that shape the attitude toward teachers and toward education, but the real life that we observe every day"[12].

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[10] Forbes – 2021 Rating. Available at: https://www.forbes.ru/milliardery-photogallery/425573-20-stran-s-naibolshim-kolichestvom-milliarderov-2021-reyting-forbes

[11] Gorshkov M.K., Sedova N.N. "Self-sufficient" Russians and their life priorities. *Sotsiologicheskie issledovaniya*, 2015, no. 12, pp. 4–16.

[12] Bitsoev S. The collapse of education in Russia: Why the prestige of the teaching profession has fallen. *Moskovsky komsomolets*. November 19, 2019. Available at: https://www.mk.ru/social/2019/11/19/krakh-obrazovaniya-v-rossii-pochemu-upal-prestizh-professii-uchitelya.html

Recently, there have been more and more calls to "revive the Soviet school of education, abolish the Unified State Exam, bachelor's degree system, specialty system..."[13]. However, so far this task seems unrealizable[14].

The results of our monitoring of public opinion clearly show the vector of evolution of spiritual and moral development in the conditions of market transformations, including those taking place during Vladimir Putin's presidential terms. Over the past 20 years, there has been an increase in the proportion of people who do not care about empathy in society, sensitivity toward others (by 9 p.p.), self-esteem, high professionalism (by 7 p.p.), respect for the team (by 6 p.p.), performance of their official duties (by 5 p.p.), honesty, decency, charity, mutual assistance, law-abidance, respect for parents and loved ones (by 4 p. p.), etc. *(Tab. 3)*.

During the same period, there has been an increase in the proportion of people who tolerate and have nothing against such phenomena and qualities as laziness (by 22 p.p.), the desire to work less and get more (by 16 p.p.), conceit and arrogance (by 12 p.p.), sycophancy and servility (by 9 p.p.), disrespectful attitude toward women (by 7 p.p.), drug addiction (by 6 p.p.), embezzlement, bribes, frivolous attitude toward children (by 3–4 p.p.; *Tab. 4*). The increase in the proportion of such people seems insignificant, but the process of transformation of spiritual and moral values is of a long and evolutionary nature; therefore, first of all, in this case, its vector is important.

Table 3. Importance of moral qualities, % of respondents*

Phenomena / actions	Important			Not important		
	1996	2020	Dynamics (+/–), 2020 to 2000	1996	2020	Dynamics (+/–), 2020 to 2000
Responsiveness, sensitivity to other people	86.5	78.1	–9	13.6	21.9	+9
Self-esteem	91.2	84.5	–7	8.7	15.5	+7
High professionalism	85.3	78.5	–7	14.7	21.5	+7
Respect for the team	85.9	80.9	–6	14.1	19.1	+6
Performance of official duties	87.8	82.6	–5	12.2	17.4	+5
Honesty, truthfulness	92.9	86.2	–4	7.1	13.8	+4
Tolerance, respect for the views and opinions of others	86.7	79.0	–4	13.3	21.1	+4
Respect for parents, loved ones	93.3	88.4	–5	6.8	11.5	+4
Decency	93.7	87.1	–4	6.3	13.0	+4
Mutual assistance and mutual support	88.1	80.6	–4	11.9	19.4	+4
Compliance with laws, law-abiding behavior	80.6	77.0	–4	19.3	23.0	+4
Respect for someone else's (private, state) property	78.3	75.2	–3	21.8	24.8	+3
Showing compassion, mercy	80.4	76.0	–3	19.6	23.9	+2

* Ranked according to the decrease in the proportion of people for whom the above-mentioned moral qualities are unimportant.
The wording of the question: "People evaluate different life phenomena in different ways. To some, one thing is important, to others – another… Which of the following is important to you and which is not?" In total, there are 18 possible answers to the question.
Here and further, when presenting the results of the public opinion monitoring, we use average annual data calculated as an average of six polls conducted during the year.

[13] Opinion of the Chairman of the Investigative Committee of the Russian Federation A. Bastrykin (Source: Bastrykin called the Unified State Exam torture for young people and proposed to cancel it. *RBK*. November 23, 2021. Available at: https://www.rbc.ru/society/23/11/2021/619ce0d39a794724b788912c).

[14] Opinion of the Head of Rosobrnadzor A. Muzaev (Source: Rosobrnadzor estimated the probability of cancellation of the Unified State Exam by 2030. *RBK*. March 5, 2021. Available at: https://www.rbc.ru/rbcfreenews/6041cb5c9a7947726e7d022a).

Table 4. People's attitude toward negative moral phenomena and actions, % of respondents*

Phenomena / actions	Unacceptable			Acceptable, quite normal		
	1996	2021	Dynamics (+/–), 2021 to 1996	1996	2021	Dynamics (+/–), 2021 to 1996
Laziness	66.3	48.9	-17	22.3	44.4	+22
Desire to work less and earn more	52.4	40.1	-12	36.1	52.5	+16
Arrogance, conceit	79.4	69.8	-10	10.9	22.5	+12
Sycophancy, servility	81.8	72.3	-10	9.0	18.2	+9
Disrespectful attitude toward women	88.0	80.0	-8	5.6	12.8	+7
Drug addiction	92.5	87.7	-5	2.0	7.8	+6
Frivolous attitude toward family and children	90.2	87.3	-3	3.9	8.3	+4
Embezzlement	85.0	80.4	-5	7.8	11.5	+4
Bribes	80.4	76.6	-4	10.7	13.7	+3

* Ranked by the decrease in the proportion of people for whom the above phenomena and actions are acceptable and quite normal.
The wording of the question: "Please express your attitude toward the following phenomena ..." In total, there are 15 possible answers in the question.

3. The third urgent problem, in our opinion, is **modernization of the healthcare system**, which began in 2010, since the adoption of the law on compulsory medical insurance, carried out under the leadership of T. Golikova, who after almost 10 years (at the end of 2019) admitted that "optimization was carried out unsuccessfully in many Russian regions"[15].

The results of the so-called optimization of healthcare are disappointing and, by and large, represent a very significant threat to national security (which was especially evident amid the COVID-19 pandemic). During the period from 2010 to 2019, the number of hospital beds in Russia decreased from 93.8 to 80.0 per 10 thousand people, and compared to 2000 – from 115.0 to 80.0 per 10 thousand people[16].

In 2010–2018, the share of healthcare expenditures in Russia was slightly more than 3% of GDP; for comparison, in the USA, Germany, and the UK, the figure was 8–9%[17].

For the period from 2010 to 2019, life expectancy in Russia was 71.1 years. For comparison: in the USA – 78.7 years; in China – 75.7 years; in Germany – 80.7 years; in the UK – 81 years[18].

"The current extinction of Russia is not only the result of the "optimization" of healthcare and the new coronavirus infection, due to which many people, our fellow citizens, have lost access to timely and qualified medical care; it is also the result of the socio-economic situation that has developed in our country as a whole"[19].

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[15] Golikova acknowledged the optimization of healthcare in the regions as unsuccessful. *RBK*. November 3, 2019. Available at: https://www.rbc.ru/society/03/11/2019/5dbecba99a79470b57a29e69

[16] *Russian Statistical Yearbook – 2020*. Available at: https://gks.ru/bgd/regl/b20_13/Main.htm

[17] World Bank database. Available at: https://data.worldbank.org/indicator/SH.XPD.GHED.GD.ZS?view=chart

[18] World Bank database. Available at: https://data.worldbank.org/indicator/SP.DYN.LE00.IN?view=chart

[19] Delyagin M.G. The situation in the financial system of Russia is unacceptable. *Zavtra*. November 24, 2021.

The President's targets assume an increase in the growth rate of life expectancy and the achievement of the indicator of 78 years by 2030[20]. However, so far, the actual situation is completely the opposite: in 2020 alone, life expectancy in Russia decreased by almost two years (from 73.3 to 71.5 years)[21]. Of course, this is partly due to the COVID-19 epidemic, but in any case, it proves that the healthcare system was not prepared for this challenge.

4. Finally, the fourth negative aspect that deserves attention is ***Russia's lagging behind in the development of scientific and technological potential, that is, in fact, lagging behind in the main factor that determines the future for decades to come.***

We agree with Vladimir Putin's statement that "Today knowledge, technology and expertise make the most important competitive advantages. They are the key to a real breakthrough and improved quality of life"[22].

However, the real processes and decisions taken in the field of science and technology development clearly contradict this thesis. First of all, this concerns the 2013 reform of the Russian Academy of Sciences, which the academic community

A.M. Sergeev: "One can't improve everything at the same time. Without the leaders, without the beacons to guide the way, nothing can be improved. **The country should have a system for training the scientific and technological elite; there should be places where one has to take it to the extreme limit to study there. As, in fact, it should be: we must give it one hundred and ten percent; studying is not just having fun.** I communicate a lot with the teaching staff. **There is dissatisfaction with those means of social mobility, those paths that should help gifted and motivated children to join the scientific and technological elite. Indeed, in the 2030s, they will hold leading positions in the country, in science, in education, in technology...**

Our country lacks an effective innovation system that could turn our knowledge into our technology. And just like that, you can't extract profit from fundamental science at the expense of scientists themselves"[23].

described as follows: "a huge mistake"[24], "a powerful blow to scientists and to innovation development of the Russian economy"[25], "an extremely costly and unpromising reform"[26].

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[20] "On the goals of national development until 2030", June 21, 2020. *Official website of the President of the Russian Federation*. Available at: http://www.kremlin.ru/events/president/news/63728

[21] Federal State Statistics Service database. Available at: https://www.fedstat.ru/indicator/31293

[22] Vladimir Putin's Address to the Federal Assembly of the Russian Federation. March 1, 2018. *Official website of the President of the Russian Federation*. Available at: http://www.kremlin.ru/acts/bank/42902/page/1

[23] Sergeev A.M. In the USSR, there was a different attitude toward scientists. Sad thoughts in the festive year. *Argumenty nedeli*, 2021, November 9. Available at: https://argumenti.ru/society/2021/11/746025

[24] A.I. Miroshnikov (Academician, Doctor of Sciences (Chemistry), member of the Presidium of the Russian Academy of Sciences, member of the Department of Biological Sciences of RAS Section of Physico-Chemical Biology). Source: Academics consider the scandal related to the election of the president of the Russian Academy of Sciences a "disgrace". *Kommersant*. March 27, 2017. Available at: http://kommersant.ru/doc/3254105

[25] G.B. Kleiner (RAS Corresponding Member, Doctor of Sciences (Economics), Member of the Department of Social Sciences of RAS Economics Section, deputy director of RAS Central Economics and Mathematics Institute). Source: Ibidem.

[26] Polterovich V.M. The reform of the Russian Academy of Sciences: Expert analysis. *Obshchestvennye nauki i sovremennost'*, 2014, no. 1, p. 26.

Table 5. Dynamics of research and development costs, % of GDP

Country	2000	2010	2018	Dynamics (+/–) 2018 to ...	
				2010	2000
China	0.89	1.71	2.14	+0.43	+1.25
Germany	2.41	2.73	3.13	+0.4	+0.72
UK	1.62	1.65	1.70	+0.05	+0.08
Russia	1.05	1.13	0.98	−0.15	−0.07
USA	2.63	2.74	2.83	+0.09	+0.2
Source: World Bank. Available at: https://data.worldbank.org/indicator?tab=all					

Among the less noticeable, but no less negative decisions in the field of science we can name the following: unification of the Russian Foundation for Humanities and the Russian Foundation for Basic Research, the major Russian funds that finance scientific research (2016); "Westernization" of domestic science, when funding leaves the academic sector, being redistributed to universities and newly created development institutions[27], and often without taking into account the spatial aspect (needs and opportunities of territories); M. Kovalchuk's proposal, which is discussed today and which is aimed at reformatting the scientific potential of the Russian Federation and unite scientific and scientific-and-educational organizations into five clusters "in accordance with the tasks they face"[28]; President of the Russian Academy of Sciences A.M. Sergeev called this proposal "untimely", noting that "when decisions are made that are not discussed with the scientific community, it is perceived extremely painfully... We must think about how to make sure that scientists themselves are involved in the decision-making process, rather than how to move from one place to another. Here we believe that there is a certain flaw on the part of the authorities"[29].

These and many other measures lead to the fact that Russia is lagging increasingly behind its geopolitical competitors in terms of scientific and technological potential *(Tab. 5)*.

These system-wide negative processes have been going on for a long time; they accompany the work of Vladimir Putin as President of the Russian Federation. They lead to three consequences for the Russian statehood: destabilization of the domestic social situation (lack of tangible dynamics of improving the standard of living and quality of life becomes the main "claim" of society to the state and to Vladimir Putin personally); Russia's lagging behind in key development indicators in the international arena (which is a direct threat to national security in the context of the emerging multipolar world), and moral "decomposition" deep within Russian society (we agree with Defense Minister Sergei Shoigu who described it as "a more terrible part than external threats" in August 2021[30]).

Thus, throughout all Vladimir Putin's presidential terms, his policy was filled with contradictions between the positive results he himself has achieved in the external political arena and the systemic failures to implement his specific instructions, goals, and tasks formulated in the May Decrees and national projects in the internal life of the country.

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[27] Pisarev D. Is there life in RAS? *Nezavisimaya gazeta*. December 2, 2020. Available at: https://www.ng.ru/nauka/2020-12-02/100_184401122020.html

[28] RAS academicians demanded to stop Mikhail Kovalchuk from "destroying the scientific space of Russia". Available at: https://theins.ru/news/238020

[29] Interview with A.M. Sergeev, February 9, 2021. *Troitskii variant — Nauka*, 2021, no. 3 (322).

[30] Sergei Shoigu's speech at the panel discussion of the All-Russian Youth Educational Forum "Territory of Meanings" (August 2021). Available at: https://zavtra.ru/events/shojgu_nazval_strashnejshuyu_ugrozu_dlya_rossii

Public administration system in the face of internal and external challenges in 2019—2021

The 2019—2021 period for Russia was full of large-scale international and domestic events. In many ways, it has become a real test of strength for the entire system of public administration that Vladimir Putin has been creating over the previous 18 years.

Russia faced *the year 2019* in the context of the already adopted amendments to the pension legislation (since January 1, 2019) and the national projects that are traditionally[31] "stalled". The consequences were clearly manifested in the results of the single voting day held on September 8, 2019. Despite the fact that either representatives of United Russia or self-nominated candidates whom the party actively supports won in all regions, the party in power failed to reverse the trends that were noted in previous federal and regional elections: in 2019, the number of those who voted for United Russia in the election to the legislative bodies decreased by 1.7 million in comparison with 2018, and by 2.9 million people — in the election of heads of regions[32]. **Thus, the past elections have shown that people are not satisfied with the state of affairs in the country, but they understand that today Russia has no other feasible alternative (except for the course of national development pursued by the President).**

Amid growing anxiety and "disappointment and irritation" from unrealized expectations, the President of the Russian Federation and the public administration system faced two global external challenges *in 2020*.

The first one is the COVID-19 pandemic announced by the World Health Organization on March 11, 2020. The coronavirus epidemic, which still remains undefeated, has not only changed the world in all forms of its organization (from international political relations to the daily life of each individual), but has also clearly shown the results of modernization processes in the healthcare system.

It is no coincidence that according to the latest data from the World Health Organization (as of November 1, 2021), Russia ranked 5th in the world in terms of the number of coronavirus cases and deaths *(Tab. 6)*. At the same time, over the year (from November 1, 2020 to November 1, 2021), the number of COVID-19 cases in Russia increased fivefold, and the number of deaths — eightfold (that is, more than in the leading countries: the USA, India and Brazil).

Table 6. Countries leading in the total number of reported COVID-19 cases (as of November 1, 2021)

Country	Data as of November 1		Growth 2021 to 2020 (times)
	202	2021	
Total number of cases			
USA	10016321	46146676	4,6
India	8507754	34355536	4,0
Brazil	5631181	21862458	3,9
UK	1206500	9272070	7,7
Russia	1774334	8795095	5,0
Deaths			
USA	243943	747957	3,1
India	126121	460791	3,7
Brazil	162015	609060	3,8
UK	48888	141743	2,9
Russia	30537	246814	8,1

Source: World Health Organization. Statistics on the spread of coronavirus in the world. Available at: https://covid19.who.int/table

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[31] See more in: lyin V.A., Morev M.V. Nationally oriented rotation of the elites — the most important condition for the implementation of national projects. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2019, vol.12, no. 4, pp. 9—25.

[32] See more in: Ilyin V.A., Morev M.V. The 2018—2019 regional election: Voters' trust in the authorities continues to decline. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2019, vol. 12, no. 5, pp. 9—24.

The second external challenge that Russia faced in 2020 was of a geopolitical nature. In May 2020, at the Davos Forum, the beginning of the Great Reset policy was announced, and its leader is the US President J. Biden[33]. The purpose of the Great Reset was to restore the dominance of global political and economic elites over the power that is gradually slipping out of their hands; to slow down the process of transition from a unipolar to a multipolar world as much as possible.

To this end, the process of purposeful erosion of universal spiritual, moral and cultural values has intensified (especially in the United States and European countries); the aggressive nature of foreign and anti-Russian policy has become more pronounced, since Russia and China, the two countries with nuclear potential and a high level of development of national culture (i.e. the countries that can become cultural centers of a multipolar

> **"In the modern world, the United States has only two serious enemies – China and Russia...** Ideological confrontation with our country is very important for Washington. **Russia has become the "other" state that American propaganda endows with the most negative features.** As for China, it is a serious competitor in the economic sphere"[34]. **"...China will remain an economic rival, Russia – an enemy..."**[35].

world), have turned out to be the main obstacles to global forces.

At the same time, China is coping more effectively with negative effects of the COVID-19 pandemic and has higher GDP growth rates, which, according to experts, will allow it to overtake the United States and become the top economy in the world by 2030 *(Tab. 7)*. By this time, Russia

Table 7. The rating of countries by level of economic development (CEBR forecast)*

Country	2010		2020		2030	
	GDP billion USD (in constant prices)	Rank	GDP billion USD (in constant prices)	Rank	GDP billion USD (in constant prices)	Rank
China	6.762	2	14.059	2	26.365	1
USA	16.801	1	19.685	1	23.822	2
India	1.915	9	2.453	6	4.909	3
Japan	6.388	3	4.646	3	4.788	4
Germany	3.813	4	3.577	4	3.866	5
UK	2.777	6	2.496	5	3.415	6
France	2.967	5	2.414	7	2.782	7
Brazil	2.475	7	1.290	12	2.095	8
Canada	1.813	11	1.514	9	2.035	9
Russia	**1.830**	**10**	**1.385**	**11**	**1.993**	**10**

* Ranked by the ranking of countries in 2030; total number of countries is 193.
Source: WORLD ECONOMIC LEAGUE TABLE 2021 A world economic league table with forecasts for 193 countries to 2035 December 2020, 12th edition. Annual report by the Centre for Economics and Business Research (CEBR).

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[33] See more in: Ilyin V.A., Morev M.V. Where does the soullessness of the ruling elites lead? *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2021, vol. 14, no. 2, pp. 9–28.

[34] Polonskii I. Who is the main enemy of the United States: China or Russia? *Voennoe obozrenie*. October 11, 2018. Available at: https://topwar.ru/148186-kto-glavnyj-vrag-ssha-kitaj-ili-rossija.html

[35] Opinion of national security specialist Prof. D. Yonchev (source: US election results: Russia is an enemy, China is a rival, Europe is a competitor. *Information webite Inosmi.info*. November 7, 2020. Available at: http://www.inosmi.info/itogi-vyborov-v-ssha-rossiya--vrag-kitay--sopernik-evropa--konkurent-bnr.html).

will have ranked only 10th in terms of economic development. This clearly does not correspond to the goals of "Russia's joining the top five world economies" (which was indicated by the President in the May 2018 Decrees, but, apparently, it was fairly and objectively deleted from the decree "On national development goals through to 2030").

Thus, without finally solving the complex of internal problems that accumulated in 2018−2019 (and, by and large, continued throughout the 2000s), in 2020 the President once again found himself facing a number of external and internal force majeure circumstances that require cardinal and quick solutions.

Such a decision was Vladimir Putin's initiative to amend the Constitution of the Russian Federation, which he announced during his Address to the Federal Assembly of the Russian Federation on January 15, 2020, even before the pandemic and the Great Reset were officially announced (which once again underlines the President's strategic foresight). This step made it possible to consolidate Russian society around traditional spiritual and moral values, as well as the values of a welfare state (which was Russia's response to the Great Reset), and strengthen the system of public administration by distributing powers and responsibilities among its various institutions and changing the deeply liberal Government of D. Medvedev, which was gradually arousing public discontent, to the largely technocratic, but professional Government of M. Mishustin.

In addition, the initiative to change the Basic Law of the country helped to relieve tension in society and in political circles about the transit of presidential power, that is, the possibility of Vladimir Putin's leaving the post of head of state in 2024 in accordance with the 1993 Constitution of the Russian Federation. The so-called "Tereshkova amendment" turned out to be the most vulnerable point in the President's initiative to change the Basic Law; however, in the existing external and internal political conditions, the positive effect of this amendment turned out to be much more significant than the negative consequences of "targeted" protest actions organized by the non-systemic opposition[36].

At the All-Russian referendum on amendments to the Constitution, held from June 25 to July 1, 2021, 78% of voters, or about 58 million people, voted for changing the Basic Law of the country *(Tab. 8)*. Thus, the voters once again gave a credit of confidence to the President and to the course of national development he is pursuing. Moreover, the Russians' support for the amendments to the Constitution turned out to be even greater than the support for Vladimir Putin himself in all the presidential elections in which he participated.

Table 8. Dynamics of support for Vladimir Putin in the RF presidential elections
and the All-Russian vote on amendments to the Constitution

The number of votes cast for V.V. Putin / amendments to the Constitution	RF Presidential election				All-Russian vote on amendments to the Constitution
	March 26, 2000	March 14, 2004	March 4, 2012	March 18, 2018	July 1, 2020
% of the number of voters	52.94	71.31	63.60	76.69	77.92
Million people	39.74	49.56	45.60	56.42	57.75

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[36] For a more detailed analysis of the content of amendments to the Constitution and their significance, see the article: Ilyin V.A., Morev M.V. Another step toward V. Putin's "Long State". *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz,* 2020, vol. 13, no. 1, pp. 9−33.

At the same time, Russian society has again expressed dissatisfaction with the state of affairs in the country. This is evidenced by the fact that in 47 out of 86 RF constituent entities, the share of votes against amendments to the Constitution was higher than the national average (21.27%), and in regions and large cities with backbone enterprises[37], 1.5 million fewer people voted for the amendments to the Basic Law initiated by the RF President than for Vladimir Putin in the 2018 presidential election.

Thus, the President's initiative to strengthen social obligations of the state and the traditional spiritual and moral values proclaimed by the new Constitution of the Russian Federation helped to reduce the negative psychological effects of the situation of uncertainty caused by the first "waves" of the COVID-19 epidemic and by the "wave" of destruction of traditional spiritual and moral values, actively coming from the West.

But, as many experts noted, "it was not possible to consolidate Russian society around the amendments to the Constitution. The result is obvious, but there is no solid support"[38], since it did not affect in any way either the standard of living and quality of life or people's subjective feeling of the positive dynamics of their change.

In 2021, against the background of events such as the personal meeting of the presidents of Russia and the United States in Geneva (June 16), as well as the withdrawal of NATO troops from Afghanistan (August), the degree of anti-Russian sentiment has somewhat decreased. Moreover, the United States, the system of liberal capitalist values it personifies, and President Biden himself were increasingly criticized.

Thus, in 2021, the conditions were relatively favorable (at least compared to 2020) for the President to focus attention on Russia's internal problems once again. In our opinion, Vladimir Putin's most important decisions of this year included a **decree that banned extremist organizations from participating in elections (June 4, 2021)**[39] (which effectively nullified the possibility of the "fifth column" to destabilize the situation in the country[40]); **as well as the signing of a new National Security Strategy (July 2, 2021)[41],** in which (as experts noted) for the first time we observe that the system of national values or moral and spiritual values was "prominently marked" ... "ideological leadership, which is necessary in the world"[42] is pointed out as a separate priority.

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[37] The study sample included 14 regions and 17 cities (regional capitals and some large cities), on the territory of which major, systemically important companies for the Russian economy are located (such as Norilsk Nickel, NLMK, Kovatek, Severstal, Lukoil, Metalloinvest, MMK, Evraz, PhosAgro, Acron, Rusal, Severalmaz, Polymetal). See more in: Ilyin V.A., Morev M.V. Announced in 2018, V. Putin's "decisive breakthrough" is now stuck. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2020, vol. 13, no. 5, pp. 22–54.

[38] Constitutional prologue to the future. *Ekspert*, 2020, no. 28, July 6–12.

[39] See Federal Law 157-FZ, dated June 4, 2021 "On amendments to Article 4 of the Federal Law "On basic guarantees of electoral rights and the right to participate in a referendum for citizens of the Russian Federation" and Article 4 of the Federal Law "On elections of deputies of the State Duma of the Federal Assembly of the Russian Federation".

[40] See more in: Ilyin V.A., Morev M.V. Voters supported the President: On the results of the election to the State Duma of the eighth convocation. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2021, vol. 14, no. 5, pp. 9–33.

[41] See more in: Ilyin V.A., Morev M.V. National Security Strategy – 2021: Positive experiences and conflicting expectations. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2021, vol. 14, no. 4, pp. 9–32.

[42] Opinion of Director of the Center for Military-Political Studies of MGIMO A. Podberezkin (source: Experts assessed the changes in the national security strategy signed by Putin. *RBK*. July 3, 2021. Available at: https://www.rbc.ru/politics/03/07/2021/60e0a1c79a7947a36edadc3d

These and some other[43] steps taken by the President (including the draft law "On the general principles of organization of public power in constituent entities of the Russian Federation", which is currently under discussion and which assumes the subordination of all public power directly to the head of state), became a logical continuation of his Address to the Federal Assembly of the Russian Federation in 2018 and the initiative to amend the Constitution of the Russian Federation in 2020. **Together, they made it possible to outline the boundaries and vector of the ideological course of national development, according to which Russia will have to develop under Vladimir Putin's presidency, that is, potentially in the next 15 years.**

Moreover, these boundaries were outlined not only for the majority of the country's citizens, who are still in a state of uncertainty about the future due to the pandemic and the stalling implementation of national projects, but also for the ruling elites, who continue to increase their personal welfare, despite the decline in the economy and the level of incomes of the population in the context of the epidemiological crisis.

However, as experts warned in 2016, "no patriotic upsurges solve any pressing socio-economic problems"[44]. And this was clearly manifested in the election to the State Duma of the Russian Federation held on September 17—19, 2021.

> **"The main issues of concern to Russian society are internal ones.** They were and remain as follows: standard of living and quality of life, eliminating social inequality, achieving social justice, fighting corruption, improving the efficiency of social institutions, the ability of ordinary citizens to use their services, finding solutions to the most pressing everyday problems... **These issues have remained unresolved for many years,** which largely caused the "euphoria" after the events of 2013–2014. However, **if the internal problems are not solved, then positive trends in public opinion are, to put it mildly, unstable"**[45].

During the voting, the United Russia party in power (despite the newly obtained constitutional majority in parliament) lost about 5% of the votes, **and in general over the past 14 years (from 2007 to 2021) — almost 15% (or 17 million) votes[46].** This fact is no less vivid characteristic of the President's activity than the "Crimean spring" or the adoption of a new, socially oriented Constitution.

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[43] See more in: Ilyin V.A., Morev M.V. National Security Strategy — 2021: Positive experiences and conflicting expectations. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2021, vol. 14, no. 4, pp. 9—32.

[44] Ershov Yu.G. R. Collins on the collapse of the Soviet Empire: Instructive conclusions. *Sotsium i vlast'*, 2016, no. 4, p. 118.

[45] Ilyin V.A., Morev M.V. A new stage of Russian history: Trends, specifics and prospects. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2015, no. 2 (38), pp. 42—71.

[46] See more in: Ilyin V.A., Morev M.V. Voters supported the President: On the results of the election to the State Duma of the eighth convocation. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz*, 2021, vol. 14, no. 5, pp. 9—33.

After the parliamentary election, in October 2021, Russian President Vladimir Putin noted that low incomes of Russians are "our main enemy and a threat to stable development, to the demographic future"[47]. **In our opinion, the fact that the President himself recognizes that the public administration system he created does not solve internal problems effectively is the most objective assessment of the contradictory results of his work.**

Moreover, the data of official electoral statistics are confirmed by the dynamics of people's subjective assessments, which we receive in the course of the regional monitoring of public opinion. Thus, the approval of the authorities at all levels (federal, regional, municipal) was steadily increasing during Vladimir Putin's first and second presidential terms *(Insert 1)*. However, since the presidency of Dmitri Medvedev (2008–2011), that is, over the past 10 years, the share of people who positively assess the work of the authorities has significantly decreased (on average for 2018–2021 compared to 2008–2011):

✓ Assessments of the work of the President decreased by 9 p.p. (from 65 to 56%);

✓ Assessments of the work of the Government of the Russian Federation decreased by 15 p.p. (from 51 to 36%);

✓ Assessments of the work of the Federation Council decreased by 3 p.p. (from 41 to 38%);

✓ Assessments of the work of the State Duma decreased by 9 p.p. (from 38 to 29%);

✓ Assessments of the work of the Governor decreased by 13 p.p. (from 49 to 36%);

✓ Assessments of the work of the heads of local administrations decreased by 7 p.p. (from 42 to 35%).

The same can be said about people's assessment of the President's work aimed at solving the country's key problems *(Insert 2)*. In fact, the positive dynamics of public opinion was noted only during Vladimir Putin's first presidential term. Since the second presidential term (2004–2007), no positive changes have occurred:

The share of people who consider the actions of the head of state to strengthen Russia's international positions and protect democracy as successful remains at the level of 35–37%; to restore order in the country – 45%;

The proportion of those who positively assesses the work of the head of state to boost the economy and increase the welfare of citizens decreased by 12 p.p. (from 39 to 27%).

Resume

Thus, taking into account the results of the monitoring concerning the effectiveness of the public administration system and the work of the head of state, conducted for more than 10 years, we (based on statistical data, public opinion polls and expert assessments) can draw two conclusions.

1. First, throughout his presidential terms, Vladimir Putin has consistently implemented a plan to restore the post-Soviet Russian statehood destroyed together with the collapse of the USSR. He outlined its foundations in detail and publicly in the 1999 article "Russia at the turn of the Millennium": "the Russian idea", "a strong state", "an efficient economy"[48].

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[47] Vladimir Putin's speech at a meeting with deputies of the State Duma of the eighth convocation. *Official website of the President of the Russian Federation*. October 12, 2021. Available at: http://www.kremlin.ru/events/president/transcripts/66905

[48] Putin V.V. Russia at the turn of the Millennium. *Nezavisimaya gazeta.* December 30, 1999. Available at: https://www.ng.ru/politics/1999-12-30/4_millenium.html

Insert 1

Dynamics of public opinion assessments concerning the work of federal, regional and municipal authorities*, % of respondents

Authorities	Level of approval/ disapproval (percentage of positive/negative assessments)	Boris Yeltsin's 2nd presidential term (1996–1999)	Vladimir Putin's 1st presidential term (2000–2003)	Vladimir Putin's 2nd presidential term (2004–2007)	Dmitri Medvedev's presidential term (2008–2011)	Vladimir Putin's 3rd presidential term (2012–2011)	Vladimir Putin's 4th presidential term (2018 – present)	Dynamics (+/–), Vladimir Putin's 4th presidential term (2018 – present) to…	
								Vladimir Putin's 1st presidential term (2000–2003)	Dmitri Medvedev's presidential term (2008–2011)
DYNAMICS OF ASSESSMENTS OF THE WORK OF THE RF PRESIDENT									
RF President	Level of approval	11.1	65.9	68.9	65.0	62.5	56,5	–9	–9
	Level of disapproval	71.4	15.1	16.3	18.0	23.4	29,0	+14	+11
For reference: RF President (according to VTsIOM data)**	Level of approval	12.8	81.6	75.0	69.6	76.8	64,5	–17	–5
	Level of disapproval	87.3	17.9	16.6	17.7	16.4	26,1	+8	+8
For reference: The share of the region's residents whose interests are expressed by the United Russia party***		10.1	17.8	23.5	35.2	33.4	33.7	+16	–2
DYNAMICS OF ASSESSMENT OF THE WORK OF FEDERAL PUBLIC AUTHORITIES									
RF Government	Level of approval	23.8	42.6	46.6	51.0	43.9	36.1	–7	–15
	Level of disapproval	50.4	26.2	27.8	24.0	31.3	39.4	+13	+15
Federation Council	Level of approval	16.6	29.2	37.5	40.7	36.7	37.7	+9	–3
	Level of disapproval	40.3	25.4	26.8	23.6	30.0	30.7	+5	+7
State Duma	Level of approval	14.8	25.3	34.6	38.1	34.2	29.4	+4	–9
	Level of disapproval	54.5	37.8	36.4	30.8	36.3	41.6	+4	+11

End of Insert 1

Authorities	Level of approval/ disapproval (percentage of positive/negative assessments)	Boris Yeltsin's 2nd presidential term (1996–1999)	Vladimir Putin's 1st presidential term (2000–2003)	Vladimir Putin's 2nd presidential term (2004–2007)	Dmitri Medvedev's presidential term (2008–2011)	Vladimir Putin's 3rd presidential term (2012–2011)	Vladimir Putin's 4th presidential term (2018 – present)	Dynamics (+/-), Vladimir Putin's 4th presidential term (2018 – present) to…	
								Vladimir Putin's 1st presidential term (2000–2003)	Dmitri Medvedev's presidential term (2008–2011)
DYNAMICS OF ASSESSMENT OF THE WORK OF REGIONAL AND LOCAL PUBLIC AUTHORITIES									
Vologda Oblast Governor	Level of approval	36.5	49.2	52.1	49.2	40.5	36.5	–13	–13
	Level of disapproval	36.0	24.1	25.6	26.0	36.7	40.2	+16	+14
Heads of local administrations	Level of approval	30.1	38.7	40.3	42.4	38.3	35.7	–3	–7
	Level of disapproval	39.7	32.0	33.8	31.3	36.4	38.2	+6	+7

* The wording of the question: "How would you assess the work of …?" Answer options: "fully and mostly approve", "fully and mostly disapprove". Source: VolRC RAS public opinion monitoring.

** The wording of the question: "Do you generally approve or disapprove of the work of…?" Answer option: "The President of Russia".

*** The wording of the question: "Which party expresses your interests …?" Answer option: "United Russia".

The average data for the period were calculated as an average of annual data. The data for each year – as an average for 6 surveys.

On average over the first four years of Vladimir Putin's fourth presidential term (2018–2021), the level of approval of the work of most federal, regional and local authorities (except for the Federation Council and the State Duma) is less than the average for his first presidency (2000–2003). The level of approval of all authorities, except for the Federation Council, has been declining since the presidential term of Dmitri Medvedev (2008–2011).

Insert 2

Dynamics of people's assessments of how successfully the Russian President addresses the country's key issues*, % of respondents

1. Strengthening Russia's international positions

2. Imposing order in the country

Trends in Public Opinion Regarding the Effectiveness of Public Administration....
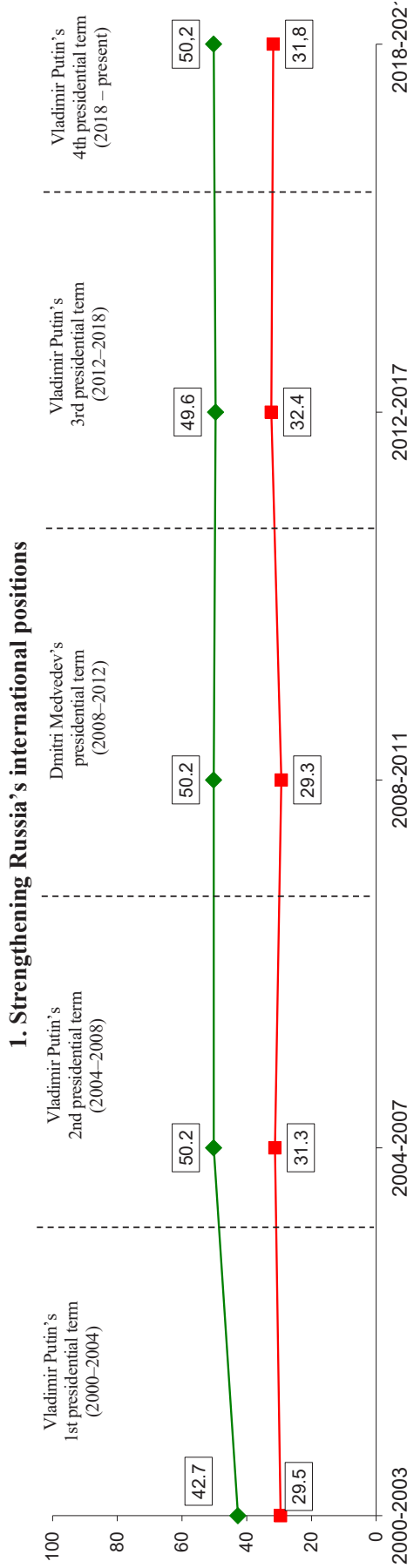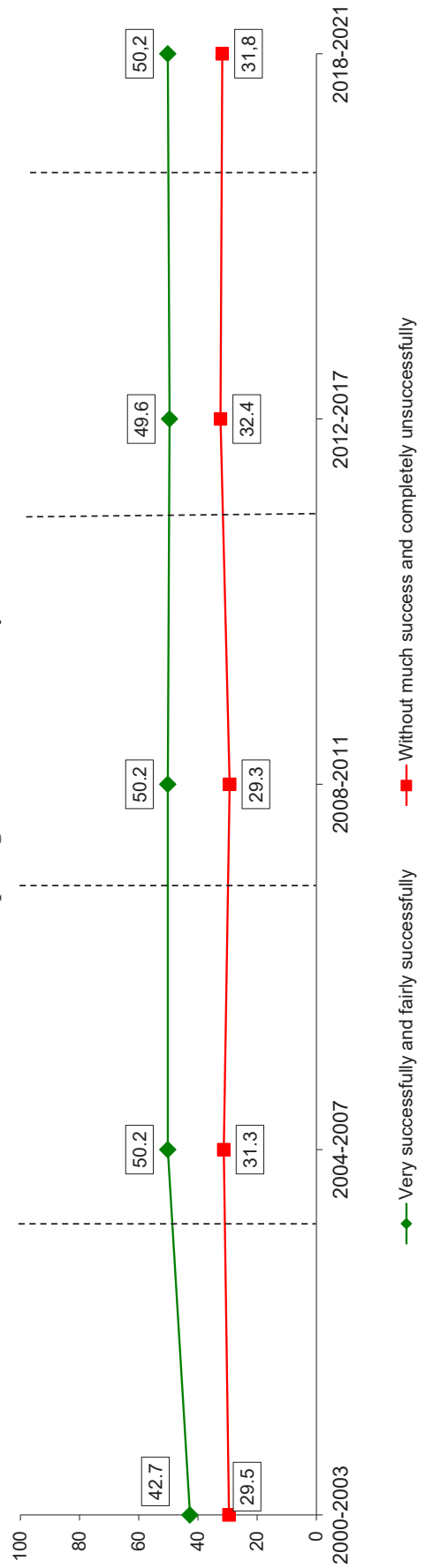
End of Insert 2

3. Protecting democracy and strengthening citizens' freedoms
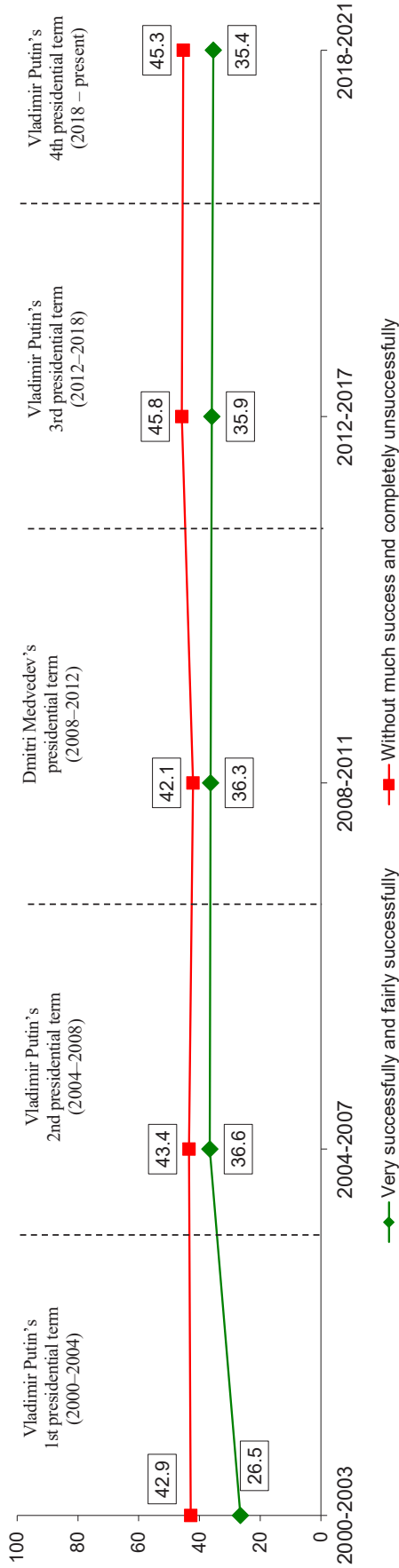
4. Economic recovery, growth of citizens' welfare

◆— Very successfully and fairly successfully   ■— Without much success and completely unsuccessfully
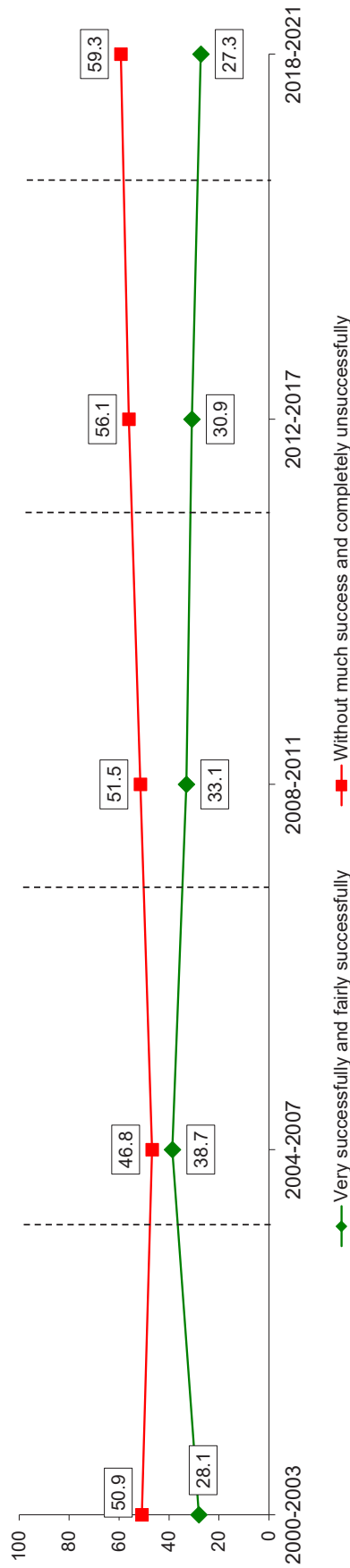
* The wording of the question: "In your opinion, how successfully does the President cope with the following problem?". Answer options: "Very successfully, fairly successfully"; "without much success, completely unsuccessfully". The question is included in the survey since 2000.
Source: VolRC RAS public opinion monitoring.

The assessments of how successfully the President addresses Russia's key problems were improving during Vladimir Putin's first presidential term (on average for 2004–2007 compared to 2000–2003). Throughout all subsequent presidential cycles, people's assessments regarding the President coping with such problems as strengthening Russia's international positions, imposing order in the country and protecting democracy have not actually changed. At the same time, the share of people who consider the President's work aimed to promote economic growth and increase people's welfare to be successful has significantly decreased (by 12 p.p., from 39% on average in 2004–2007 to 27% in 2018–2021).

2. Second, each of these foundations of the new statehood has not yet been achieved. First of all, it concerns the efficiency of the Russian economy. Despite the fact that the President is taking active and large-scale measures to determine the ideological vector of national development (both for society and for the ruling elites) and implementing targeted personnel measures and putting forward initiatives to improve the organizational foundations of the public administration system, the problems of poverty and inequality remain critical to the general population.

This negates the positive effect of other decisions and initiatives of the head of state (in particular, amendments to the Constitution, May Decrees, etc.), making the overall effectiveness of his activities extremely contradictory and not implemented to the fullest extent.

The "litmus test" in relation to this thesis is the federal and regional elections, in which Russian society regularly gives a "credit of trust" to Vladimir Putin's course (either to the President himself or to the party of power he supports), but at the same time regularly expresses dissatisfaction with the state of affairs in the country, the dynamics of the standard of living and quality of life.

The American philosopher and sociologist R. Collins wrote that "the prospects for fruitful modernization in Russia, without breaking its socio-cultural code, are inevitably associated with a strong state". However, so far everything points to the fact that modernization in Russia is following an "archaic path", which "instead of rapid social progress leads to an outflow of capital, a parasitic consumption of natural resources along with a surge in consumer lifestyle in the context of a dramatic differentiation of luxury and poverty, negatively affecting the level of trust in political power"[49].

In order to reverse this trend, the President of the Russian Federation will have to solve, perhaps, the main task he is facing – to nationalize the elites (the "sixth" column) in order to overcome internal, primarily ideological, contradictions in the system of public administration that hinder the implementation of his managerial decisions.

It is obvious that in the two years remaining until the end of Vladimir Putin's 4th presidential term, it is impossible to solve this task. However, during this very period (2022–2023) the President will most likely decide whether he will again nominate his candidacy for the post of head of state; that is, whether he will personally continue the course of national development that he launched in 1999, or hand over the country in the condition, in which it is now, to his successor.

We (as authors and researchers who have been observing the effectiveness of the public administration system created by the President for a long time) think that the sooner he makes this decision, the more certain the political and social situation in the country will be. But, as practice shows, the President publicly announces his decision to participate in the elections only a few months before the vote itself[50].

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[49] Ershov Yu.G. R. Collins on the collapse of the Soviet Empire: Instructive conclusions. *Sotsium i vlast'*, 2016, no. 4, p. 118.

[50] The 2018 presidential election was held on March 18, 2018. Putin announced his participation three months before the event (in December 2017). The 2012 presidential election was held on March 4, 2012; Putin announced his participation five months before the event (in September 2011).

E. Minchenko (President of Minchenko Consulting Communication Goup): "I think there were different options for the transit of power, it was clear how they were viewed. As a result, the option of zeroing presidential terms seemed to be the easiest to implement, the most understandable and reliable. Moreover, this option, according to sociologists, enjoys the support of a significant part of the population".

D. Badovsky (Head of the Noncommercial foundation – Institute of Socio-Economic and Political Researches (ISEPR Foundation): "Zeroing out presidential terms gives Vladimir Putin additional space for opportunities and secures his political initiative. The right to be elected does not mean that you need to be elected – it will depend on the situation both in the world and in Russia, and on how the system of the branches of government will work in the coming years. But the presence of such a right will be a stabilizing and safety mechanism for the system in the conditions of its updated functioning"[51].

"The project for the development of the Russian Federation is needed only by the Russian society and the Russian people, because it does not have to exist for so long in the format of a colonial state, to which many have become almost accustomed... Over the past 35 years, our country has not experienced any real development; neither has there been any significant increase in Russia's competitive positions in the world community. Thus, there is a clear link between the lack of development of our country and the lack of a development project for the Russian Federation"[52].

The possibility of extending Vladimir Putin's presidential terms potentially until 2036 (by 15 years) temporarily postpones acute issues related to the irreversibility of the transit of presidential power in Russia. However, the need for this shows that **the public administration system is not yet ready to function without the "hands-on management"; therefore, it is still important to look for answers to the questions "What** are the reasons for this?", "What should be done so that by the next milestone period the President can safely hand over the country to his successor?"...

The real historical experience of Russia (in 1917 and 1991) shows that the processes of internal "ferment" are, in fact, a much more serious threat to national security than attempts of any external encroachments. And this must be taken into account, as well as the fact that the future of Russia cannot be built according to Western "patterns". It must correspond to the Russian "gene code", otherwise it will simply not be accepted by the broad strata of the Russian population and will remain only the lot of a small group of people who receive purely personal benefits from this "future".

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[51] Experts on zeroing out the terms of the current President. *Vedomosti*. March 10, 2020. Available at: https://www.vedomosti.ru/politics/articles/2020/03/10/824836-ob-obnulenii-srokov

[52] Aganin A. The image of the future. *Zavtra*. March 15, 2021. Available at: https://zavtra.ru/blogs/obraz_budushego_6

Thus, our view of the situation in the country and the logic of its development over the past 30 years coincides with the opinion of many experts:

1) Russia needs an image of the future, purposefully built, understandable and accepted by society;

2) this image of the future must comply with the basic principles of a "social and humanistically active state"[53].

We believe that only if these two conditions are met, it will be possible to overcome experts' fulfilled forecasts that "the country will face a long-term prolongation of the current situation"[54].

To do this, the President will have to dramatically raise the quality of his managerial decisions, which are still quite fragmented, largely dictated by forced circumstances and unrealized by part of the ruling elite surrounding him; all this resulted in the loss of 17 million votes of Russian voters in federal elections.

Will he manage to make it in time? Will he be able to do it…? Of course, we hope that life will give an affirmative answer to this question; that the head of state will be able to realize all the goals that he set for himself back in 1999 – to create, following the collapsed USSR, a virtually new country with a "Russian idea", a "strong state" and an "effective economy"[55]. But we do not know how it will actually be… Apparently, only time and the next waves of our monitoring of the effectiveness of public administration and, in general, the evolutionary process of the formation of a new, post-Soviet Russian statehood will show it.

References

1. Gorshkov M.K., Sedova N.N. "Self-sufficient" Russians and their life priorities. *Sotsiologicheskie issledovaniya=Sociological Studies*, 2015, no. 12, pp. 4–16 (in Russian).

2. Ershov Yu.G. R. Collins on the collapse of the Soviet Empire: Instructive conclusions. *Sotsium i vlast'=Society and Power*, 2016, no. 4, p. 118 (in Russian).

3. Lapin N.I. On the disclosure of the active humanistic function of the social state in Russia. *Vlast'=Power,* 2019, vol. 27, no. 2, pp. 9–17 (in Russian).

4. Mamychenko A.V. *Zamena Elit. Novye Lyudi Kreativnogo Gosudarstva. Professional'nyi Parlament* [Replacement of the Elites. New People of the Creative State. Professional Parliament. Book 2]. 257 p.

5. Polterovich V.M. The reform of the Russian Academy of Sciences: Expert analysis. *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World*, 2014, no. 1, pp. 5–28 (in Russian).

6. Sulakshin S.S. et al. *Rossiyu zhdet revolyutsiya? Voprosy perekhoda k postliberal'noi modeli Rossii (algoritm i stsenarii)* [Is a Revolution in Store for Russia? Issues of Transition to the Post-Liberal Model of Russia (Algorithm and Scenarios)]. Moscow: Nauka i politika, 2016. 712 p.

7. *WORLD ECONOMIC LEAGUE TABLE 2021 A world economic league table with forecasts for 193 countries to 2035 December 2020, 12th edition*. Annual report by the Centre for Economics and Business Research (CEBR).

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[53] Lapin N.I. On the disclosure of the active humanistic function of the social state in Russia. *Vlast'*, 2019, vol. 27, no. 2, pp. 9–17.

[54] Sulakshin S.S. et al. *Is a revolution in store for Russia? Issues of transition to the post-liberal model of Russia (algorithm and scenarios)*. Moscow: Nauka i politika, 2016. 712 p.

[55] Putin V.V. Russia at the turn of the Millennium. *Nezavisimaya gazeta*. December 30, 1999. Available at: https://www.ng.ru/politics/1999-12-30/4_millenium.html

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THEORETICAL AND METHODOLOGICAL ISSUES

From a Robinson Crusoe Economy to a Pure Exchange Economy

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Abstract. The pure exchange model is considered as the first stage of the analysis of a simple exchange economy; at that, the research is based on the patterns of behavior of the "economic man" that were identified while studying the Robinson Crusoe model. The interpretation at this stage of production as an exogenous factor helps to determine in "pure form" the forces leading to the formation of exchange relations, to introduce into analysis and to reveal basic features of the main phenomena and processes in the sphere of circulation. Proceeding from well-known approaches to the impact of redistribution of the initial bundle of goods on the individual well-being of members of society, we pay considerable attention to the difference between the exchange of bundles of goods and the exchange of individual goods, the two possible forms of exchange that implement such redistribution. While studying the market form of exchange, we additionally analyze the known options for achieving general equilibrium — on the basis of equilibrium and a series of non-equilibrium proportions of exchange. We show that due to institutional reasons, competition between the participants of the exchange, as a tool for reducing transaction costs, cannot eliminate the costs completely; therefore, the path of moving toward the contract surface inevitably turns out to be multi-stage, accompanied by the use of non-equilibrium proportions of exchange. But the final (limit) point on this path will necessarily be a point of general equilibrium, and the number of such points that can be reached from the initial position is infinitely large. The latter is explained by the multitude of proportions of exchange that can be used by its participants at each of the nodal points of the path. The paper develops our viewpoint formulated in an earlier publication: the possibility of introducing credit relations into the analysis at this stage is

associated with the existence of consumer goods of long-term use. At the same time, only the goods of long-term use can serve as the object of the credit and it is impossible to single out an "interest rate component" in the supplies that ensure the repayment of the credit.

Key words: Robinson Crusoe model, exchange economy, economic institutions, exchange, pure exchange, exchange value, credit, interest rate.

From a Robinson Crusoe economy to an exchange economy

We propose the Robinson Crusoe model [1; 2; 3] as a starting point of pure economic theory. At the same time, we imply that this model allows us to determine essential features in the behavior not only of an isolated individual, but of a person in general and, therefore, a social person. In turn, the understanding of crucial aspects of human economic behavior, obtained on the basis of the Crusoe model, should help to identify those internal forces that encourage an individual to enter into economic relations with other people. Only in this case will the Robinson Crusoe model actually become the first step in the building of pure economic theory.

One of the questions that arises when we try to implement such a research program consists in determining basic features of the economic system, from the analysis of which we will proceed further.

Upon closer examination, it turns out that this question is not so simple. When trying to resolve it, we first of all face the fact that the benefits (namely, they are the driving force of human behavior) that an individual can derive from interaction with his fellow human beings are directly dependent on the institutional framework in which this interaction is taking place. It is one thing if a certain group of people considers the fruits of productive activity as a common property, and another thing if everyone assumes that the product of one's activity is one's own property. In other words, the form of a social economy that logically follows the Crusoe model should be determined by the basic economic institutions[1] [1, p. 33].

Since we are interested in the market economy, we will proceed from the fact that the members of society are free people who make decisions independently, respect private property (thus, we do not consider the problems of non-economic coercion) and are responsible for the obligations they have assumed.

The institution of private property undoubtedly plays an important part in the emergence of exchange relations, but is this institution a sufficient condition for them? Representatives of classical political economy tended to give a negative answer to this question. They linked the existence of exchange to the social division of labor, apparently because members of society in such conditions have no other way to satisfy their multilateral needs, except by redistributing the goods they produce through exchange. Such an approach was quite natural in the conditions of the dominance of the labor theory of value. The inability to quantify human needs made it necessary to look for the roots of exchange exclusively in the effect resulting from the specialization of producers. Accordingly, the equilibrium proportions of the exchange of goods were explained solely by labor input for production

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[1] A special question is whether there exists a certain logic in the change of basic economic institutions throughout the history of human civilization. There are various approaches to this issue, among which the Marxist theory of economic formations and modes of production and the theory of stages of economic growth are widely known [4]. In the study of a special economic system (for example, a market economy) this problem is not raised openly: the basic institutions are considered as given exogenously. However, since our proposed approach involves identification of internal institutional dynamics within the framework of given basic institutions, it indirectly helps to identify forces that can create prerequisites for their change.

(cost); as for the exchange, which was not based on the division of labor, it was considered "random" in the full sense of the word [5, pp. 57—72].

Apparently, this is why K. Marx, in *Das Kapital*, when analyzing the basic properties of goods, took the model of "simple exchange of commodities" as the basis; he considered the model as a system of individual producers connected by the social division of labor [5, pp. 43—156]. This form of economic setup should undoubtedly occupy an important place in pure theory, but there are doubts about whether it is enough to explain its emergence by simply referring to the effect resulting from specialization in the production of individual goods?

The negative answer to this question became obvious as a result of the "marginalist revolution" and, in particular, after the emergence of ordinal utility theory. There emerged an understanding that commodity exchange is not an addition to the social division of labor; it has an independent value. Accordingly, "pure trade", in which production acts as an exogenous factor, is put on solid foundations and, in this sense, is deprived of randomness. Moreover, in this paradigm, the effect of exchange becomes an impetus for the development of the division of labor, rather than vice versa.

In view of the above, there is an intermediate point between the Crusoe model and "simple exchange of commodities" model based on the social division of labor; this point is represented by an economic system in which there are many isolated economic agents who have the right of ownership of the results of their labor. In other words, we are talking about the "economy of *m* Robinsons", each of which:

• has a system of individual preferences with characteristics axiomatically introduced by V. Pareto;

• has production capabilities that allow them to produce various types of goods.

The analysis of this model is logically divided into two stages. In the course of the first stage,

which is the subject of our article, the emphasis will be placed on a consistent study of the "pure trade" model. At the next stage, we will trace the development of the system of categories of "exchange economy" in the conditions of transformation of production from an exogenous to an endogenous factor. In both cases, the task is to continue building an ordered system of categories of a market economy in the spirit of the paradigm of pure economic theory, based on the available achievements of economic science, which was started within the framework of studies on the Crusoe model.

This task is fundamentally different from the one that is addressed in numerous articles aimed at studying exchange transactions from a game-theoretic point of view. Within the framework of such works, emphasis is placed on identifying strategies of behavior of exchange participants in a variety of institutional conditions, in particular those formed by various auction structures. The results obtained turn out to be a function of assumptions regarding the framework in which the subjects of exchange operate, and the general problem of exchange breaks down into countless special cases. The conclusions of such studies are undoubtedly useful for application in individual case studies, but they can hardly help in any way when attempts are made to develop an orderly view of the economic system. In the same cases, when game-theoretic approaches are implemented on the basis of Nash's "bargaining solution" [6], they also explicitly violate the axiom of the inadmissibility of interpersonal comparisons of individual utility levels.

And the last introductory remark concerning those features of individual preferences, which we will rely on during the analysis. Essentially, there are two possibilities here. In accordance with the first one, the subject of attention is A. Smith's "economic man", aimed at maximizing individual welfare that is identified exclusively with the amount

of own consumption. The second possibility is associated with the orientation to a more complex system of individual preferences, covering both one's own consumption and the welfare of other members of society; such an individual could be called a "social man".

At this stage of the study, the choice should be made in favor of the "economic man". This is not only (and not so much) associated with the desire to facilitate the task being solved by abstracting from the "humane component" of our individual preferences. More importantly, the market mechanism is able to identify only the "selfish" part of our preferences; accordingly, it is the model of "economic man" that is adequate to the task of determining the nature of this social mechanism. Subsequent stages of the study will deal with the consequences that the functioning of the economic system will encounter due to the presence of a "social" component in individual preferences.

"Pure trade" as an exchange of bundles of goods

So, we are dealing with a society consisting of members, each of whom has a bundle of goods e_{ik}, where i is the number of the good ($i = 1, ..., n$), k is the number of the member of a society ($k = 1, ..., m$). At the same time, individual systems of preferences of economic agents are expressed by utility functions $U_k(x_{1k}, ..., x_{nk})$, where x_{ik} is the amount of the i-th good consumed by the k-th member of society.

The theory of pure trade allowed to get an answer to the question of whether it is possible, as a result of the redistribution of goods through exchange, to increase the level of welfare of at least one member of society without reducing the welfare of the rest[2]. Given that exchange is a bilateral act, the object of analysis is often narrowed down to two people ("Robinson" and "Friday"), and the model itself is formulated as follows, see, for example, [7, pp. 578–579]:

$$Max\ U_F = U_F(x_{1F}, ..., x_{nF}) \qquad (1)$$

under the restrictions:

$$U_R(x_{1R}, ..., x_{nR}) = U_R^0 \qquad (2)$$

$$x_{1R} + x_{1F} = e_1 \qquad (3)$$

$$x_{iR} + x_{iF} = e_i \qquad (4)$$

$$x_{nR} + x_{nF} = e_n \qquad (5)$$

where U_F is the value of Friday's utility to be maximized, U_R^0 is the level of Robinson's utility established on the basis of the initial distribution of goods, $e_i = e_{iR} + e_{iF}$ is the total amount of the i-th good initially available to Friday and Robinson.

The standard procedure – the solution of a system of equations composed of the first partial derivatives of the Lagrange function[3] equated to zero, allows us not only to determine the desired values of x_{iR} and x_{iF}, but also to establish the fact that in the optimal position the marginal rates of substitution of the j-th good for the i-th will be the same for Robinson and Friday:

$$-\left[\frac{\partial U_R}{\partial x_{iR}} \Big/ \frac{\partial U_R}{\partial x_{jR}}\right] = \frac{\partial x_j}{\partial x_i} = -\left[\frac{\partial U_F}{\partial x_{iF}} \Big/ \frac{\partial U_F}{\partial x_{jF}}\right] \quad (6)$$

The model that provides for maximizing the welfare of Robinson while maintaining the utility level of Friday will be symmetrical. Based on this model, we can obtain a new distribution of goods between the exchange participants, and consequently, the exchange vectors $\bar{z}_k = (x_{1k} - e_{1k}, ..., x_{nk} - e_{nk})$ that link it to the original distribution ($k = R, F$). It is clear that in this case, the new distribution of goods between

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[2] It is not difficult to make sure that such a statement of the question is directly related to the accepted basic institutions of the society under consideration: the free owner of goods will not enter into an exchange relationship that leads to a deterioration of his position.

[3] In this case, it has the following form:
$\Im = U_F(x_{1F}, ..., x_{nF}) + \lambda \cdot [U_R^0 - U_R(x_{1R}, ..., x_{nR})] + \lambda_1(e_1 - x_{1R} - x_{1F}) + \cdots + \lambda_n(e_n - x_{nR} - x_{nF})$. We also note that the first-order conditions obtained on the basis of this function ensure maximization of the function due to the assumption of quasi-concavity of utility functions.

the exchange participants will correspond to the equality of the marginal rates of substitution of the *i*-th good with the *j*-th good available to Robinson and Friday.

Along with the considered "extreme" possibilities, in which one of the subjects of the exchange wins, and the other retains the same position, there are many exchange vectors that provide a (utility) gain for each of them. Any element of this set can be found if we present the first restriction of the model – equation (2) – in the following form:

$$U_R(x_{1R}, ..., x_{nR}) = U_R^0 \cdot q, \qquad (7)$$

where q is a parameter whose possible value is limited both from above and from below: $1 \leq q \leq q_{max}$. With $q = 1$, we get a situation in which Friday's utility reaches its maximum value while the level of Robinson's welfare remains unchanged. The value of the upper limit q_{max} is determined by the requirement that the maximized utility of Friday does not fall below the initial level. In other words, at $q = q_{max}$, Robinson's welfare level will be the maximum at an unchanged welfare level of Friday.

Thus, the described approach to determining the pure trade effect allows us to draw a number of important conclusions. It becomes clear that the very existence of this effect is due to the initial difference in the comparative assessment of benefits by potential exchange participants, because the exchange opportunities are exhausted at the moment when these differences disappear. In connection with the implementation of this approach, it also becomes possible to naturally introduce the concept of a contract surface (a curve – for the case of two goods), to show that all points belonging to it represent Pareto-efficient distributions of consumer goods between exchange participants.

At the same time, we have not encountered any cases when attention would be drawn to the fact that this model implicitly assumes that the object of exchange is represented by bundles of goods rather than individual goods. But this is really so: in the conditions of the model represented by formulas (1)–(5) there are no proportions of the exchange of individual goods for each other. In general, they cannot be determined from the resulting exchange vectors[4]. Accordingly, with the help of this approach, it is not possible to introduce the concepts of exchange value of goods and the state of general equilibrium, which are fundamental in a market economy. The question remains open as to which point of the contract surface the exchange relations of its participants will lead to. Finally, it is difficult to imagine how exchange participants can form an acceptable exchange vector in practice. In other words, a curious situation arises when there is a theoretical solution to the problem, but there is no practical one[5]!

Classic commodity exchange

Another, more realistic possibility of redistribution of goods between two economic agents is associated with a series of classic market exchanges, involving the exchange of one good for another in separate transactions. The basis for such an exchange is different assessment of the marginal value of the corresponding goods by the participants (inequality of the marginal rates of substitution of one of the goods for another). In view of the above, each of the numerous acts of exchange cannot worsen the situation of any of the participants. It is also clear that the possibilities of a series of exchanges will be exhausted when the marginal rates of substitution will be the same for both its

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[4] The exception is the two-goods model: here the exchange vector automatically determines the amount of one good given in exchange for another. Accordingly, with the geometric representation of such a model using the Edgeworth box diagram, the proportion of exchange turns out to be equal to the slope of the straight line connecting the points of the initial and final distribution of goods.

[5] Planned socialist economies – members of the Council for Mutual Economic Assistance – have faced this problem in real life. The subjects of exchange here were not individual producers, but countries as a whole. In order to ensure the equivalence of the exchanged bundles of goods, they were forced to borrow prices formed in the market (capitalist) sector of the world economy.

participants. Thus, as in the case of the exchange of bundles of goods, pure trade carried out in the format of "good for good" must inevitably end on the contract surface.

Classic exchange equates a certain amount of one good to a certain amount of another good. Therefore, its integral feature is the proportion of exchange based on which the concept of the exchange value of an individual good[6] is introduced in economic theory. As for the quantitative dimension of exchange values, so far we can only state that they should be between the marginal individual rates of substitution for each other of the exchanged goods, since otherwise the exchange would be unprofitable to one of its participants. There is also the question of whether the sequence of individual acts of exchange in the process of approaching the contract surface matters.

Economic theory, in fact, has developed two approaches that allow us to formulate certain, but different answers to both of these questions.

The first approach, founded by L. Walras [8], consists in determining the equilibrium proportions of exchange, transferring the economic system in question from the initial position to such a distribution of goods in which none of the participants in the exchange is interested in its continuation. If such a vector of exchange proportions is found, then economic agents can be granted the right to make transactions with their usage; and regardless of the sequence of such transactions, the end result will be the same. But it is also possible to simply redistribute goods between economic agents, relying on the values of the functions of pure individual demand for each of the goods corresponding to the equilibrium proportions of exchange. In the latter case, on a new basis — after all, we proceed from the exchange values of individual goods — we return to the exchange of their bundles.

As it turned out in the course of intensive research conducted in the second half of the 20th century, the question of the presence and number of general equilibrium states (and, consequently, vectors of equilibrium exchange values) turned out to be much more complicated than it seemed to the author of the theory. The equations in the L. Walras model are not linear, and therefore a simple reference to equality in the system of the number of equations and independent variables does not allow us to make a conclusion that there is a single equilibrium vector of exchange values.

First of all, on the basis of Brouwer's fixed-point theorem, it was proven that the strict convexity of consumer preferences is a sufficient condition for the existence of a state (states) of general equilibrium [9; 10] in the pure trade model.

In the course of further research, attention was drawn to the specifics of the market functions of pure demand. Through the efforts of H. Sonnenschein [11; 12], R. Mantel [13], G. Debreu [14], it was found that the mandatory properties of such functions are limited by the fact that they are homogeneous of zero order, continuous, and that they satisfy the requirements of Walras' law. This means that the maximizing behavior of economic agents does not impose restrictions on the specific shape of these curves; therefore, they may not be monotonically decreasing in the exchange value of a corresponding good. In other words, in the process of aggregating individual functions of pure demand, some of the important functions of the latter may be lost.

In the development of this theorem, it was found that "regular economies"[7] will have a finite odd number of general equilibrium states [15; 16], and all states will be characterized by local uniqueness,

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[6] The latter, in fact, is a "cardinalist index": the amount of the exchange value of a good depends on the good whose exchange value is taken as a unit.

[7] A regular economy is an economy in which the slope of the graph of aggregated excess demand will not be zero when the x axis is reached in the coordinate system "the exchange value of the good (price) — the aggregate excess demand for it". In irregular economies, the number of states of general equilibrium turns out to be infinite.

but some of them will not have the property of stability under the accepted rule of establishing the proportions of exchange[8].

For two reasons, we can leave these mathematical subtleties aside for now. First, the abovementioned problems related to the specifics of market functions of pure demand have nothing to do with the "reduced" Robinson − Friday model: after all, only one person makes a demand for each good in the model; therefore, there is no aggregation problem mentioned above. Second, much more important for us is the question of how Robinson and Friday can determine the equilibrium proportions of the exchange? Are there institutional mechanisms to solve this problem?

As we know, L. Walras proposed a well-known auction model that helps to find equilibrium proportions of an exchange (it is clear that in the Robinson − Friday model, the functions of the Walrasian auctioneer should be performed by one of the exchange participants). In this case, we are faced with a very interesting problem: can an institutional structure that has no chance of practical implementation (at least in its immediate form[9]) be theoretically valuable? And we have every reason to give a positive answer to this question. First, because L. Walras' "unrealistic" proposal helps us to clearly see the problem at hand: the need to identify the reaction of economic agents to various vectors of exchange values of goods by institutional methods. Second, it makes us think about the reasons for the practical inapplicability

of the proposed mechanism. The answer, of course, is simple: the auctioneer and economic agents must incur enormous losses of time and effort to collect and process the necessary information. But its very articulation directly urges us to introduce a very theoretically important concept of system costs[10], which in economics expresses phenomena analogous to friction in mechanics.

The second approach to the redistribution of goods between their owners on the basis of classical exchange allows for a consistent movement toward the contractual surface with the help of a series of exchanges, within which exchange values are adjusted thus satisfying the interests of the participants. Let us look at it first on the example of a situation where Robinson and Friday have two goods at their disposal, and then let us move on to the case with n goods. At the same time, we will proceed from the fact that each participant in the exchange has an adequate idea of their own preferences and does not have one with respect to the preferences of their counterpart.

Let us assume that $\overline{MU_R} = (MU_{1R}, MU_{2R})$ and $\overline{MU_F} = (MU_{1F}, MU_{2F})$ are the vectors of marginal utilities of goods available prior to the exchange, respectively, of Robinson and Friday. Then the absolute values of the marginal rates of the substitution of the 1st good by the 2nd will be equal to $|MRS_{(2/1)R}| = \dfrac{MU_{1R}}{MU_{2R}}$ and $|MRS_{(2/1)F}| = \dfrac{MU_{1F}}{MU_{2F}}$. If we assume that for both potential participants of the exchange the individual exchange value of the second good EV_2 equals 1, then these values for them will determine the marginal comparative assessment (individual exchange value) of the first good: $EV_{1R} = |MRS_{(2/1)R}|$ и $EV_{1F} = |MRS_{(2/1)F}|$.

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[8] Such a property under the Walrasian auctioneer rule will not be present in the equilibrium states in which the excess demand curve intersects the abscissa axis at a positive angle from below. With excess demand located in the vicinity of such points, the application of this rule will lead to the fact that the economy will not approach them, but will distance from them, because the magnitude of market excess demand will in such cases change in the "wrong direction" under the influence of changes in the proportions of exchange [17, pp. 122−123].

[9] Walras' idea, however, managed to be used as the basis for the voucher privatization model applied in the process of transition to a market economy in some post-socialist countries (Czech Republic, Slovakia, Baltic states).

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[10] This concept in this case seems to be more accurate than the concept of transaction costs: after all, the essence of the whole procedure of "groping" the equilibrium proportions of exchange, strictly speaking, is not the preparation of market transactions, but the redistribution (it can be made by the auctioneer himself) of available goods between the relevant economic agents.

In the course of communication, Robinson and Friday realize that the comparative assessments of the two goods — 1st and 2nd — do not coincide. Let us say Robinson evaluates good 1 relatively higher than Friday, that is $EV_{1R} > EV_{1F}$. This state of affairs is the basis for a transaction in which Robinson exchanges a certain amount of good 2 belonging to him for a certain amount of good 1 belonging to Friday. Let us call the proportion of the exchange of good 2 for good 1 the social exchange value of good 1, expressed through good 2 — EV_{1S}. So that the exchange was beneficial to both parties, its value should be in the range $EV_{1F} \leq EV_{1S} \leq EV_{1R}$. Or else: $EV_{1S} = EV_{1R} \cdot r + EV_{1F} \cdot (r - 1), 0 \leq r \leq 1$.

Let us assume that during the bargaining, Robinson and Friday managed to agree on a certain proportion of the exchange, which is within the specified limits. The question arises: what will be the quantitative parameters of the exchange?

If we proceed from the logic of the exchange of bundles of goods, then we can conclude that the exhaustion of exchange opportunities will occur at the intersection of a straight line drawn from the point of the initial distribution of goods with an inclination to the x axis corresponding to the agreed proportion of exchange and the contract curve. However, such a result will take place only in one case, namely, if the agreed proportion of exchange accidentally turns out to be equilibrium. In all other cases, the exhaustion of exchange opportunities will occur for one of the participants earlier. Indeed, the behavior of both Robinson and Friday will be described by the following model:

$$Max\ U^k(x_{1k}, x_{2k}) \qquad (8)$$

with the constraint:

$$e_{1k} \cdot EV_{1S} + e_{2k} = x_{1k} \cdot EV_{1S} + x_{2k}, \quad (9)$$

where U^k is the utility value of the k-th exchange participant ($k = R, F$), e_{ik} is the initial amount of the i-th good of the k-th exchange

participant, x_{ik} is the amount of good after the exchange is completed. The restriction presented by formula (9) is due to the fact that the exchange value of the bundle of goods available before the exchange must equal the exchange value of the set of goods after the exchange. At the same time, it should be remembered that we have agreed to consider the exchange value of the second good equal to one.

The Lagrange function for this model will have the following form:

$$\mathfrak{I} = U^k(x_{1k}, x_{2k}) + \lambda \cdot [(e_{1k} - x_{1k}) \cdot EV_{1S} + e_{2k} - x_{2k}] \qquad (10)$$

Let us now determine the necessary conditions (they are sufficient due to the quasi-concavity of the objective function) for the maximum of utility function (8), equating the partial derivatives of the Lagrange function to zero:

$$\mathfrak{I}_{x_{1k}} = \frac{\partial U^k}{\partial x_{1k}} - \lambda \cdot EV_{1S} = 0 \qquad (11)$$

$$\mathfrak{I}_{x_{2k}} = \frac{\partial U^k}{\partial x_{2k}} - \lambda = 0 \qquad (12)$$

$$\mathfrak{I}_\lambda = (e_{1k} - x_{1k}) \cdot EV_{1S} + e_{2k} - x_{2k} = 0 \quad (13)$$

Then we transfer the second terms of equations (11) and (12) to the right side and divide equation (12) by equation (11):

$$\frac{\partial U^k}{\partial x_{2k}} \bigg/ \frac{\partial U^k}{\partial x_{1k}} = MRS_{1/2} = \frac{1}{EV_{1S}} \qquad (14)$$

Thus, the exchange opportunities for the k-th participant will be exhausted at the moment when the marginal rate of substitution of the first good with the second one turns out to be equal to the ratio of the exchange values of the second good to the first one.

Solution of the system of equations (11) − (13) allows us to determine the value of each good that maximizes the welfare of the k-th economic agent as a function of their quantities available before

the exchange and the agreed proportions of the exchange (**the demand function for the good**):

$$x_{1k}^* = x_{1k}(e_{1k}, e_{2k}, EV_{1S}), \qquad (15)$$

$$x_{2k}^* = x_{2k}(e_{1k}, e_{2k}, EV_{1S}), \qquad (16)$$

where the sign * means that we are talking about the optimal amount of the corresponding good.

Here we can introduce **individual functions of pure demand** of the k-th economic agent for every good that will characterize those amounts of the good that the agent would like to get in the exchange (+) or transfer in exchange for another good (-):

$$z_{1k} = x_{1k}^* - e_{1k}, \qquad (17)$$

$$z_{2k} = x_{2k}^* - e_{2k}, \qquad (18)$$

Now it is the turn of **the aggregate pure demand** function for each good, which is the sum of individual pure demand functions:

$$Z_1 = z_{1R} + z_{1F} = (x_{1R}^* - e_{1R}) + (x_{1F}^* - e_{1F}) (19)$$

$$Z_2 = z_{2R} + z_{2F} = (x_{2R}^* - e_{2R}) + (x_{2F}^* - e_{2F}) (20)$$

It is obvious that in the two-goods model under consideration, if one of the values of Z_i is zero, then the value of the aggregate pure demand for another good will also be zero (manifestation of **Walras' law**). But such a state of affairs is possible only if the proportion of exchange, determined by the ratio of the social exchange values of two goods $-\dfrac{EV_{2S}=1}{EV_{1S}}-$ is equilibrium. In all other cases, the amount of goods exchanged will be limited by the capabilities of the "weakest party".

The latter circumstance can be illustrated graphically using the Edgeworth box diagram *(Figure)*.

The initial distribution of good 1 and good 2 between Robinson (the origin of the system of axes at point O_1) and Friday (the origin of the system of axes at point O_2) is given by point A. The proportion of the exchange of good 2 (y axis) for good 1 (x axis), equal to the slope of straight line AD, is equilibrium − when it is used, the exchange ends on the contract curve at point D, where the

Graphical representation of the conclusion about the multitude of trajectories of movement to the state of general equilibrium
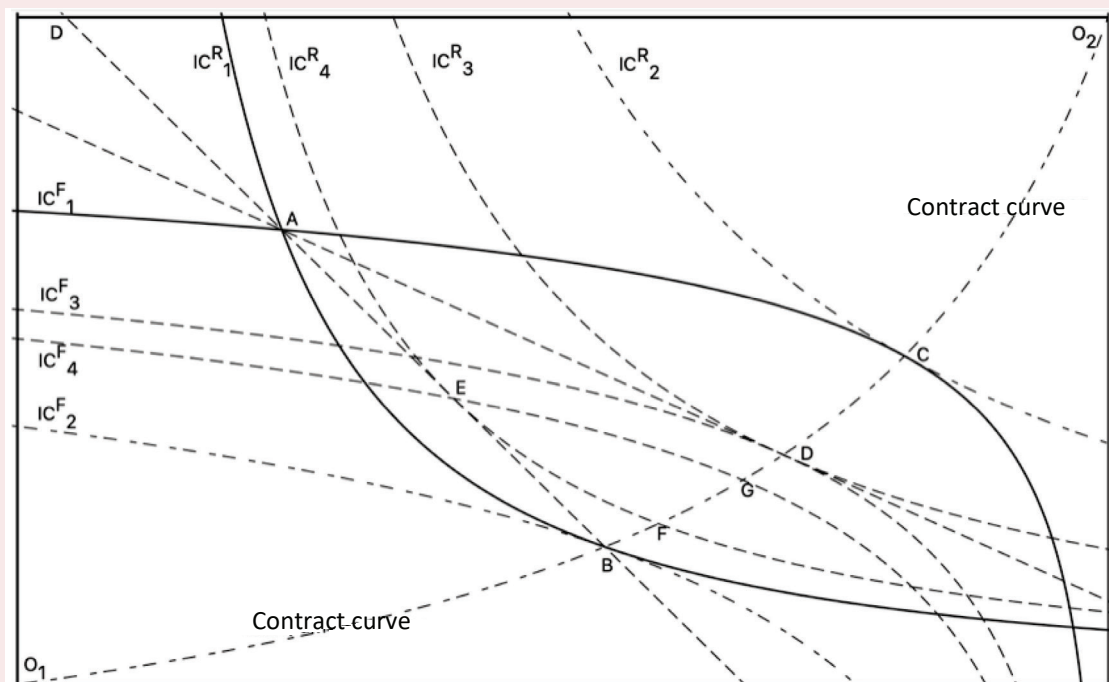
marginal rates of substitution of the second good for the first for both exchange participants are equal to this proportion of exchange.

With the proportion of exchange corresponding to the slope of straight line *AB*, the exchange does not end at point *B*, as one might assume if relying on the first approach based on the exchange of not individual goods, but their bundles. The result of applying this proportion of exchange will be the transition from point *A* to point *E*: it is here that the "weak party", which turns out to be Robinson, is characterized by the fact that the marginal rate of substitution of good 1 with good 2 coincides with this proportion of exchange.

The specific feature of point *E* in comparison with the point of initial distribution of goods *A* is that, first, it is closer to the contract curve O_1O_2 and, second, the corresponding set of points on the contract curve, which can be reached as a result of subsequent acts of exchange, narrows to interval *FG*.

The transition from point *A* to point *E* does not mean the completion of the acts of exchange between Robinson and Friday. With a new distribution of goods, the difference in the marginal rates of substitution of the first good with the second for these two actors of exchange creates the necessary prerequisites for its continuation. At the same time, the proportion of mutually beneficial exchange turns out to be "squeezed" in a narrower framework than before, determined by the slopes of indifference curves of Robinson (IC_{4R}) and Friday (IC_{4F}) at point *E*. The new distribution of goods (not shown in the graph) between the exchange participants will be even closer to contract curve O_1O_2, and the corresponding interval on the contract curve is even narrower. Taking into account the above, it becomes obvious that in the limit, in the absence of transaction costs, a sequential series of exchanges will lead to one of the points on the contract curve, and this point will necessarily be the point of general equilibrium. The latter statement is related to the fact that the marginal, "final" proportion of exchange will be equal to the marginal rate of substitution of good 1 with good 2, that is, it will be equilibrium.

Thus, a sequential series of exchange acts forms the trajectory of movement from the point characterizing the initial distribution of benefits between Robinson and Friday to one of the points of the contract curve. It is impossible to determine what this trajectory will be in advance, since it depends on the specific proportions of the exchange that its participants will establish at each of the "nodal points" similar to points *A* and *E* in the Figure. Only the following can be unequivocally stated:

• direct transition from the "nodal point" to a point on the contract line (similar to the transition from point *A* to point *D*) will take place only if the exchange participants guessed its equilibrium proportion;

• the trajectory of a sequential series of exchange acts will necessarily end on the contract curve at the point of general equilibrium.

Technically speaking, the transition from the two-goods exchange model under consideration to a multi-goods exchange model does not cause any difficulties. Perhaps we should note only the fact that with an increase in the number of goods available to Robinson and Friday the degree of uncertainty of the final result of a series of exchanges between them increases even more. First, the number of transactions that they have to make increases (and each of them is characterized by uncertainty regarding the choice of a specific proportion of exchange); and second, the sequence in which they will exchange various pairs of goods becomes important.

We cannot say that these conclusions are fundamentally new to economic theory. According to the analysis of the expanded model of the exchange economy, F. Hahn and F. Fisher [18] have long established that the assumption of exchange at non-equilibrium prices changes the idea of the states of general equilibrium achievable with the initially given distribution of goods

between economic agents. F. Hahn came to this conclusion, proceeding from the modified model of the Walrasian auctioneer [19, pp. 192–201). The change he made to the "groping process" consisted in the fact that after the auctioneer announces the price vector, it is allowed for willing economic agents to make real transactions using them. As a result, a new vector of exchange proportions is announced by the auctioneer already with a different distribution of resources than before. It is easy to notice that the difference from the above procedure consists mainly in who determines the proportions of the exchange – the economic agents themselves or a "third party" in the form of the Walrasian auctioneer.

Competition and its role

The analysis of the pure trade model allows us to get the initial idea of such an important phenomenon of the market economy as competition. However, this possibility arises when considering the "expanded" model of exchange economy, in which the number of economic agents is more than two ($m > 2$): Robinson and Friday have no competitors!

Competition between economic agents, and at this stage of the study they act both as owners of goods and as their consumers, is generated by their desire to maximize the level of welfare by achieving the best exchange conditions. In the extreme case, no transaction will be made until its participants are convinced that there are no better conditions for the realization of their own aspirations.

The mechanism of such competition can be represented as follows (see, for example [20, pp. 398–401). A potential participant in exchange relations forms a vector of marginal rates of substitution of the good used as the counter (numeraire) with other goods. Due to the concentration of trading entities in one place, each of them has a fundamental opportunity to take into account possible conditions for concluding a similar transaction with other members of the society before concluding a transaction with one of the

counterparties. The process of such comparisons (analogous to the process of tâtonnement (groping) in a Walrasian auctioneer model) and making changes to the original plans (manifestation of competition) will inevitably be very long and time-consuming, because it will affect all economic agents. However, putting this circumstance aside, we consider it logical to conclude that such competition between numerous participants in pure exchange should lead to the formation of uniform proportions of exchange (including trans-temporal) on the market, providing a *direct transition* from the initial distribution of goods to one that corresponds to the state of general equilibrium[11].

In this context, it seems logical to introduce **the concept of the market as a special place** for making transactions (the equivalent of the term "marketplace" used in English-language literature). The concentration of the owners of goods in one place and at one time to reach agreements on the exchange allows each of them, on the one hand, to minimize the time and effort spent on their implementation, and on the other to optimize the transactions themselves, taking into account the possibilities of obtaining general information about the supply and demand of various goods. Thus, spatial localization of market transactions turns out to be the downside of the lack of effective alternative sources of obtaining and exchanging information.

If we take into account the inevitability of significant transaction costs accompanying the process of perfect competition[12], then the final result will look different. In this realistic case, competition will not "go all the way", it will not be able to become "perfect" in the full sense of the word:

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[11] By virtue of what was said earlier, we see that this conclusion does not apply to a model that allows exchange at non-equilibrium prices. However, sometimes this circumstance is not taken into account properly. So D. Kreps, describing exactly this last model, concludes: "The analysis of the "random meetings" marketplace has been quite popular recently, and the analysis that has been done offers qualified support for the Walrasian equilibrium notion" [21, pp. 197–198].

[12] In this case, transaction costs act as a form of system costs.

without excluding the exchange at non-equilibrium exchange values, it will only narrow their spread in individual transactions.

But this means that reaching the end of the path from the initial distribution of goods to the contract surface will not be made in a "one jump", but in a multi-stage trajectory, the movement along which is accompanied by a change in the proportions of exchange and distribution of goods between economic agents. Due to the above reasons, the "destination" will necessarily be characterized by a general equilibrium, but the number of such states for any initial distribution of goods will be infinitely large.

In this regard, it makes sense to return to the question outlined above, concerning the number of general equilibrium states. The above-mentioned conclusion, according to which there is a finite odd number of such states in the regular economy, caused disappointment in a certain part of researchers who share the approach to economic theory as an empirical science, in a paradigm based on the concept of general equilibrium. At the same time, the following circumstance caused particular displeasure. The general equilibrium model does not make it possible to formulate so-called "refutable hypotheses" regarding aggregated market variables, since it allows for the possibility of almost any combination of value and natural aggregated indicators and directly opposite reactions of some aggregated indicators to changes in the magnitude of others. Accordingly, the theory loses its "empirical content". It is for this reason that A. Mas-Colell, M. Whinston and J. Green characterized the Sonnenschein-Mantel-Debreu theorem as denoting that "anything goes"[13]. It is clear that the conclusion about an infinite number of states of general equilibrium corresponding to any given distribution of goods can be viewed from

this position as an additional confirmation of the failure of the paradigm based on the concept of general equilibrium.

However, from the standpoint of "pure economic theory" such a conclusion cannot be accepted. The value of the concept of general equilibrium is in no way belittled by the absence of its property of uniqueness for a given initial distribution of resources between economic agents. If a transition from the initial state to an infinitely large number of points of general equilibrium is possible, then this is nothing more than a feature of the object being studied, but not a defect of the theory describing it. At the same time, to understand how an exchange-based economic system functions, it is fundamentally important to conclude that in all cases it will strive for a Pareto-efficient state of general equilibrium.

About a pure trans-temporal exchange

The analysis of the model under consideration also makes it possible to identify the foundations of credit relations, which are a trans-temporal form of exchange. This problem is investigated in detail in [23]; here we present the main result of our work and make an important clarification regarding one of the conclusions made.

It turns out that with the rejection of the hypothesis of time preference [24; 25], which does not meet the requirement of consistency of the trans-temporal utility function [26], but with the standard assumption that an individual function of trans-temporal utility has the property of a decreasing marginal rate of substitution of the present with the future, the emergence of in-kind credit relations becomes possible due to the existence of a special category of goods – durable consumer goods. This conclusion seems to be fundamentally new and important.

The specific feature of durable goods is that they have two exchange values: the exchange value of current services ("rental exchange value"), and the exchange value of the flow of services provided over the entire period of their existence ("commodity

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[13] The name they gave to Paragraph 17E of a textbook on microeconomics, dedicated to this theorem, sounds like this: "Anything Goes: The Sonnenschein-Mantel-Debreu Theorem" [22, p. 598].

exchange value"). These exchange values are realized in two different forms providing for consumer access to such goods through exchange: lease[14] and acquisition of ownership.

In an equilibrium situation, the rental exchange value of current services of a capital good is proportional to their marginal utility. In this respect, the formation of demand and supply for the lease of such goods is no different from the formation of demand and supply for "ordinary" (non-durable) goods. It also turns out that the transfer to the ownership of the consumer of a "capital good" is possible not only on the basis of the trade we are accustomed to, but also with the help of credit relations.

For both sides of the transaction, the following two options are equivalent: renting the corresponding good for the entire period of its life and providing it to the consumer, on the condition that the latter carries out loan deliveries during this entire period in an amount corresponding to the value of the rental exchange value. In other words, credit turns out to be a complete substitute for rent in this case.

We should note that although such a loan ensures the transfer of the "capital good" into the ownership of the borrower, it does **not require** the presence of a commodity exchange value for the object of these relations, as well as the existence of an interest rate. The very durable good is provided on credit (or attracted with the help of a loan); its repayment can be carried out by a counter-good or

any other ordinary commodity. In the total amount of loan repayment deliveries, we **cannot** single out a component that ensures that the lender receives the main part of the debt, on the one hand and interest "income" on the other.

But without the formation of the commodity exchange value of consumer goods of durable use and the interest rate on the market, conditions cannot arise under which a loan would be provided in the form of ordinary goods: it is simply impossible to formulate the terms of such a loan without having the appropriate information. A natural question arises: are there necessary conditions in the pure exchange economy for the formation of the commodity exchange value of consumer durable goods and/or the interest rate?

Let us suppose that such conditions exist. Then the well-known functional relationship between the equilibrium levels of rental exchange value, interest rate and commodity exchange value of "capital goods" can be represented as follows:

$$EV_k = EV_k^* \cdot S, \qquad (21)$$

where EV_k is the market exchange value of the capital consumer good, EV_k^* is the exchange value of the services of this good for one period, $S = \sum_{t=1}^{T} \frac{1}{(1+r)^t}$ is the sum of discounts for T periods (r is the interest rate for the period, t is the period number). If this equality is violated, one of the forms of attracting capital consumer goods — rent or acquisition of ownership — becomes more beneficial, which indicates the imbalance of the current situation.

The rental exchange value EV_k^* in equilibrium conditions is exactly equal to the current marginal utility of the durable good expressed in terms of the exchange value of the counter-good. Therefore, the commodity exchange value EV_k of this good and the value of the interest rate are in a "rigid functional coupling": it is impossible to determine the equilibrium value of one without simultaneously determining the equilibrium value of the other. But then the question arises, which of these parameters

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[14] Theoretically, any durable consumer good can be the object of rental transactions. This is due to the fact that the rental agreement may well provide for the transfer of the relevant item for its entire life cycle to the lessee (in modern conditions — the so-called "financial leasing"). In this case, the lease differs from the acquisition of the good in ownership not by the period for which the good is placed at the disposal of the user, but by the payment schedule. The fact that many "capital consumer goods", such as clothing, in practice do not become (or almost never become) the object of rental relations is explained by the fact that the transaction costs associated with ensuring compliance with the terms of the lease agreement are excessively high in relation to the market exchange value of the corresponding goods.

is the leading one: the commodity exchange value of the "capital good" or the interest rate?

In the mentioned article, without giving a clear answer to this question, I made an attempt to identify the effect of the interest rate on the pure demand of an economic agent for credit at a given value of the commodity exchange value of the "capital good" [23, pp. 16−18]. But by doing so, the aforementioned "rigid coupling" was clearly violated, because with the rental exchange value EV_k^* prevailing in the market, a change in the interest rate will inevitably change the value of the commodity exchange value EV_k.

As for the question formulated above, it seems to me that it is simply impossible to answer it at this stage of the study. The prospect of finding the answer arises in connection with the transformation of production into an endogenous factor in the model of a simple exchange economy. Looking ahead, I note that such a statement is connected with the confidence that identifying the role of production costs as a factor in the formation of the exchange value of goods will show that in the coupling "commodity exchange value of durable goods − interest rate", the first of these parameters plays a leading role. In the meantime, we can only state that when studying the pure trade model, it is possible to demonstrate the existence of prerequisites for the simplest form of credit relations. Within its framework, only durable goods can be the object of a loan, and it is impossible to single out "an interest component" in loan servicing supplies.

Conclusions

The well-known model of pure trade harmoniously fits into the logic of general economic theory. Based on the patterns of behavior of an isolated economic agent, which are the object of study at the first stage of analysis, this model allows us to identify possibilities of increasing the level of welfare of at least one of the participants in the redistribution of existing goods without reducing the levels of utility of the remaining members of society. We clearly see

the reason that motivates economic agents to enter into exchange relations, and thereby **the reason for the transformation of the economic system under consideration**: from a set of isolated individual natural economies to a system of members of society united by exchange relations. At the same time, there exists an inextricable link between the basic institutions of an exchange economy (primarily the right of private property) and the principle of Pareto efficiency, which defines the boundaries of mutually beneficial exchange.

The article draws attention to the existence of **two institutionally different possibilities for the implementation of the exchange effect**, each of which leads to one of the distributions of goods located on the contract surface.

The first possibility consists in the **exchange of bundles of goods**. The composition of such a bundle is determined according to a well-known model in which the welfare of one of the participants is maximized, while the welfare of the other either remains the same or increases within certain permissible limits. The article shows that such a theoretically conceivable organization of exchange cannot be implemented in practice and is essentially non-market: in general, it does not even allow us to introduce the concept of proportions of exchange, and consequently, the exchange values of individual goods.

The second form of redistribution is based on the **classical commodity exchange**, the object of which is two goods. This method of redistribution of goods between owners, adequate to the market economy, presupposes the existence of proportions of their exchange for each other, which makes it possible to introduce an important concept of exchange value into the analysis. In modern economic theory, there are two approaches to the study of classical commodity exchange: **search for equilibrium proportions of exchange** proceeding from L. Walras' studies, which would make it possible to move from the initial distribution of goods to a distribution corresponding to the state of general

equilibrium in a "single jump", and an approach that allows **moving toward the contract surface by means of a series of successive commodity exchange transactions** using non-equilibrium proportions of exchange.

The article draws attention to the fact that the implementation of the first approach involves the creation of conditions that allow identifying and coordinating (through finding the equilibrium proportions of the exchange) the individual preferences of its participants **before the exchange itself**. The Walrasian auctioneer model illustrates this idea in a remarkable way, but it is an exclusively theoretical construction. The alternative is to create a perfect competition mechanism within a spatially localized market.

The analysis of two possibilities of directly achieving (with the help of exchange) the state of general equilibrium urges us to study most attentively the **problem of system costs (transaction costs – in the particular case of purely market relations)**. Being an economic analogue of friction in the physical world, they help to understand the limitations of certain institutional solutions in terms of the achievability of an ideal result. At the same time, it becomes clear that the desire to reduce system costs is a powerful driver of institutional improvement of the economic system.

Transaction costs also play an important role in moving toward the contract surface through a series of exchange transactions using non-equilibrium prices. The article demonstrates the mechanism by which the movement should ideally be completed not just on the contract surface, but also in a state of general equilibrium. At the same time, **an infinite number of such states correspond to any initial distribution of goods**, which is determined both by the presence of an inevitable zone of uncertainty in the proportion of exchange within each individual transaction, and by the sequence of transactions themselves.

The article concludes that in the system under consideration, the competition of economic agents will lead to a reduction in the spread of the proportions of exchange in individual transactions, but will not be able to eliminate them completely. In this sense, perfect competition turns out to be an unattainable ideal. The fact that in such conditions an infinite number of states of general equilibrium are preserved, corresponding to any initial distribution of benefits between owners, should in no way be disappointing to the researcher, because it is nothing more than a reflection of the real property of the object in the theory.

Finally, the analysis of the "pure exchange economy" allows us to lay the foundations of the theory of credit and interest rate and demonstrate the limitations in this regard.

Summary: the analysis of the pure trade model makes it possible not only to identify the drivers of development of exchange relations, but also **to reveal essential features of most of the main phenomena and processes in the sphere of circulation.** At the same time, the necessary prerequisites for involvement in the analysis of problems from the production side have been formed.

References

1. Nekipelov A.D. *Stanovlenie i funktsionirovanie ekonomicheskikh institutov. Ot "robinzonady" do rynochnoi ekonomiki, osnovannoi na individual'nom proizvodstve* [Formation and Functioning of Economic Institutions. From a Robinson Crusoe Economy to a Market Economy Based on Individual Production]. Moscow: Ekonomist", 2006.

2. Nekipelov A.D. The Robinson Crusoe model as a starting point of pure economic theory. *Ekonomika i matematicheskie metody=Economics and Mathematical Methods*, 2019, vol. 55, no. 3, pp. 5–20 (in Russian).

3. Nekipelov A.D. The crisis in economics its nature, and ways to recover. *Herald of the Russian Academy of Sciences,* 2019, vol. 89, no. 1, pp. 24–37 (in Russian).

4. Rostow W.W. The stages of economic growth. *The Economic History Review, New Series,* 1959, no. 12 (1).

5. Marx K. Das Kapital. 1867. In: Marx K., Engels F. *Soch. 2-e izd*. [Works. Second edition]. Gosudarstvennoe izdatel'stvo politicheskoi literatury. Moscow, 1961. Vol. 23 (in Russian).

6. Nash Jr J.F. The bargaining problem. *Econometrica,* 1950, no. 18 (2), pp. 155−162.

7. Silberberg E. *The Structure of Economics. A Mathematical Analysis.* Second Edition. McGraw-Hill Publishing Company, 1990.

8. Walras L. *Éléments d'économie politique pure ou théorie de la richesse sociale*. L. Corbaz & cie., 1874.

9. McKenzie L.W. On equilibrium in Graham's model of world trade and other competitive systems. *Econometrica,* 1954, no. 2 (2), pp. 147−161.

10. Arrow K.J., Debreu G. Existence of an equilibrium for a competitive economy. *Econometrica,* 1954, no. 22 (3), pp. 265−290.

11. Sonnenschein H. Market excess-demand functions. *Econometrica,* 1972, no. 40 (3), pp. 549−563.

12. Sonnenschein H. Do Walras' identity and continuity characterize the class of community demand functions? *Journal of Economic Theory,* 1973, no. 6 (4), pp. 345−354.

13. Mantel R. On the characterization of aggregate excess-demand. *Journal of Economic Theory*, 1974, no. 7 (3), pp. 348−353.

14. Debreu G. Excess-demand functions. *Journal of Mathematical Economics*, 1974, n. 1, pp. 15−21.

15. Debreu G. Economies with a finite set of equilibria. *Econometrica,* 1970, no. 38 (3), pp. 387−392.

16. Dierker E., Dierker H. The local uniqueness of equilibria. *Econometrica,* 1972, no. 40 (5), pp. 867−881.

17. Ackerman F. Still dead after all these years: Interpreting the failure of general equilibrium theory. *Journal of Economic Methodology*, 2002, no. 9 (2), pp. 119−139.

18. Fisher F.M. *Disequilibrium Foundations of Equilibrium Economics. Econometric Society Monographs*. New York: Cambridge University Press, 1983.

19. Hahn F. On the stability of pure exchange equilibrium. In: *"On Some Equilibrium Growth Paths" in Models of Economic Growth*. 1973.

20. Katzner D.W. *An Introduction to the Economic Theory of Market Behavior. Microeconomics from a Walrasian Perspective*. Cheltenham; Northampton: Edward Elgar, 2006.

21. Kreps D. A *Course in Microeconomic Theory*. Princeton University Press, 1990.

22. Mas-Colell A., Whinston M., Green J. *Microeconomic Theory*. New York: Oxford University Press, 1995.

23. Nekipelov A. On the theory of credit and interest rate. *Ekonomika i matematicheskie metody=Economics and Mathematical Methods*, 2021, no. 57 (2), pp. 5−20 (in Russian).

24. Böhm-Bawerk E. *Capital and Interest, a Critical History of Economical Theory*. London and New York: Macmillan and Co., 1890.

25. Fisher I. *The Theory of Interest*. New York: August M. Kelley, 1970.

26. Strotz R. Myopia and inconsistency in dynamic utility maximization. *Review of Economic Studies,* 1956, no. 23 (3).

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Polycausal Concept of Social Evolution*

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Abstract. The article puts forward a polycausal concept of social evolution (PCSE) based on taking into consideration the structure of the competition mechanism. The novelty of the PCSE lies in the simultaneous consideration of a set of interrelated variables of the competition mechanism that exclude the establishment of simple cause-and-effect relationships typical of monocausal theoretical constructions. A structural scheme of the PCSE includes the subject, object, environment and the process of competition; all of them are directly associated with such civilizational phenomena as technology, institutions, culture and ecosystem; together, these variables determine the nature of economic growth and the type of capitalist (market) relations. This approach can be called a method of structural (organizational) competition. To illustrate the PCSE and test its explanatory capabilities, we look for answers to the following classic questions: Why has human civilization matured in Eurasia rather than in other continents? How did humanity manage to break out of the Malthusian trap? How can we explain the Needham Puzzle? Why are some countries and peoples rich, while others are poor? Why do some poor countries and peoples manage to catch up with rich ones, while others do not? How can we explain the "case of the USSR"? The proposed PCSE is used to reconstruct key events in the history of human civilization. For this purpose, we put forward a structural outline of social evolution, which includes basic principles and mechanisms that determine certain results of the development of human societies. In conclusion, we make an attempt to use the PCSE to designate reference points of a modern civilizational crisis.

Key words: evolution, competition, profitability, capital, economic growth.

Introduction

Currently, a general theory of social evolution is being actively constructed; this theory could provide answers to a bulk of the most vital economic questions and shed light on many historical puzzles. Among those, let us indicate only the most important and topical ones. Why did human civilization mature in Eurasia rather than on other continents? How did humanity manage to break out of the Malthusian trap[1]? How can we explain the Needham Puzzle[2]? Why are some countries and peoples rich, while others are poor? Why do some poor countries and peoples manage to catch up with rich ones, while others do not? How can we explain the "incident of the USSR"[3]?

Many theories and concepts are proposed in an attempt to find answers to these questions. Granted, the very scale of these questions does not imply simple and unambiguous answers, and therefore the concepts that are being put forward coexist, sometimes entering into contradictions, and sometimes successfully complementing each other. Still, none of them brings cognitive satisfaction to researchers, and therefore the search for a comprehensive theory continues. The purpose of the article is to develop another, alternative, concept of social evolution, the novelty of which consists on the one hand in polycausality, unlike the majority of

known monocausal constructions, and on the other, in a structural and organizational approach, unlike the traditional reductionist method of identifying cause-and-effect relationships.

Prerequisites for the creation of a new concept

In this section, there is not enough room to reflect the entire range of ideas and developments regarding the driving forces of social evolution, and therefore let us focus only on two analytical trends. The first one is connected with the development of various monocausal theories and a gradual transition from them to polycausal constructions, the second one considers traditional causal chains (we shall conditionally call this approach *causal methodology*) and their abandonment in favor of organizational and managerial concepts (we call this approach *structural methodology*).

One of the most impressive monocausal theories of evolution is the empirically confirmed geographical interpretation of Jared Diamond, according to which the priority of the Eurasian continent in the development of human civilization was predetermined by several groups of natural factors [1]. However, it has been noted in the literature that this concept has two distinctive features. The first is its *explanatory limitations:* the ability to perfectly explain long-term civilizational trends in the early period of human history coexists with its chronic inability to interpret modern evolutionary shifts [2]. Its second feature is associated with *conditional monocausality*: along with geographical and natural factors, it implicitly contains a competition mechanism that is of key importance to all historical events [3; 4]. The syndrome of conditional monocausality permeates almost all advanced evolutionary concepts; their authors are aware of this, and therefore, they simply focus on the greater importance of one or another factor. This reservation will be assumed by default in further discussions.

An addition to Diamond's concept is a study by S.G. Kirdina-Chandler, in which, on a sample of 65 countries and with the help of large-scale statistical

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[1] The Malthusian trap (or the poverty trap) denotes a long-term preservation of an extremely low per capita welfare level: when positive changes in income occurred, there was an accelerated population growth and a return to the initial state. The Malthusian trap persisted for about 10 thousand years in all communities, and Europe managed to break out of it only in the 17th–18th century; currently, some African countries are still trapped in poverty.

[2] The Needham Puzzle (otherwise known as the Needham Paradox) is named after the British scientist Joseph Needham and consists in an inversion in the mutual evolution of Europe and China: before the 17th century, the Celestial Empire was ahead of European countries by many economic and social parameters; afterwards, it began to lag significantly behind.

[3] This phenomenon means the following historical nonsense – after its establishment, the Soviet Union withstood the hardships of civil war, famine, coerced collectivization and industrialization, won the Second World War, successfully opposed the United States in the Cold War, and in 1991 ceased to exist in relatively comfortable conditions.

calculations, she demonstrates the influence of a narrow range of climatic features on the spatial location of countries with the dominance of market (Western) and non-market (non-Western) institutions. The former are characterized by the predominance of competitive self-regulation mechanisms, while the latter – by administrative methods of centralized management [5]. As it turns out, in territories with relatively mild geothermal conditions and low risks of natural disasters, countries with the dominance of Western institutions are formed; and in territories with high variations in precipitation, air temperature and high risks of natural disasters, centralized (non-market) institutional models historically prevail [5, p. 80]. However, researchers point out that the dependence identified by Kirdina-Chandler is not universal: as a rule, countries with externally imposed institutions do not fit into it [3].

An alternative to geographical concepts is found in the theory of Daron Acemoglu and James Robinson which advocates the priority of the *institutional factor* in the formation of state models in the course of social evolution. According to their views, the success or failure of a particular social system depends on which of the two types of institutions dominate it: inclusive, which involve large masses of the population in economic turnover, or extractive, aimed at preserving the privileges of a narrow group of the ruling elite [6]; a very similar institutional concept – the concept of social orders – has already been proposed by Douglass North and his colleagues [7]. However, this analytical outline is also extremely vulnerable to criticism. First, it presents Western democracies and, in particular, the U.S. political system as a kind of "end of history", as the pinnacle of development of human civilization, which does not imply further improvement [2]. Second, the theory of inclusive institutions is too much prone to suffer from a syndrome of conditional monocausality: the authors constantly "dilute" the historical analysis with geographical and cultural factors and thereby contradict themselves [3]. Subsequent development

of these authors' ideas in the form of the concept of the narrow corridor has only aggravated this disadvantage [8]. In the previous book, Acemoglu and Robinson demonstrated the secondary nature of the institutions of South Korea and North Korea depending on the personality of the leaders who came to power in them; while in their new work, they once again emphasized the "fatal" dependence of Athenian democracy on the unique reforms of Solon and the ingenuity of his mind.

L. Harrison consistently proved the role of personality and culture in social evolution; his theory includes two conditions for the success of man-made institutional transformations: a) the presence of a crisis or unique opportunities; b) the presence of bright reformers with progressive ideas [9, p. 190]. Although the validity of the above conditions is beyond doubt, Harrison's concept still attaches too much importance to a random factor in the form of a timely emerging personality.

An attempt to give the *cultural factor* a more objective and large-scale character was made by C. Welzel in his concept of *emancipative values* (the desire for freedom), which underlie the collective actions of both the elites and the masses [10]. However, this attempt to build a theory of social evolution on the basis of one main factor turned out to be unconvincing. First, in this scheme, the very values of freedom lead to an acceleration of technological progress, and the latter further strengthens people's emancipative attitudes; critics believe that it is necessary to decipher the mechanism of such connections [2]. Second, the emphasis on the values of freedom does not take into account D. North's argument regarding the dual nature of institutions [11] and D. Zolo's political theory on the dualism of state regulation [12]; according to these concepts, we should be talking about equally important values – the *security* and *freedom* of citizens, and the *limitations of* and *incentives for* their activities [13]. Third, cultural differences in values do not provide a good explanation regarding the early periods of human history [2]. Fourth, Welzel's concept

of emancipative values is characterized by an even greater eclectic interweaving of cultural, technological, geographical and institutional factors [3].

As for technology regarded as a major driver of social development, K. Marx supported this viewpoint in his teaching about the determining role of productive forces (technologies) in production relations (institutions): "... the capitalist mode of production presupposes ... a definite social form [Gestalt] of the conditions of production, ... it produces not merely the material products, but reproduces continually the production relations in which the former are produced..." [14, p. 893]. The criticism of this concept consists in the fact that the overwhelming majority of authoritative researchers assert the primacy of institutions over technologies [11; 15]. R. Lucas substantiates this position by referring to the period of domestication: privatization of hunting grounds or gathering rights preceded or at least developed alongside agricultural technologies; otherwise, a sacramental question arises: why domesticate an animal, since anyone has the right to kill and eat it? [15, p. 200].

At present, we can state that a long-term struggle for the theoretical primacy and dominance of geographical, institutional, technological and cultural factors driving social evolution has reached a dead end. It is possible that such a stubborn defense of the principle of monocausality of the social theory is based on the desire to find the *fundamental basis* of being, which, in turn, is rooted in monotheistic religious thinking, when priests reduce all phenomena to God (Absolute), physicists – to an elementary particle (atom), biologists – to a cell (gene), economists – to a commodity (working hour), etc. [16, p. 88]. However, today we already see the formation of an alternative position, according to which no monocausal concept is able to adequately explain social evolution; we need to move on to polycausal constructions [2]. At the same time, there exists an opinion that along with the development of civilization the role of biological and geographical factors in human life reduces

and, conversely, the importance of technology and culture increases [3]. It is noteworthy that in the past century T. McKenna already noticed the difference between the laws of development of civilization in its early and late stages: "If nature represents a principle of *economy,* then culture surely must exemplify the principle of innovation through *excess*" [17, p. 17]. This effect can be called the *McKenna inversion*. Thus, we can point out the need to construct a polycausal concept of social evolution (PCSE) and abandon fruitless attempts to reduce all the diversity of social phenomena to one group of factors.

We should emphasize that the construction of the PCSE involves essentially a transition from a causal methodology based on the understanding of long chains of cause-and-effect relationships to a structural methodology involving the consideration of complex organizational entities in conjunction with their management system. In other words, instead of studying the influence of some objects and processes on others, the structural approach requires understanding the general *rules of self-assembly* for complex organizational formations with their subsequent evolution toward increasing or decreasing their orderliness, functionality and efficiency. Such an attitude is aimed not so much at the analysis of various social phenomena, but rather at their synthesis and understanding of this very process.

We should say that structural methodology assumes an explicit interdisciplinarity or, to be more precise, polydisciplinarity; moreover, it has already been implemented many times, but unsuccessfully. Suffice it to recall the work of A.A. Malinovskii (Bogdanov) published in the 1920s; the work introduces *tectology*, a new universal organizational science [18]. In 1948, N. Wiener published a landmark work in which he introduced *cybernetics*, a new science of control and communication in the machine, animal and society [19]. Then, in 1955, W. Ross Ashby's book consolidated the position of cybernetics [20]. Finally, in 1968, L. von Bertalanffy published a treatise on the *general system*

theory, in which he contrasted integral features of different systems with the doctrine of cause-and-effect relationships [21]. These works did not go unnoticed; however, they did not contribute to the formation of a new science. Until very recently, the social sciences have continued to adhere to long-established orthodox views, trying to reduce all the diversity of phenomena to a simple – conditionally monocausal – analytical construction. It seems that it was only in 2018 that a new constructive attempt was made to move to polycausal constructions based on structural methodology by considering three main social *coordination mechanisms* (competition, power and cooperation), which are formed as a result of the interaction of cultural, institutional, technological and geographical factors. Moreover, the level of coercion built into the coordination mechanisms serves as an indicator of social progress in itself [22]. The development of this idea helped to establish a civilizational cycle of coercion with a typical growth of this phenomenon at the earliest stages of humanity, followed by a weakening of coercion at a later stage of development [3]. An important element in the structural methodology was the *principle of interrelated changes* in the main groups of factors [23], which was subsequently concretized in the form of the *principle of consistency* of these factors [24]. The scientific positions described above are a starting point for further theoretical constructions.

In substantiating my theses, I will rely on authoritative works in the field of economics, history, sociolinguistics and philosophy; natural science works in an explicit form will not be used. This approach is justified by the fact that many of these sources have already reviewed the natural scientific achievements of our time, as, for example, in J. Diamond's [1].

The polycausal concept of social evolution: the mechanism of competition

There is no doubt that the attempt made in [22] to consider social evolution through the prism of the mechanisms of interaction of subjects is a serious step forward. At the same time, while introducing the

nature of social ties makes it possible to streamline human history, it does not lead to an explanation of its most important riddles and paradoxes. To do this requires one more, additional, step: to investigate the mechanism of competition and its structure. The fact is that *any human community carries out self-assembly through the formation of a competition mechanism*, which is the most general manifestation of any interactions between people. Forms of competition can be infinitely diverse: traditional (hot), "cold", information and hybrid warfare; trade, currency, patent wars, etc.; economic, political, administrative, technological competition, etc.; monopoly, oligopoly and other types of market power; associations, cooperation and partnership. All these forms of competition differ only in the degree of toughness, but the struggle itself never stops. We can single out the term "competitive equilibrium", when a temporary balance of forces of competing parties arises.

Let me make a reservation right away: there can be different interpretations of existing concepts. For example, competition, power, war, cooperation, etc. can be considered as particular cases of the general mechanism of coordination of interactions between subjects [22]. However, in my opinion, the competition mechanism for social systems is something similar to the mechanism of energy-and-information interaction in physics and thus has the maximum degree of generality. Back in the 1960s, L.A. Petrushenko expressed an idea that the general *law of entropy increase* in the Universe is opposed by the equally general and global *law of autoregulation in nature* [25]. In primitive physical systems, it takes the form of quasi-management; in social systems, it takes the form of feedback control [26]. At the same time, the law of autoregulation ensures the natural unity of the comprehensiveness, organization and self-movement of a society [27]. The mechanism of competition is a manifestation of the forces of self-organization and self-regulation in biological and social systems. Consequently, the law of entropy increase leads to the destruction of the order and organization within the system, whereas

competition is mainly a manifestation of creative and ordering forces; this determines its role in the proposed PCSE.

In order to reflect all the variety of historical turns, and build a full-fledged PCSE with a high explanatory ability, it is necessary to use the structure of a competition mechanism rather than just an abstract mechanism of competition *(Fig. 1)*. At the same time, the following methodological analogy comes to mind: Buddhism considers personality as a structurally ordered combination of five elementary psychophysical states, dharmas [28, p. 48]; In the PCSE, society as a whole and its individual social groups are also considered as constructions made up of several structural elements, the effective combination of which allows this social group to compete with other similar groups in various markets. This interpretation provides an essentially dynamic picture. According to the Buddhist teaching, the human personality is a stream of constantly changing elementary psychophysical states [28, p. 50], while the PCSE considers competition mechanism as a recombination of its continuously changing structural elements.

The specific feature of the structural outline in Figure 1 is that each element of the competition mechanism is compared with a group of factors that

Figure 1. Organizational structure of the competition mechanism
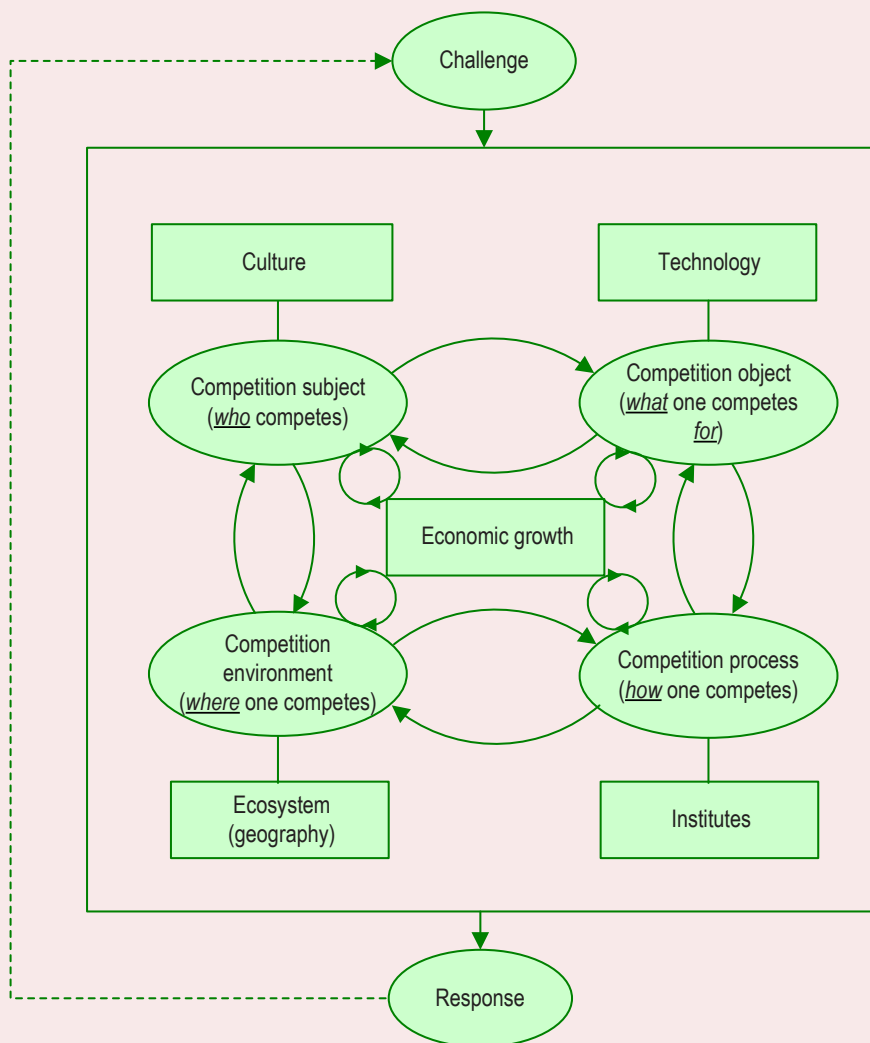
traditionally appears in modern monocausal theories of evolution. As a result, the formation of the competition mechanism is automatically coupled with such groups of factors as technology, institutions, culture, geography and welfare. At the same time, in accordance with A. Toynbee's "Challenge and Response" model [29], the process of assembling a social system and forming a competition mechanism begins with an external shock (Challenge), and a modified competitive system is the reaction (Response) to this shock. The center of the assembly of the social system is the process of economic growth, which simultaneously serves as a measure of a successful or, conversely, unsuccessful Response to historical challenges.

The block diagram in Figure 1 represents the theoretical core of the PCSE and possesses an obvious potential for explaining numerous historical phenomena. Certainly, this diagram requires a lot of additional material in order to provide satisfactory answers to the questions posed at the beginning of the article. To this end, we will use the method of *key historical events* (KHE) and consider those events which marked the formation of a new evolutionary trend and the dominance of certain driving forces of social evolution [3]. Considering the history of civilizations through the prism of such milestone events, it is possible to determine with greater objectivity and impartiality a set of factors that served as original determinants of the subsequent trajectory of evolution. In addition, these events are analyzed in detail by almost all researchers, and therefore they are well described and elaborated; this creates the basis for their correct analysis and discussion for the reconstruction of human civilization.

So as to interpret further material correctly, it is necessary to define some basic terms. First, I consider the history of human *civilization* (humanity) in the time interval from the 10th millennium BC to the present day. I identify the term "civilization" with the most general categories of world economy, world system and world economic system in the understanding of I. Wallerstein [30];

despite the difference in connotations in these terms, I will use them as synonyms without losing the extent of generality in the analysis. Second, in the history of civilization, I focus on the processes of social evolution that is understood as qualitative changes in the world system or its individual regional fragments. Evolutionary shifts in the world economic system imply either an increase in its level of organization, which is equivalent to *development* or evolution in the narrow sense of the word, or a decrease in the level of organization, which is equivalent to *degradation* or *involution*. Third, social development emerges as a result of *progress* in various elements of the world system. Basically, I will also use development and progress as synonymous terms.

At the same time, no one knows the global *goals* of the social evolution of mankind, but the *criteria* (and manifestations!) of this evolution are quite understandable and universal. Positive social evolution (development, progress) implies the growth of the viability of society, the increase in its functionality and efficiency. The *viability* of a society is understood as its ability to preserve itself by responding to external challenges; the *functionality* of a social system is understood as the diversity of its operational capabilities or, what is the same thing, the number of options and ways to respond to the challenge that has arisen; *efficiency* is understood as the ratio of the results of the activities implemented by a society to the costs it incurred to obtain them, or, to paraphrase the above, the results of responding to the challenge are compared with the resources spent on this.

Reconstruction of human civilization: Hegemony of Eurasia in the 11th−2nd millennium BC

The first question we raised in the introduction is the need to explain the superiority of Eurasia in the early stages of human development. What can be the reconstruction of the specified KHE?

In my opinion, J. Diamond provides an exhaustive explanation of the indicated KHE, the essence of which boils down to the following: Eurasia possesses the richest gene pool of domestic

animals (13 out of 14 currently existing species); Eurasia has an advantageous geometric shape compared to the rest of the continents – it is stretched from east to west, rather than from south to north, like America and Africa, this promoted a rapid spread of product innovations horizontally, rather than vertically; the Eurasian continent is geographically open and does not have natural barriers – it has neither vast deserts like the Sahara, nor dangerous insects like the tsetse fly [1]. The presence of such comfortable climatic and geographical conditions led to the first great discovery of ancient man – he realized that domestication (cultivation) in the form of animal husbandry and crop production may be more convenient than hunting and gathering. Thus, the first prototype of a powerful competitive mechanism began to be formed on the Eurasian continent. In the interval between the 11th and 2nd millennia BC, a wave of discoveries and innovations in the field of domestication of plants and animals led to the emergence of new production technologies, new relationships between people (institutions), new values and attitudes of individuals (cultures) and a completely different level of well-being.

According to Diamond, the transition from a lifestyle of hunting and gathering to one of agriculture and cattle breeding on Earth occurred mainly between 6000 and 4000 BC [1, p. 194]. From this moment, the process of ethnogenesis begins, when behavioral models of different peoples are formed on the basis of specifics of geographical landscape with its subsequent radical transformation [31]. It is this process that triggers the history of mankind as such, which is a clash of different peoples, from which the most successful and competitive emerge victorious, and the less weak and adapted die and leave the historical scene. North America, South America, sub-Saharan Africa, Australia – neither of these continents received so refined a challenge from the natural ecosystem, and therefore neither of them responded so powerfully as Eurasia. Since this key historical event, the gap between the civilizations of Eurasia and those of other parts of the world has been growing in favor of the Eurasian peoples.

I note that already at the abovementioned early stage of the development of human civilization, two phenomena emerged, which, in turn, generated two social mechanisms: limitation of resources (land, animals, plants, technology, etc.) led to the emergence of *competition among communities* (collectives), and the different effectiveness of alternative activities (gathering/crop production and hunting/animal husbandry) led to *competition of professions* [1]. Thus, at the initial stage of social evolution, the mechanism of competition is *self-organized* as a result of limited resources and differentiation of production efficiency, whereas at later stages it itself becomes a source of overcoming limited resources and increasing economic efficiency due to the creative activity of individuals.

Reconstruction of human civilization: Europe vs Asia at the stage from 2000 BC to 1500 AD

The next question we put forward in the introduction is the need to explain the Needham Puzzle. In order to find an explanation to this paradox, it is necessary to review a rather extensive historical period during which Europe slowly but surely overtook Asia. As in the previous case, the initial advantage of Europe was its geographical uniqueness. According to J. Diamond, Europe suffered from chronic political fragmentation, while China was characterized by chronic political unity. At the same time, the political fragmentation of Europe and the unity of China originate in their geography, and in particular in the form of geographical borders. Europe had a broken coastline, almost isolated peninsulas and islands that were large enough and located close to the continent, while China represented an almost homogeneous geographical area. As a result, many politically independent territories with their own languages and ethnicities have developed in Europe, which was not the case in China [1, p. 526]. Thus, the ecosystem of Europe gave rise to much more powerful and sophisticated competitive mechanisms, which subsequently led to its global leadership.

However, competition, as mentioned above, can take destructive forms and lead to an endless war[4]. In this regard, the second prerequisite for the hegemony of Europe was a special mental atmosphere that had developed among the peoples of this territory. This mentality has ancient roots and represents an *ideology of individualism* reinforced by the demand for *political participation* of all full-fledged citizens of the state.

The phenomenon of political participation is apparently connected with the ancient Greek poleis, which, due to their compactness, produced a very peculiar political and state culture. For example, according to Aristotle, "... every state is a community of some kind, and every community is established with a view to some good..." [32, p. 376]. The following passage of Aristotle highlights the deep idea of the ancient world of Europe about the essence of man: "...man is by nature a political animal. And he who by nature and not by mere accident is without a state, is either a bad man or above humanity" [32, p. 378]; "... he who is unable to live in society, or who has no need because he is sufficient for himself, must be either a beast or a god: he is no part of a state" [32, p. 379]. "That they [the members of a state. *Translator's note*] should have nothing in common is clearly impossible, for the constitution is a community, and must at any rate have a common place..." [32, p. 403]. Such rigid attitudes led to the original understanding of an idiot (idiotae) as a person who is not able to participate in public life [33, p.70]. The loss of political capacity by a political animal (zoon politikon) automatically turned him into an idiot.

It is curious that this Greek tradition manifested itself in an even more refined form in the era of the Roman Republic, in which "the Romans were thoroughly politicized. They spent days and nights at the Forum; speeches by the masters of rhetoric, new laws, the struggle of politicians, court cases — that is what was the source of their amusement"

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[4] Without dwelling on this point, we note that scientific literature has considered a huge number of examples when fierce competition between manufacturers led to the collapse of entire economic sectors.

[34, p. 67]. In Rome in the 2nd century BC, all adult men were engaged in state affairs [34, p. 239]. Political activity manifested itself in the hitherto unthinkable art of eloquence; Tacitus gives it a very accurate definition: "Great and vivid eloquence is a child of self-will... We do not know ... the eloquence of the Macedonians and Persians and any other people who was held in obedience by a firm hand" [34, p. 149]. It is also noteworthy that in Rome the abandonment of public affairs in favor of entertainment was frowned upon more than in Greece. For example, theatrical plays were written, as a rule, by former slaves, and the one who acted on stage could not be a Roman citizen [34, p. 289]. Any manifestations of idle antics and jestering made a person unfit to participate in serious state affairs.

If we talk about the phenomenon of European individualism, the sociolinguistic analysis of such important linguistic constants as "society" and "state" allows us to shed more light on the situation. Language constants, as basic historical concepts, reflect the core of social reality transmitted through national languages. Thus, the analysis has shown that in Russian, Chinese and Japanese, as well as in Hindi, Urdu, Sanskrit and Arabic, the term "society" reflects the predominance of "the general over the private", the idea of unity with the priority of society as a whole over the individuals included in it. Similarly, for the peoples of these linguistic groups, the term "state" contains the figure of a supreme ruler, whose mission is to govern the subjects [35, p. 23]. Pomegranate is a visual metaphor for the term "society" in Oriental languages and cultures [35, p. 19]. To English, French and German, as well as Latin, the term "society" demonstrates the principle of its construction "from below", when integrity is understood as the association of "primary" individuals in a legitimate union, and the individual is "soldered" into "society". The term "state" for these languages has no personification and is understood as an impersonal stable legalized order of things (law) without references to power and hierarchies. Grape is a visual metaphor for the term "society" in Western languages and cultures [35, p. 21].

Historical attempts to "reinterpret" these language constants in accordance with other patterns have not been successful; this confirms the deeply rooted foundations of cultural stereotypes among different peoples of Europe and Asia [35, 2019, p. 23]. According to D. North, later it was the *impersonal institutions* of the West that served as the basis for achieving a political balance between state power and society, which in turn led to the construction of democratic European states [11].

Thus, the presence of developed competition mechanisms in Europe, alongside political civic activism and militant individualism, led to the creation of a Law binding on all, and the establishment of states with a reasonable balance of power between elites and civil society. All this made it possible to launch military and technological competition with all the ensuing consequences. None of such prerequisites has developed in China, India, Russia, Africa, or America. It was the widespread use of the competition mechanism that acted as the main driver of the transformation of the territory of Europe into a hot spot of *creative activity* of large masses of the population; this very fact served as the main source of the Needham Puzzle. Even N. Machiavelli had to state that "...in republics there is a stronger vitality, a fiercer hatred, a keener thirst for revenge. The memory of their former freedom will not let them rest" [36, p. 45].

Reconstruction of human civilization: Breaking out of the Malthusian trap after 1500 AD and the emergence of capitalism

The Needham Puzzle is closely associated with the question of European civilization finding the way out of the notorious Malthusian trap. However, to answer this question we find it expedient to focus on two additional mental features of European civilization – dialectical thinking and a vast horizon of event planning. The first feature of Europeans originates in the dialectical philosophy of Ancient Greece and finds its mature form in Christian theology, dealing with a huge number of biblical contradictions and paradoxes, the overcoming of which led to scientific dialectics in the works of G. Hegel [37]. It was dialectical logic that made it

possible to "reverse" the entire original Christian morality and not only justify, but also elevate traditional sins such as pride, the desire for wealth, loan interest, etc. into the category of virtues. The intellectual resourcefulness of representatives of European peoples was especially evident during the split of Catholicism and the birth of Protestantism, which not only gave the new system a new ethic, to which M. Weber attached great importance [38], but also reconciled any contradictions and paradoxes of life at an intellectual level[5]. Thus, Orthodox thinkers speak of eight deadly sins (gluttony, fornication or lust, avarice, anger, sadness, despondency, vainglory, pride), the severity of which increases from the lowest to the highest. Protestant Western culture grants full and unconditional justification to three of them – pride, vainglory and avarice, as well as to loan interest. Europeans accept rational pride (man is created in the image of God), Protestant ethics condones and justifies vanity and avarice (wealth is a manifestation of a person's chosenness, which they deserved through their diligence and asceticism) [40, p. 213]. All this could not but affect the character of the White Man and made him equally ambiguous and contradictory. I agree with K. Krylov, who pointed out: "The Europeans are super-predators who created a great civilization based on refined violence" [33, p. 299].

A bright illustration of the above thesis can be found in the way the European states of the 17th–18th century forced people to work and provided technological progress with workforce. Thus, on the territory of modern Germany, the order of the Landgrave of Hesse in 1616 read: "All the beggars and drunkards capable of working, who lounge

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[5] By the way, the Protestant morality defended by M. Weber did not prevent Jean Calvin from burning Michael Servetus, who discovered pulmonary circulation, at the stake [39]. How was this different from the Catholic Inquisition, which did the same to Giordano Bruno? In this case, I emphasize that all the arguments about the formation of capitalism in terms of Good and Evil, Good and Bad, are devoid of any meaningful sense. The emphasis should be on the mechanisms of competition and its results; bringing ethical entities into the analysis only prevents us from seeing the true drivers of evolution. I should also emphasize here that the civilizational victory of the West over the East says nothing about which peoples and cultures are better.

around in taverns, any idlers who have made a trade for themselves from begging alms from our subjects, are forced to work in our mines for a proper fee, and in case of unwillingness on their part, they shall be put in shackles and delivered to the mines" [41, vol. 2, p. 147]. This approach was further developed through the widespread introduction of special institutions – workhouses, almshouses and prisons. In France (in Paris) in 1656, *L'Hopital general* was opened, which combined a workhouse, a hospital for the insane, a prison, an orphanage and an almshouse for the elderly [41, vol. 2, p. 151]. The provision of customers for this institution was conducted in the most uncompromising way: "All beggars, able-bodied and disabled, of all ages, men and women alike, who are found within the city and suburbs of Paris will be imprisoned in *Hopital* and places under its jurisdiction, and will be used for public works, industrial labor and maintenance of the institution itself, by order of its directors [41, vol. 2, p. 151]. Contrary to traditional ideas about the introduction of technological progress in advanced private firms, the initial stage of capitalism was based on forced labor of vagrants, beggars and the sick. This is largely due to the quite natural reluctance of people to become appendages of new machines and mechanisms with which they had to work monotonously for many hours. It is not surprising that the masses preferred free begging to forced and low-paid labor in manufactories. In this case, there was a ban on leaving institutions like *L'Hopital general*; the runaway customers were searched for, subjected to severe corporal punishment for escaping, and brought back. Labor service in European workhouses was total: even the elderly, the crippled and the paralyzed worked [41, vol. 2, p. 152].

An extremely important fact is that all the described examples of the brutal imposition of capitalism and technological progress were absolutely legitimate. For example, in Great Britain, even in the 18th century, 223 violations of the law were punishable by death, including pickpocketing, robbery in the amount of more than 40 shillings, digging up trees from private gardens and on the streets, etc. [42, pp. 14–15]. The institution of capital punishment was supplemented by other physical punishments, many of which were essentially equivalent to it. For example, stealing a sheep was punishable by 300 lashes, regardless of the offender's age and gender; the punishment was too severe to endure even for young and healthy men [42, p.15]. Dura lex, sed lex – The law is harsh, but it is the law.

The contradictory nature of representatives of the European peoples manifested itself in their seemingly incompatible qualities like greed, cunning, cruelty, aggressiveness, religiosity and fanaticism, endurance, the ability to save, withstand hardships and make complex calculations, sacrifice, kindness, devotion to higher causes, etc. In no other part of the world have all the listed properties of human character been able to blend organically. I agree with W. Sombart who points out that the true capitalism emerged only when the European peoples formed the *spirit of capitalism*, which transformed the medieval principle of rest into capitalist anxiety, the static world into a fundamentally dynamic world [43, p. 29], and traditional skills and abilities into new specific competencies [43, p. 125].

The contradictory nature of a European individual created two poles in their character. The first pole is the *inevitability* of the White Man, manifested in the fact that he was able to destroy literally the whole world and all peoples, if it was necessary to achieve his goals. This character trait found its most refined artistic embodiment in Jack London's symbolic story *The Inevitable White Man*. The second pole is the White Man's *readiness to make sacrifices*, manifested in his selfless missionary activity, in his willingness to give his life for the aborigines he conquered. This trait also found artistic embodiment in Rudyard Kipling's equally symbolic poem *The White Man's Burden*. The combination of these two poles of character with the desire to plan their activities over huge periods of time became the spiritual and intellectual basis that made the European peoples able to create capitalism, a new economic system. As L. Summ put it, picturesquely, "the new

Florentine is educated, successful, cynical, skillfully exploiting the weaknesses of both people and gods" [36, p. 11]. The new bourgeois class combined the principle of the Gospel According to John: "In the beginning was the Word ... and the Word was God" [44, p. 1127] with the Pythagorean concept "Everything is a number" (or "Things themselves are numbers") [45, p. 10]. By combining quality (meanings) with quantity (measure), Europeans have gained such practical functionality and efficiency that were previously simply unattainable for any peoples. In the future, this led to the creation of science and technology and, as a result, the power of the West.

It is interesting that Christianity was not only divided into denominations (Orthodoxy, Catholicism, and Protestantism in the form of numerous denominations and sects: Anglicanism, Lutheranism, Calvinism, Baptists, Methodists, Quakers, Mormons, etc.), but also united with other religions. For example, Buddha Shakyamuni was canonized as an Orthodox saint under the name of Josaphat[6] Buddha in Byzantium [28, p. 22]. The unique Buryat monk Lama Itigilov actively communicated with representatives of the royal family and was recognized as Russia's main Orthodox Buddhist [46, pp. 80−81]. And P. Tillich, a major Protestant thinker of the 20th century, argued that the Japanese school of Buddha Amitabha − the True Faith of the Pure Land − came close to the Protestant principle of salvation by faith and grace [28, p. 111]. Such paradoxes were based on a deep tradition of considering logical collisions in Christian theology. For example, the universe is created as a result of the self-alienation of the Spirit (God) [37, p. 137]. And what is the role of Christ? Through him, did God become man or, conversely, did man incarnate into God? In other words, is it the deification of man or the humanization of God? [37, p. 58]. And does not the very coming of Christ mean that God himself needs man in order to come to himself, so that man is the cause of God? [37, p. 63]. And the execution of God in the person

of Christ led Christians to feel that omnipotence made God incomplete [37, p. 92]. I agree with S. Žižek's statement that it is Christianity that enacts the reflexive reversal of atheist doubt into God himself. When Christ exclaims: "Father, why have you forsaken me?", then in the person of Christ it is God that does not believe in himself [37, p. 94]. And the very fact of God's abandonment of Christ at the moment of his greatest suffering demonstrates that God is also imperfect − he himself is the source of opposites and, consequently, Good and Evil [37, p. 95].

However, all of the above has not yet helped to find a way out of the Malthusian trap, create capitalism and launch economic growth; these were only the organizational and mental prerequisites for the upcoming KHE *(Fig. 2)*. Subsequent events were triggered by the emergence of the *phenomenon of superprofits* as a result of Great Geographical Discoveries and maritime trade. It has already been noted in literature that with a normal rate of return, the process of capital accumulation could stretch for a long time, and economic growth would simply not take place [47]. In the depths of the economy of the Middle Ages, there emerged a *special economic sector*, in which the return on capital reached hundreds or even thousands of percent per annum; this acted as a kind of Challenge for humanity. Trade in sugar, tobacco, coffee, cocoa, tea, slaves, rubber, drugs (opium), spices, as well as territorial transactions with native tribes, the emergence of exchange mechanisms of speculation, privateering, etc. produced stable three- and four-digit profit margins in 1500−1750 [48]. Such profitability parameters were truly a great temptation for European businesspeople. Recall the statement of T.J. Dunning: "A certain 10 per cent. will ensure its employment anywhere; 20 per cent. certain will produce eagerness; 50 per cent. positive audacity; 100 per cent. will make it ready to trample on all human laws; 300 per cent., and there is not a crime at which it will scruple... even to the chance of its owner being hanged" [49, pp. 35−36]. In the period under consideration, profitability reached from 700 to 2000%. The presence of competitive mechanisms

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[6] Derived from "Bodhisattva".

in Europe, people's thirst for profit and religious zeal resulted in the fact that the continent quickly turned into a hot point of creative activity of large masses.

Unlike China, Europe accepted a historical Challenge: Britain, for example, developed *individualist-type* institutions (with the priority of the interests of the individual over the interests of the collective), and in China, *collectivist-type* institutions continued (with the priority of the interests of the collective over the interests of the individual). These differences were manifested most clearly in the redistribution of land. In China, the growing rural population was granted land at the expense of existing owners, while in England, on the contrary, farmers were uncompromisingly driven off the land and turned into proletarians. Consequently, in Britain, the average size of farms in the period from the 13th century to 1800 increased from 14 to 151 acres (10.8-fold); in China, in the period from 1400 to 1800, it decreased from 4.0 to 2.5 acres (1.6-fold) [50, p. 47]; the final divergence in the size of British and Chinese agricultural plots was 60.4 times. The direct consequence of such processes was the growth of inequality: according to available data, the Gini coefficient in Great Britain increased from 46% in 1688 to 60% in the 1860s [50, p. 54]. Such obvious manifestations of cruelty and "injustice" of British institutions led to the fact that in the period from 1760 to 1831 alone, the share of accumulation in the country increased from 6 to 12% [50, p. 46]. This led to acceleration of economic growth and technological progress.

It is noteworthy that all the geographical, institutional, economic and technological prerequisites discussed above were more or less typical of other parts of the world. For example, the Chinese traveler Zheng He, almost a century before Columbus, sailed on board ships four times longer than the schooners of the European discoverers of America [50, p. 40]. Nevertheless, Chinese merchants did not find anything worthy in the new lands and dutifully accepted the decision of the emperors of the Ming dynasty to ban the construction of large ships, which marked the

beginning of self-isolation of the Middle Empire over the next four centuries [50, p. 40]. Similarly, the fact that China possessed such inventions as silk, compass, gunpowder, paper, porcelain, blast furnaces and printing did not receive proper development and did not lead to the development of capitalism [50, p. 50]. Moreover, the Chinese mentality provoked a fundamental unwillingness to trade with the outside world: even at the beginning of the 19th century, China was economically self-sufficient, that is, it produced almost everything it needed, and therefore kept borders closed and minimized foreign trade. On the entire Chinese coast, only two ports, Macau and Canton (Guangzhou), were opened to ships of foreign merchants. At the same time, trade in Canton, as well as the presence of Europeans there, was surrounded by many prohibitions and administrative restrictions. European merchants had the right to stay in Canton only during the trading season (from October to March); in the remaining months, they had to close their trading posts and move to Macau. They were not allowed to enter the city; a small plot about the size of two football fields was allocated to them on the river bank behind the city wall. It housed 13 European trading posts with warehouses and infrastructure: shops, small workshops, drinking places, etc. European traders could not communicate directly with the Chinese authorities. There was a special Chinese guild of merchants, whose members could act as a guarantor for every European trading company and for every private merchant. All contacts with local officials were carried out exclusively through this guarantor. Guarantors owned trading post buildings, and the firms only rented them; besides, guarantors directly or indirectly provided their European wards with supporting staff such as translators, compradors (managers), shroffs (money changers), servants. All trading operations were carried out through the guarantors, who also carried out covert supervision of the "barbarians" entrusted to them. In fact, China implemented a recessive foreign trade principle: "We don't need you here; accept it and be thankful that we are dealing with you at all" [51].

So, the KHE in the form of the superprofit phenomenon received an adequate response from the Europeans: business activity, inequality, rapid accumulation of capital in private hands and the emergence of a layer of investors who could invest money in any endeavors at their discretion, securing property rights, including the results of intellectual (creative) activity. These circumstances "revived" J.M. Keynes' basic psychological law of accumulation, according to which subjects with a higher income have a higher propensity for accumulation [52, pp. 158–159] and which, ultimately, gave rise to high investment activity, economic growth and technological progress [53]. Taken together, these circumstances helped the European civilization break out of the Malthusian trap (Fig. 2). As for China, it ignored the specified KHE and remained in a state of total poverty and under the influence of destructive bureaucracy. From that moment on, the divergence between the level of development of Europe and Asia only intensified.

We should mention that the formation of capitalism is directly related to the McKenna inversion. The fact is that for the Chinese and other Asian peoples, *modus operandi* consisted in the *principle of minimizing costs*; for the Europeans, the phenomenon of superprofits "suppressed" their natural desire to save resources and brought to life the *principle of maximum gains* – in profits, profit margins, revenue, production volumes, etc. From that moment on, the physical laws of being for European peoples and states recede into the background, while the vital and economic attitudes, which have been supporting economic growth for about 400–500 years, come to the fore.

The principle of maximizing the result correlates with the philosophical doctrine of energy evolutionism [54], according to which the man, in comparison with other biological species, has an excess of energy and adaptive resource [55, p. 15]. It is this quality that determines the essence of a person – to feel as much as possible and do as much as possible, for which one has to think as much as possible [55, p. 21]. M. Veller uses this quality

to explain even the phenomenon of aesthetics, generated by excessive need and the ability of the human psyche to adapt the environment to itself [56]. However, an important component of energy evolutionism consists in the fact that the energy surplus of an individual is increasing as their basic biological needs – self-preservation and reproduction – are being satisfied. During the formation of capitalism, the principle of maximizing vital energy manifested itself most fully due to the incentives and opportunities that arose. However, at more mature stages of society's development, the principle of optimization of results and costs comes into play [25]; this gives the process of evolution flexibility and maneuverability.

I should add that the East, like the West, obviously had dialectical teaching in its intellectual arsenal. However, fundamental differences are observed even here. For example, the Chinese school of Huayan Buddhism (Ekayāna) formed a "soft" dialectic, in which the opposition between opposites was absent because it was smoothed out due to the "everything is present in everything" principle [28, p. 297]. On the contrary, the Western philosophical tradition of Hegel created an "uncompromising", militant dialectic, emphasizing the contrast of opposites as a source of development and deducing from this principle the mechanisms of their mutual struggle, i.e. competition (!). In a certain sense, we can say that the religious and philosophical intellectual intransigence of the European peoples acted as the ideological basis for justifying competition in all its forms.

Reconstruction of human civilization after 1500 AD: Some get richer, others get poorer

Why are some countries and peoples rich and others poor? It can be said without prejudice that nations can be wealthy only in the conditions of an effective state. Only European countries managed to build different prototypes of an effective state in the Modern age.

In the 18th century, modern states began to emerge; the dialectic of their formation is described most precisely by the *concept of the narrow corridor* (CNC) put forward in a monograph by D.

Acemoglu and J. Robinson [8]. According to their views and terminology, the construction of a modern effective state (Shackled Leviathan) takes place in conditions of political equilibrium – between the state (the institutional foundation of the country) and society (its culture and level of self-awareness). While in real life institutions and culture act in an indissoluble unity, they can be conditionally divided. Then, according to CNC, a lot of effective interactions between civil society (the masses) and the state (the ruling elites) form a narrow corridor; and it is possible to enter and stay in it only if many conditions are met. If these are observed, then a fruitful regime of simultaneous coupling of productive forms of competition mechanisms arises between institutions and culture, as a result of which the capacity of the state and the opportunities (freedom) of society increase. To ensure such a regime, it is necessary to implement the *Red Queen effect*, when the masses and elites make incessant efforts to the limit of their capabilities to preserve the political status quo [8]. In this case, political equilibrium is achieved and the Shackled Leviathan is created, i.e. a state with enormous organizational capabilities for creative activity. Otherwise, a war arises between the state and society, ending with the victory of either society (the masses) – with organizational anarchy and social chaos (Absent Leviathan), or the state (ruling elites) – with the despotism of the central government and the suppression of individual freedoms (Despotic Leviathan) (Fig. 2).

The extreme forms of the political process, the Absent Leviathan and the Despotic Leviathan, produce the same result – stagnation and regression – in different ways: The Shackled Leviathan, on the contrary, makes it possible to increase the *innovation susceptibility* of the economic system and launch the so-called *consistency principle* (CP), according to which the pace of economic growth positively depends on the degree of consistency between the levels of *technological, institutional and cultural* factors in a country's development; on the contrary, discrepancies in the levels of maturity of these three entities negatively affect economic growth [24].

The consistency principle works only in a modern efficient state and in practice means the existence of an extremely flexible social system in which its main links – technologies, institutions and culture – are in constant mutual interaction and mutual adaptation. The state, in the form of the Shackled Leviathan, permanently generates technological, institutional and cultural innovations or promotes their borrowing if they emerge outside its borders (Fig. 2). Otherwise, when the system goes beyond the narrow corridor of political equilibrium, technological, institutional and cultural traps are being continuously formed in society; these traps reject even existing advanced innovations and provoke more sluggish economic growth, and in some cases, impede it. In the most general and schematic form, the PCSE is presented in Figure 2.

Countries that have been able to build democratic states in the form of the Shackled Leviathan, as a rule, release the creative energy of their citizens, which in turn generates a variety of technologies, increased labor productivity and higher welfare of the nation. New technologies require adequate registration in the form of improved institutions, which changes the entire culture of the country's population. The phenomenon of the Shackled Leviathan is quite rare, and therefore there are not so many rich countries even in the modern world. If the state does manage to build a capitalist society, then it fully implements the McKenna inversion, when economic entities strive for maximum production and profit, which leads to positive social evolution.

Successes and failures in the catching up development

Next in line is the question of why some poor countries and peoples manage to reduce their lagging behind the rich, while others do not.

New production technology is the source of modern welfare. However, technologies emerge only in a certain institutional and cultural environment. In this regard, countries that adopt institutions and culture from advanced states are able to launch technological progress and economic growth. At the same time, even under totalitarian regimes,

there should be a minimum dose of democratic institutions and individualistic culture. South Korea and China eventually followed this path. The success of the PRC, which has been actively capitalizing its economy for the past 35 years, attracting foreign capital and foreign technologies, is particularly large-scale and impressive. Prior to this period, all attempts of the communist regime did not produce any positive results. Regrettably, the consistency principle requires that technologies, institutions and culture correspond to each other, which in most cases of a catch-up development leads to the Westernization of the modernized country.

An example of a chronic failure in catching up development is Russia, which for 30 years has not been able to restore the technological potential of the USSR and is characterized by extremely unstable economic growth. The reasons for the failures are obvious: constant outflow of capital abroad, the country's deprivation of its investment resources, interference of bureaucratic and law enforcement agencies in the affairs of small, medium and large businesses, lack of protection of rights to the technologies being developed, denial of modern forms of private management in corporate governance, etc. Attempts to launch technological initiatives in the conditions of old Soviet institutions and managerial culture lead to a stalemate. It can be said that technological modernization in Russia is carried out without first creating competitive mechanisms that would increase the innovative susceptibility of the economy to technological and managerial achievements.

However, in addition to ignoring competitive mechanisms and the consistency principle, Russia makes another mistake of catching up development: its rate of technological modernization and institutional reforms is excessive. For example, too rapid, large-scale, deep and inconsistent (!) institutional reforms can destroy the traditional culture of the people and cause not only a decrease in its viability, but also direct degeneration and depopulation [57]. Thus, on the one hand, society needs institutional reforms, technological progress and cultural revolutions, on the other — they must

obey the ideology of the narrow corridor and the consistency principle and should not go beyond some reasonable limits determined by the biological properties of the human body. In Russia, this principle has been violated for 30 years, which led to an imbalance of the entire economy and to the fact that the people reject even quite reasonable and progressive reforms.

Another point that helps to clarify the issue regarding the achievements and failures of catching up development is the presence or absence of strong institutions and leaders of the nation. Only with their presence is it possible to mobilize the disparate resources of the population without losing its organizational unity and maintain the planned vector of reforms. In this context, China and Russia are striking antipodes, which explains their different modernization effectiveness [58]. At the same time, the consistency principle urges reformers to creatively adapt the traditional institutions and culture of the peoples in their country to foreign production and management technologies that have come from outside. Obviously, this is an absolutely non-trivial task that not many countries, governments and leaders who have embarked on the path of modernization can cope with.

"Case of the USSR"

Perhaps the last key historical event in need of a systematic explanation is the "case of the USSR". Oddly enough, but the explanation of this paradox lies on the surface.

In the most general terms, the existence of the USSR from 1917 to 1970 can be characterized as an era of *total competition*. The country had to defend itself in World War I, in the Civil War, in World War II; it had to carry out industrialization and collectivization, create atomic and thermonuclear weapons, create aircraft and rocket engineering from scratch, go into space and establish a new (nuclear) energy industry. To do this, the best personnel were needed, which could be selected only if there were inclusive institutions based on fair competition and taking objective merits into consideration. Even in the aircraft industry, there was uncompromising competition between several

development companies – Sukhoi Design Bureau, Ilyushin Aviation Complex, Tupolev Design Bureau, etc. The competition of these companies for the development of new aircraft has already become a legend [59].

The situation began to change in the 1970s, when military and strategic parity with the U.S. was achieved, the communist system itself was finally built, and the party elite began to consolidate its privileges. At that moment, the established system of the means of social mobility began to be dismantled, and the managerial, party and professional structures started their conservation [59]. In the next 15–20 years, almost all competitive institutions of the USSR in economics and politics were curtailed, which automatically reduced the country's innovativeness in all areas, with the final dismantling of the system in 1991. The most striking

Figure 2. Structural outline of social evolution
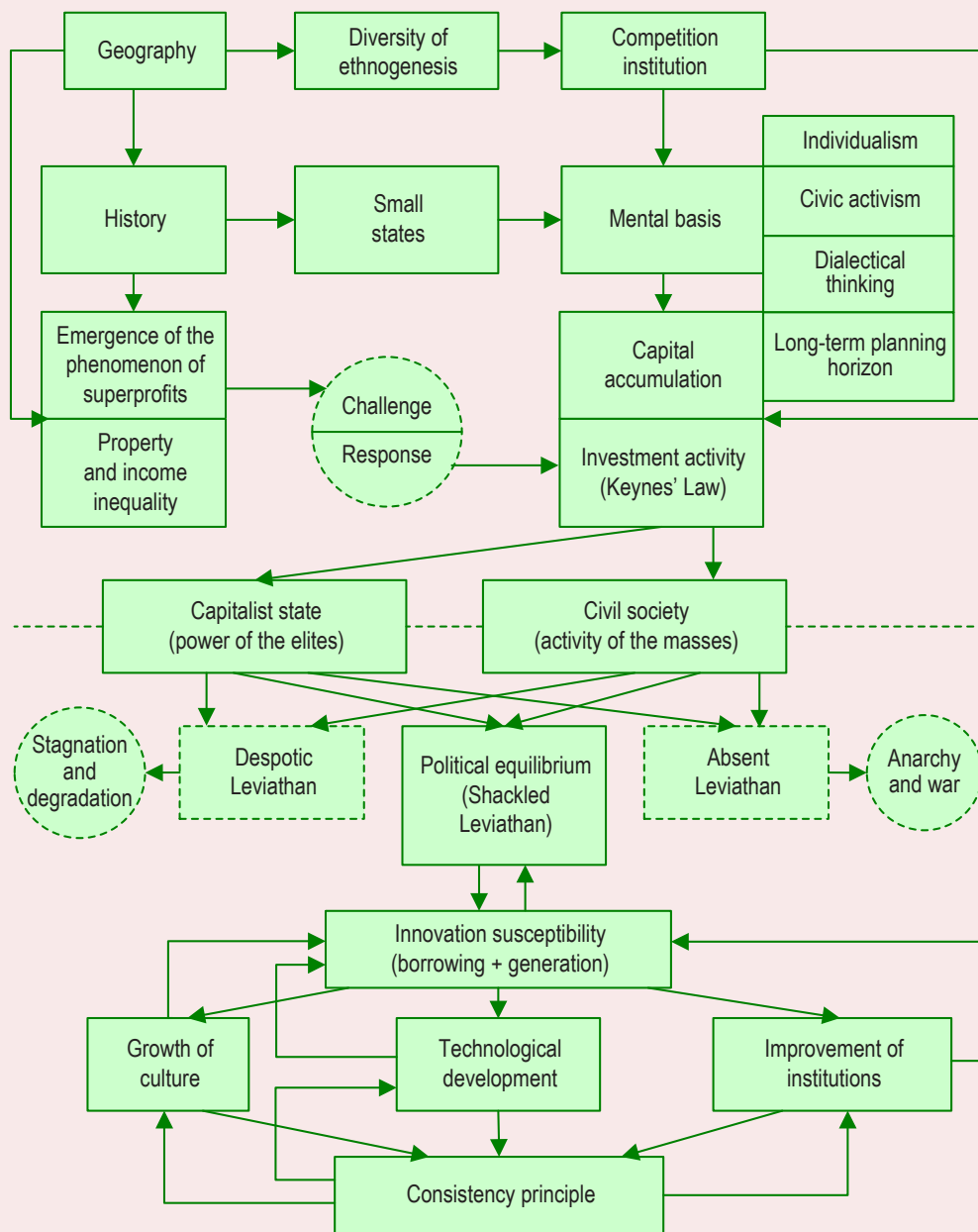
manifestation of the erosion of Soviet culture and institutions was observed in the degradation of the composition of the top party leadership, when mediocre or, even worse, incompetent personalities became heads of state – Nikita Khrushchev, Leonid Brezhnev, Yuri Andropov, Konstantin Chernenko and Mikhail Gorbachev. In other words, the suppression of previously created competition mechanisms destroyed the state itself with all its previous achievements.

Conclusion

The polycausal concept of social evolution proposed in the article can be reduced to two simple block diagrams: Figure 1 and Figure 2. At first glance, it may seem that the new concept is more complex and confusing compared to monocausal constructions. However, that is not so; the PCSE is extremely simple and in some points is revealed and "deciphered" more fully by traditional theories and models. Its main advantage is that it makes it quite easy to identify bottlenecks in the political system of a modern state with all the conclusions and consequences that follow from this. The theoretical and instrumental core of the PCSE is the *principle of structural competition*.

Today, at best about 40 countries of the world fit the model of the Shackled Leviathan with developed competition mechanisms; the rest of the states are still far from the infamous narrow corridor. All this once again suggests that even the knowledge of how to build a modern effective society does not automatically allow this knowledge to be realized. The structural schemes in Figure 1 and Figure 2 do not pretend to be exhaustive, but they help to establish the natural sequence of the construction of modern capable states. This task is especially relevant for catching-up countries that seek to join the club of developed countries.

Another advantage of the PCSE is its fundamental *determinism*. Certainly, the world has many "generators of events" as N. Taleb has put it [60]; many of them are so rare that they are fundamentally unpredictable. However, the mechanism of interaction of generated events is deterministic and does not involve the introduction of primitive random factors into it. The structural methodology of the PCSE, in contrast to the causal methodology, proceeds from the fact that certain *necessary* and *sufficient* conditions are required for evolutionary shifts, which change over time [47]: the European peoples were better prepared for the economic opportunities of the world system after the Great Geographical Discoveries; they formed both types of conditions, and they did not miss their chance. However, the explanation of the PCSE regarding the centuries-old dominance of the West over the East during the period of capitalism does not contain any value connotations: Asian communities have their own unique advantages, which are already gradually emerging and may prevail in the near future. This question remains open for now.

The importance of the PCSE also lies in the fact that it outlines the reference points of the modern world civilizational crisis. For example, there is no struggle of ideas in science anymore; political parties have become indistinguishable from each other; representatives of the political establishment have turned into puppet figures without their own opinions; market competition is being replaced by administrative competition; and the state authorities are trying by all means to make the population obedient. And this is typical of all countries without exception: from the USA, Germany, France and the UK to China, Russia, Israel, etc. Why is this happening?

According to the PCSE, breaking out of the Malthusian trap and the construction of capitalism occurred as a result of the emergence of *hyperactivity* on the part of large masses of the European population that are in a state of destitution and chronic poverty. Currently, the world is entering a state of a *neo-Malthusian trap*, which is characterized by a decrease in economic growth rates against the background of an immeasurably higher per capita level of welfare compared to the pre-capitalist period [61]. Strictly in accordance with J. Calhoun's law, the high standard of living leads to a drop in people's *social activity* due to the lack of incentives

to engage in it [62], which we observe in reality. At the same time, traditional cultural attitudes are deformed, followed by the degradation of institutions and technologies according to the consistency principle. In my opinion, the fate of the modern world is directly related to the fate of competitive mechanisms. If today's relatively efficient capitalist competitive mechanisms adapt to the challenges facing humanity, then our world will be preserved; if competitive mechanisms are suppressed and distorted to the point of losing a critical value of their effectiveness, then a very dim future is in store for our world. It is reasonable to assume that with a favorable development of events, competition as a phenomenon will persist, but its forms can change dramatically. For example, the competition will take place not so much between companies, activities and states, as between the very *social models* into which large groups of the population are arranged. At that, a huge amount of natural-scientific and social material has already been accumulated, which convincingly proves that the modern world system has exhausted traditional sources of economic growth [63]. This means that the McKenna inversion has also exhausted itself, and the maximization of everything and everything should be replaced by more subtle optimization mechanisms such as the *minimax* criterion of game theory. It is possible that social models based on Asian collectivism, rather than European or American individualism, will gain much greater advantages in such competition. At least, such an opinion is being actively voiced [58, p. 114; 50, p. 59]. Time will tell.

References

1. Diamond J. *Ruzh'ya, mikroby i stal'. Istoriya chelovecheskikh soobshchestv* [Guns, Germs, and Steel. The Fates of Human Societies]. Moscow: AST, 2010. 604 p.

2. Polterovich V.M. Towards a general theory of socio-economic development. Part 1. Geography, institutions, or culture? *Voprosy ekonomiki*, 2018, no. 11, pp. 1−22 (in Russian).

3. Balatsky E.V. General theory of social development and cycles of coercion. *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World*, 2019, no. 5, pp. 156−174 (in Russian).

4. Polterovich V.M. Positive collaboration: Factors and mechanisms of evolution. *Voprosy ekonomiki,* 2016, no. 1, pp.1−19 (in Russian).

5. Kirdina-Chandler S.G. Western and non-Western economic institutional models in time and geographical space. *Voprosy teoreticheskoi ekonomiki*, 2018, no. 1, pp. 73−88 (in Russian).

6. Acemoglu D., Robinson J. *Pochemu odni strany bogatye, a drugie bednye. Proiskhozhdenie vlasti, protsvetaniya i nishchety* [Why Nations Fail: The Origins of Power, Prosperity, and Poverty]. Moscow: AST, 2015. 693 p.

7. North D., Wallis J., Weingast B. *Nasilie i sotsial'nye poryadki. Kontseptual'nye ramki dlya interpretatsii pis'mennoi istorii chelovechestva* [Violence and Social Orders. A Conceptual Framework for Interpreting Recorded Human History]. Moscow: Izd-vo Instituta Gaidara, 2011. 480 p.

8. Acemoglu D., Robinson J. *Uzkii koridor* [The Narrow Corridor: States, Societies, and the Fate of Liberty]. Moscow: AST, 2021. 704 p.

9. Harrison L. *Glavnaya istina liberalizma. Kak politika mozhet izmenit' kul'turu i spasti ee ot samoi sebya* [The Central Liberal Truth: How Politics Can Change a Culture and Save It from Itself]. Moscow: Novoe izdatel'stvo, 2008. 282 p.

10. Welzel C. *Rozhdenie svobody* [Freedom Rising: Human Empowerment and the Quest for Emancipation]. Moscow: VTsIOM, 2017. 404 p.

11. North D. *Ponimanie protsessa ekonomicheskikh izmenenii* [Understanding the Process of Economic Change]. Moscow: Izd. dom GU-VShE, 2010. 256 p.

12. Zolo D. *Demokratiya i slozhnost': realisticheskii podkhod* [Democracy and Complexity: A Realist Approach]. Moscow: Izd. dom GU-VShE, 2010. 320 p.

13. Balatsky E.V. D. North's cognitive-institutional synthesis. *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World*, 2011, no. 5, pp. 154−166 (in Russian).

14. Marx K. *Kapital. Kritika politicheskoi ekonomii. Kniga III: protsess kapitalisticheskogo proizvodstva, vzyatyi v tselom* [Capital: A Critique of Political Economy. Volume III. The Process of Capitalist Production as a Whole]. Leningrad: Gosudarstvennoe izdatel'stvo politicheskoi literatury, 1951. 932 p.

15. Lukas R.E. *Lektsii po ekonomicheskomu rostu* [Lectures on Economic Growth]. Moscow: Izd-vo Instituta Gaidara, 2013. 288 p.

16. Glazyev S.Yu. *Upravlenie razvitiem ekonomiki: kurs lektsii* [Management of Economic Development: A Course of Lectures]. Moscow: Izdatel'stvo Moskovskogo universiteta, 2019. 759 p.

17. McKenna T. *Pishcha bogov* [Food of the Gods]. Moscow: Izdatel'stvo Transpersonal'nogo Instituta, 1995. 379 p.

18. Bogdanov A.A. *Tektologiya: Vseobshchaya organizatsionnaya nauka* [Tectology: General Organizational Science]. Moscow: Lenand, 2019. 680 p.

19. Wiener N. *Kibernetika* [Cybernetics: Or Control and Communication in the Animal and the Machine]. Moscow: Nauka, 1983. 344 p.

20. Ross Ashby W. *Vvedenie v kibernetiku* [An Introduction to Cybernetics]. Moscow: Lenand, 2021. 432 p.

21. Bertalanffy L. von. *General System Theory*. New York: George Braziller, 1968. 289 p.

22. Polterovich V.M. Towards a general theory of socio-economic development. Part 2. Evolution of coordination mechanisms. *Voprosy ekonomiki*, 2018, no. 12, pp. 77−102 (in Russian).

23. Polterovich V.M. Institutions of catching-up development (on the project of a new model for economic development of Russia). *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2016, no. 5 (47), pp. 88−107 (in Russian).

24. Balatsky E.V. The principle of consistency in social development theory. *Terra Economicus*, 2021, vol. 19, no. 1, pp. 36−52 (in Russian).

25. Petrushenko L.A. *Printsip obratnoi svyazi* [The Principle of Feedback]. Moscow: Mysl', 1967. 276 p.

26. Petrushenko L.A. *Samodvizhenie materii v sfere kibernetiki* [Self-Movement of Matter in the Field of Cybernetics]. Moscow: Izdatel'stvo "Nauka", 1971. 292 p.

27. Petrushenko L.A. *Edinstvo sistemnosti, organizovannosti i samodvizheniya (O vliyanii filosofii na formirovanie ponyatii teorii sistem)* [Unity of Systemacity, Organization and Self-Movement (On the Influence of Philosophy on the Formation of Concepts of the Theory of Systems)]. Moscow: "Mysl'", 1975. 286 p.

28. Torchinov E. *Vvedenie v buddizm* [Introduction to Buddhism]. Moscow: RIPOL Klassik, 2020. 440 p.

29. Toynbee A.J. *Tsivilizatsiya pered sudom istorii. Mir i Zapad* [Civilization on Trial and The World and the West]. Moscow: AST: Astrel', 2011. 318 p.

30. Wallerstein I. *Analiz mirovykh sistem i situatsiya v sovremennom mire* [World-Systems Analysis]. Saint Petersburg: Izdatel'stvo "Universitetskaya kniga", 2001. 416 p.

31. Gumilev L.N. *Etnogenez i biosfera Zemli* [Ethnogenesis and the Biosphere of the Earth]. Moscow: AIRIS-press, 2016. 560 p.

32. Aristotle. *Sochineniya: V 4-kh t. T. 4* [Works: In 4 Volumes. Volume 4]. Moscow: Mysl', 1984. 830 p.

33. Krylov K.A. *Russkie vopreki Putinu* [Russians in spite of Putin]. Moscow: Algoritm, 2012. 304 p.

34. Bobrovnikova T.A. *Povsednevnaya zhizn' rimskogo patritsiya v epokhu razrusheniya Karfagena* [The Daily Life of a Roman Patrician in the Era of the Destruction of Carthage]. Moscow: Molodaya gvardiya, 2001. 493 p.

35. Kirdina-Chandler S.G., Kruglova M.S. "Society", "state", and institutional matrixes: A case in interdisciplinary meso-analysis. *Sotsiologicheskie issledovaniya=Sociological Studies*, 2019, no. 10, pp. 15−26 (in Russian).

36. Machiavelli N. *Gosudar'* [The Prince]. Moscow: Izdatel'stvo "E", 2018. 640 p.

37. Žižek S. *Monstruoznost' Khrista* [The Monstrosity of Christ]. Moscow: RIPOL klassik, 2020. 544 p.

38. Weber M. *Protestantskaya etika i dukh kapitalizma* [The Protestant Ethic and the Spirit of Capitalism]. Ivano-Frankovsk: Ist-V'yu, 2002. 352 p.

39. Zweig S. *Sovest' protiv nasiliya: Kastellio protiv Kal'vina* [Castelio against Calvin or Conscience against Violence]. Moscow: Mysl', 1988. 238 p.

40. Dedov L.A., Eissner Yu.N. On Russian and Western systems of labor motivation. *Zhurnal ekonomicheskoi teorii=Russian Journal of Economic Theory*, 2015, no. 3, pp. 212−218 (in Russian).

41. Kulisher I.M. *Istoriya ekonomicheskogo byta Zapadnoi Evropy. T. 1−2.* [History of Economic Life in Western Europe. Volumes 1−2]. Moscow, Chelyabinsk: Ekonomika, Sotsium, 2012. 1030+XXI p.

42. Falk-Rønne A. *Gde ty, rai?* [Where Are You, Paradise?]. Moscow: Progress, 1989. 168 p.

43. Sombart W. *Burzhua: Etyudy po istorii dukhovnogo razvitiya sovremennogo ekonomicheskogo cheloveka* [The Quintessence of Capitalism: a Study of the History and Psychology of the Modern Business Man]. Moscow: TERRA – Knizhnyi klub, 2009. 576 p.

44. *Bibliya. Knigi Svyashchennogo pisaniya Vetkhogo i Novogo Zaveta* [The Holy Bible. Books of the Holy Scripture of the Old and New Testaments]. Moscow: Izdanie Moskovskoi patriarkhii, 1992. 1346 p.

45. Podoprigora A.V. Number and figure: Pythagorean tradition and metaphysics of digital reality. *Nauch. ezhegodnik In-ta filosofii i prava Ural. otdeleniya RAN=Scientific Yearbook of the Institute of Philosophy and Law of the Ural Branch of the Russian Academy of Sciences,* 2018, vol. 18, issue 3, pp. 7–26 (in Russian).

46. Namsaraeva A. *Khambo Lama Etigelov. Zhizn' kak vyzov* [Khambo Lama Etigelov. Life as a Challenge]. Ulan-Ude: NovaPrint, 2019. 160 p.

47. Balatsky E.V. Return on equity as an economic growth driver. *Economic and Social Changes: Facts, Trends, Forecast*, 2021, vol. 14, no. 1, pp. 26–40.

48. Balatsky E.V., Ekimova N.A. Driving the economy: The role of a special economic sector. *Journal of New Economy*, 2020, vol. 21, no. 3, pp. 5–27 (in Russian).

49. Dunning T.J. *Trade's Unions and Strikes: Their Philosophy and Intention*. London, 1860. 52 p.

50. Popov V.V. Why the West got rich before other countries and why China is catching up with the West today? New answer to the old question. *Zhurnal Novoi ekonomicheskoi assotsiatsii=Journal of the New Economic Association*, 2012, no 3(15), pp. 25–64 (in Russian).

51. Popov A. Tea-opium knot. *Vokrug sveta=Around the World,* 2011, no. 6, pp.106–116 (in Russian).

52. Keynes J.M. *Obshchaya teoriya zanyatosti, protsenta i deneg* [The General Theory of Employment, Interest and Money]. Moscow: Progress, 1978. 494 p.

53. Balatsky E.V. Institute of social inequality and economic growth. *Zhurnal institutsional'nykh issledovanii=Journal of Institutional Studies*, 2020, no. 1, pp. 66–83 (in Russian).

54. Veller M.I. *Energoevolyutsionizm* [Energy Evolutionism]. Moscow: AST, 2011. 543 p.

55. Veller M.I. *Sotsiologiya energoevolyutsionizma* [Sociology of Energy Evolutionism]. Moscow: AST, 2011. 416 p.

56. Veller M.I. *Estetika energoevolyutsionizma* [Aesthetics of Energy Evolutionism]. Moscow: AST, 2011. 384 p.

57. Balatsky E.V. Institutional reforms and human capital. *Zhurnal Novoi ekonomicheskoi assotsiatsii=Journal of the New Economic Association*, 2021, no. 3(51), pp. 104–125 (in Russian).

58. Popov V. Why is Russia not China? *Prognozis. Zhurnal o budushchem*, 2004, no. 1, pp. 95–114 (in Russian).

59. Balatsky E.V., Pliskevich N.M. Economic growth under extractive institutions: The Soviet paradox and contemporary events. *Mir Rossii=Universe of Russia*, 2017, no. 4, pp. 97–117 (in Russian).

60. Taleb N.N. *Chernyi lebed'. Pod znakom nepredskazuemosti* [The Black Swan: The Impact of the Highly Improbable]. Moscow: KoLibri, 2009. 528 p.

61. Balatsky E.V. Consensual institutions for neutralize of neo-Malthusian trap. *Voprosy regulirovaniya ekonomiki=Journal of Economic Regulation*, 2019, no. 3, pp. 23–36 (in Russian).

62. Calhoun J. Death squared: The explosive growth and demise of a mouse population. *Proc. roy. Soc. Med.,* 1973, vol. 66, no. 2, pp. 80–88.

63. `Heinberg R. *Konets rosta* [The End of Growth]. Moscow: Knizhnyi Klub Knigovek, 2013. 384 p.

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REGIONAL ECONOMICS

Clustering Russian Federation Regions According to the Level of Socio-Economic Development with the Use of Machine Learning Methods

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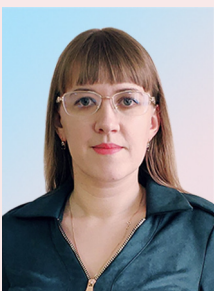
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Abstract. The paper solves the problem of clustering Russian Federation regions according to their socio-economic development, taking into account the sectoral structure of the gross regional product. Classical machine learning methods are a tool for solving the clustering problem. The object of the study is the differentiation of regions according to various socio-economic indicators. The subject of the study is the practice of using machine learning methods for clustering objects. The initial database for solving the problem of clustering regions includes actual statistical data on socio-economic development of RF constituent entities and the sectoral structure of their gross regional product as of 2019. We identify clusters of regions according to their socio-economic development with the use of modern machine learning methods implemented in Python, a high-level programming language, with the connection of libraries for working with data: Pandas, Sklearn, SciPy, etc. The preprocessing of the initial data was carried out: digitization of data categories, transition to specific values, standardization of indicators. The initial data set for 2019 contains 5,525 records on 65 indicators of socio-economic development for 85 regions of the Russian Federation. It identifies 15 basic indicators of socio-economic development of a region, based on the principal component analysis. According to these indicators, five regional clusters were identified with the use of the k-means clustering: the first cluster is characterized by a high share of wholesale and retail trade, real estate transactions, professional, scientific and technological activities in the GRP structure; the second cluster specializes in manufacturing, wholesale and retail trade, real estate transactions, agriculture and forestry; the third cluster can be described as a cluster with a mixed economy, which is characterized by averages for the main socio-economic indicators in the Russian Federation; regions of the fourth cluster show a high level of unemployment and a high share of public administration, military and social security; the fifth cluster specializes in mining.

Key words: socio-economic indicators, industry structure, gross regional product, machine learning, cluster analysis, principal component analysis.

Introduction

At present time, the elaboration of an effective strategy for the regions development in the Russian Federation requires an assessment of the current state and prospects for changes in their socio-economic development. This task is quite difficult, especially given the significant inter-regional differences in socio-economic development, financial and economic opportunities, innovation potential, the quality of human capital, etc. [1; 2; 3]. One of the functional tools for the formation of an effective regional development strategy is cluster analysis.

Cluster analysis is one of the methods of multivariate statistical analysis of data, which allows distinguishing some homogeneous groups of objects according to various parameters [4; 5]. For the purposes of our study, the use of cluster analysis helps to identify groups of Russian regions with a similar level of socio-economic development. The identification of such clusters is the basis for the development of differentiated and targeted support measures from the state.

We should note that in Russian scientific studies the regions are the most typical objects of clustering and classification in terms of different criteria: innovation development [1], quality of life [6], birth rate [7], public health [8], human capital level [9], agricultural efficiency [10], foreign economic activity [11], energy efficiency [12], road and transport system [13], etc. These works are performed on the basis of clustering by individual indicators. There are also studies in which the

clustering of regions is carried out by a set of indicators containing 10−15 parameters (see, for example, [14]).

Our work is aimed at solving the problem of clustering regions by the set of indicators that reflect the socio-economic development of the RF constituent entities, as well as considering the sectoral specifics of regional economic development. In the presented study, we processed a data set containing 65 indicators.

The purpose of the study is to identify homogeneous regional clusters using methods of data analysis and machine learning to develop a platform for adopting the right forms of support for the regions, stimulating the breakthrough growth of the economy in the Russian Federation as a whole. In order to achieve this goal, we must solve a number of tasks, in particular:

− to identify the structure of indicators characterizing the socio-economic development of regions, considering the sectoral specifics, through the formation of groups, based on the information available on the official website of the Federal State Statistics Service;

− to collect and verify the quality of a large set of initial data for the cluster analysis of the regions of the Russian Federation;

− to carry out pre-analysis of the data: filling gaps, data conversion (transition to specific values), standardization, distinguishing the main indicators in each group of indicators using the principal component analysis;

− to identify homogeneous regional clusters by applying machine learning methods;

− to analyze the differentiation of average indicators of regional cluster development in order to verify the quality of the clustering performed.

Thus, the scientific novelty of the proposed study consists in solving the problem of clustering on the basis of the big statistical date considered as a whole. The study also has practical relevance, as it allows formulating the features of socio-economic development of groups of regions, on the basis of which we can form a strategy for their development and investment policy in the currently relevant areas of life of the RF constituent entities.

Machine learning methods for solving the clustering problem

Machine learning is a large section of the study of artificial intelligence; it includes methods for building various algorithms capable of self-learning. As a rule, the scientific literature distinguishes three groups of classical methods of machine learning, often used for data mining [15−18]:

− learning with a teacher (regression, classification);

− learning without a teacher (search for rules, dimensionality reduction, clustering);

− reinforcement learning (genetic algorithm, Q-learning, etc.).

In practice, the following algorithms and machine learning methods are used for clustering [15; 19; 20; 21]:

1) heuristic graph algorithms (connected component labeling, open shortest path algorithm, FOREL algorithm);

2) statistical algorithms based on partitioning (k-means clustering, DBSCAN algorithm based on distribution density of studied characteristics);

3) hierarchical clustering (agglomerative and divisive (CURE, ROCK, Chameleon algorithms, Ward clustering);

4) fuzzy clustering (FCM, FCS and MM algorithms).

Each group of clustering methods has its own advantages and disadvantages. In particular, statistical algorithms based on dividing, work effectively with large amounts of data, which is not always possible to say about graph methods of clustering. The disadvantage of fuzzy clustering is the inability to correctly divide objects into clusters if there is a large variance in different dimensions of elements [22].

Hierarchical, *k*-means clustering, and the DBSCAN have an important advantage in finding arbitrarily-shaped clusters. Clustering of elements by these methods refers to iterative ones [23]. One should note that for the *k*-means and DBSCAN clustering, it is first required to make a decision on the values of the hyperparameters of the algorithms. For the *k*-means method, it is necessary to know the number of cluster partitions; for the DBSCAN, one needs to select the size of the neighborhood and the minimum number of elements in it. The researcher can make decisions based on their own intuition or by conducting a preliminary search for the optimal values of the necessary hyperparameters.

At the same time, most often researchers give preference to the *k*-means method, because it has such advantages as high efficiency with the simplicity of its implementation, a sufficient level of quality of the performed clustering and the possibility of calculating processes paralleling [24; 25]. Thus, the use of this algorithm is appropriate when working with big data to extract new knowledge.

Pre-processing of the initial set of statistical data to solve the problem of regions' clustering

Statistical information on the main indicators of the regions development in the Russian Federation is provided by the Federal State Statistic Service[1]. Since the content of reports of the FSSS on the regions has recently changed, both due to changes in the methodology of calculation of indicators and the All-Russian Classifier of Economic Activities, and transformations in the political-territorial structure, the current period of 2015−2019 was chosen for the analysis.

The initial data set for 2019 contains 5,525 records on 65 indicators of socio-economic development of 85 RF regions. The indicators selected for the analysis and clustering of regions are shown in *Table 1*. They are combined into socio-economic development directions. A similar approach was used in the work [26], which identified eight groups of indicators of regional development. Our study identifies groups according to the all-Russian classifiers introduced in statistical practice, used in the compilation of the statistical collection "Regions of Russia. Main socio-economic indicators".

Table 1. Indicators of socio-economic development of regions

Group	Indicator name, change unit	Designation	Conversion	Indicator (principle component)
Federal Okrugs/ Districts	Central Federal District (CFD), Northwestern Federal District (NWFD), Southern Federal District (SFD), North Caucasian Federal District (NCFD), Volga Federal District (VFD), Ural Federal District (UFD), Siberian Federal District (SibFD), Far Eastern Federal District (FEFD)	–	Dummy variables	PCA_1
Main socio-economic indicators	Population, thousand people	X_1	–	PCA_2 PCA_3
	Cost of fixed assets, million rubles	X_2	$Y_1 = X_2/X_1$	
	Mineral extraction, million rubles	X_3	$Y_2 = X_3/X_1$	
	Agriculture, million rubles	X_4	$Y_3 = X_4/X_1$	
	Manufacturing industries, million rubles	X_5	$Y_4 = X_5/X_1$	
	Electricity, gas and steam supply; air conditioning, million rubles	X_6	$Y_5 = X_6/X_1$	
	Water supply; wastewater disposal, organization of waste collection and disposal, activities to eliminate pollution, mln rubles	X_7	$Y_6 = X_7/X_1$	
	Retail turnover, million rubles	X_8	$Y_7 = X_8/X_1$	
	Balanced financial result, million rubles	X_9	$Y_8 = X_9/X_1$	

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[1] Regions of Russia. Socio-economic indicators. Available at: https://rosstat.gov.ru/folder/210/document/13204

Continuation of Table 1

Group	Indicator name, change unit	Designation	Conversion	Indicator (principle component)
Population	The ratio of men to women, per 1,000 men there are women	X_{10}	X_{10}	PCA_4 PCA_5
	Proportion of the population under working age, percentage of the total population	X_{11}	X_{11}	
	Proportion of the population of working age, percentage of the total population	X_{12}	X_{12}	
	Proportion of the population over working age, percentage of the total population	X_{13}	X_{13}	
	Total birth rates, number of births per 1,000 population	X_{14}	X_{14}	
	Total mortality rates, number of deaths per 1,000 population	X_{15}	X_{15}	
	Infant mortality rates, the number of children who died before the age of 1 year, per 1000 live births	X_{16}	X_{16}	
	Marriage to divorce ratio, divorces per 1,000 marriages	X_{17}	X_{17}	
Employment and unemployment	Unemployment rate, %	X_{18}	X_{18}	PCA_6
	Average annual number of employees, thousand people	X_{19}	$Y_9 = X_{19}/X_1$	
	Demand for personnel declared by employers, people	X_{20}	$Y_{10} = X_{20}/X_1$	
	Number of employees of state and local authorities, people	X_{21}	$Y_{11} = X_{21}/X_1$	
Standard of living	Average nominal accrued salary of organization employees, rubles/month	X_{22}	X_{22}	PCA_7
	Average per capita cash income, rubles/month	X_{23}	X_{23}	
	Consumer spending on average per capita, rubles/month	X_{24}	X_{24}	
	Average size of assigned pensions, rubles/month	X_{25}	X_{25}	
	Housing stock, million square meters	X_{26}	$Y_{12} = X_{26}/X_1$	
	Fresh water use, million cubic meters	X_{27}	$Y_{13} = X_{27}/X_1$	
Investments	Foreign direct investment in Russia, million rubles	X_{28}	$Y_{14} = X_{28}/X_1$	PCA_8
	Investments in fixed capital, million rubles	X_{29}	$Y_{15} = X_{29}/X_1$	
	Proportion of investments in Russian property, %	X_{30}	X_{30}	
Education	The number of students in preschool educational organizations, people	X_{31}	$Y_{16} = X_{31}/X_1$	PCA_9
	The number of students in general education, people	X_{32}	$Y_{17} = X_{32}/X_1$	
	Number of students in vocational education, people	X_{33}	$Y_{18} = X_{33}/X_1$	
	The number of bachelor's, specialist's, and master's degree students, people	X_{34}	$Y_{19} = X_{34}/X_1$	
	The number of graduate students, people	X_{35}	$Y_{20} = X_{35}/X_1$	
	The number of teachers in organizations of primary and secondary education, thousand people	X_{36}	$Y_{21} = X_{36}/X_1$	
	The number of higher-education teaching personnel in organizations of bachelor's, specialist's and master's degree programs, people	X_{37}	$Y_{22} = X_{37}/X_1$	
Health Care	The number of doctors of all specialties, thousand people	X_{38}	$Y_{23} = X_{38}/X_1$	PCA_{10}
	The number of people for one hospital bed, people	X_{39}	X_{39}	
	The number of patients with a first-time diagnosis, per 1,000 people, people	X_{40}	X_{40}	
Culture, recreation and tourism	The number of spectators of theaters and the number of visits to museums per 1,000 people, people	X_{41}	$Y_{24} = X_{41}/X_1$	PCA_{11}
	The number of sports facilities, units	X_{42}	$Y_{25} = X_{42}/X_1$	
	Library stock, copies/items	X_{43}	$Y_{26} = X_{43}/X_1$	
	The number of Russian tourists who used travel agencies, people	X_{44}	$Y_{27} = X_{44}/X_1$	
	The number of registered crimes, units	X_{45}	$Y_{28} = X_{45}/X_1$	

End of Table 1

Group	Indicator name, change unit	Designation	Conversion	Indicator (principle component)
The size and structure of the gross regional product	Gross Regional Product (GRP), million rubles	X_{46}	$Y_{29} = X_{46}/X_1$	PCA_{12}
	Sectoral structure of GRP:			
	Mineral extraction, proportion	X_{47}	X_{47}	
	Wholesale and retail trade; repair of vehicles and motorcycles, proportion	X_{48}	X_{48}	
	Activities in the field of information and communication, proportion	X_{49}	X_{49}	
	Activities on operations with real estate, proportion	X_{50}	X_{50}	
	Activities in the field of health and social services, proportion	X_{51}	X_{51}	
	Activities in the field of culture, sports, leisure and entertainment, proportion	X_{52}	X_{52}	
	Activities of households as employers, proportion	X_{53}	X_{53}	
	Agriculture, forestry, hunting, fishing and fish farming, proportion	X_{54}	X_{54}	PCA_{13}
	Manufacturing activity, proportion	X_{55}	X_{55}	
	Building activity, proportion	X_{56}	X_{56}	
	Financial and insurance activities, proportion	X_{57}	X_{57}	
	Professional, scientific, and technical activities, proportion	X_{58}	X_{58}	
	Public administration and military security; social security, proportion	X_{59}	X_{59}	
	Education, proportion	X_{60}	X_{60}	
	Water supply; wastewater disposal, organization of waste collection and disposal, activities to eliminate pollution, proportion	X_{61}	X_{61}	PCA_{14}
	Transportation and storage, proportion	X_{62}	X_{62}	
	Administrative activities and related ancillary services, proportion	X_{63}	X_{63}	
	Electricity, gas and steam supply; air conditioning, proportion	X_{64}	X_{64}	PCA_{15}
	Activities of hotels and catering companies, proportion	X_{65}	X_{65}	
Source: own compilation.				

In the study, we carried out the transition to the specific values of some indicators of socio-economic development in the region. In particular, we replaced the indicator of the fixed assets value by the specific fixed assets value per capita ($X_2 \rightarrow Y_1$), the volume of mineral production in monetary terms – by the specific value of mined minerals per capita ($X_3 \rightarrow Y_2$), etc. However, the transition only to specific values is not enough, because the results of the cluster analysis may be inadequate due to the influence of different units of measurement of the values. In order to bring all indicators to a single dimensionless format and represen-

tation, which ensures the correct application of multivariate clustering, we propose to perform their standardization [27]:

$$\tilde{x}_i^j = \frac{x_i^j - \bar{x}_i}{\sigma_{x_i}}, \qquad (1)$$

where $\tilde{x}_i^j$ standardized value of x_i^j-indicator; x_i^j – initial or specific value of the indicator for the j-region; σ_{x_i} – root-mean-square deviation of the x_i-indicator from its average value for all regions; $i = \overline{1,\ 65};\ \ j = \overline{1,\ 85}$.

Further, in order to effectively conduct clustering and identify significant features that influence it, we propose to reduce the dimensionality of the original

data set by principal component analysis (PCA) [28]. The algorithm tries to find projections in the data that preserve the maximum variance. It reduces dimensionality, removes uninformative features, and still retains the ability to separate the data.

In order to determine the number of required indicators (principal components), reflecting the differentiation of regions in terms of socio-economic development, we should plot the dependence of the explained variance proportion on the number of indicators. *Figure 1* shows the above dependence for the problem to be solved. It was plotted using PCA method implemented in Python using *Sklearn* library and *decomposition.PCA* function ()[2].

From the obtained plot of variance in the direction of the eigenvector explained by each of the components, we can see that it is sufficient to include 15 development indicators in the analysis, which will describe about 85% of the variance.

We introduce 15 principal components into the study according to the enlarged groups identified in Table 1. *Figure* 2 shows the HeatMap display of the Pearson correlation coefficients (*SciPy* library) between the specific main socioeconomic indicators and the PCA-method PCA_2 and PCA_3 principal components obtained for them. According to the values of the correlation coefficients between the indicators, we can see that the principal component of PCA_2 is responsible for the variables Y_1, Y_5, Y_6 and Y_8 (pair correlation coefficients are in the range of 0.7−0.8 and indicate a strong correlation), and the principal component of PCA_3 is responsible for the variables Y_2 and Y_4.

Figure 3 shows a similar HeatMap display of the Pearson correlation coefficients between the variables characterizing the GRP industry structure and the principal components PCA_{12}, PCA_{13}, PCA_{14}, and PCA_{15} obtained for them.

Figure 1. Dependence of the explained variance proportion on the number of indicators of socio-economic development of regions
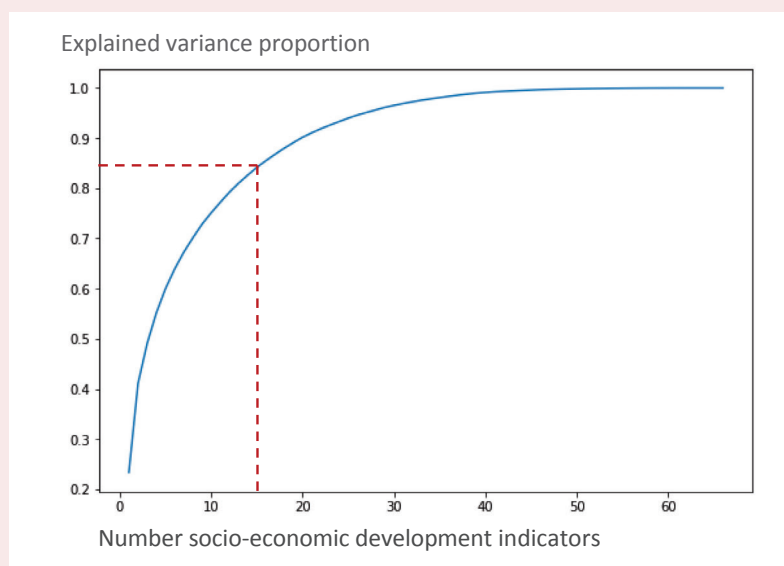
Source: own compilation.

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[2] Principle component analysis. Available at: https://scikit-learn.org/stable/modules/generated/sklearn.decomposition.PCA.html

Figure 2. HeatMap display of the Pearson correlation coefficients between
socio-economic indicators and their principal components

Source: own compilation.

Figure 3. HeatMap display of the Pearson correlation coefficients between
variables (X_{47}–X_{65}) and principal components (PCA_{12}–PCA_{15})
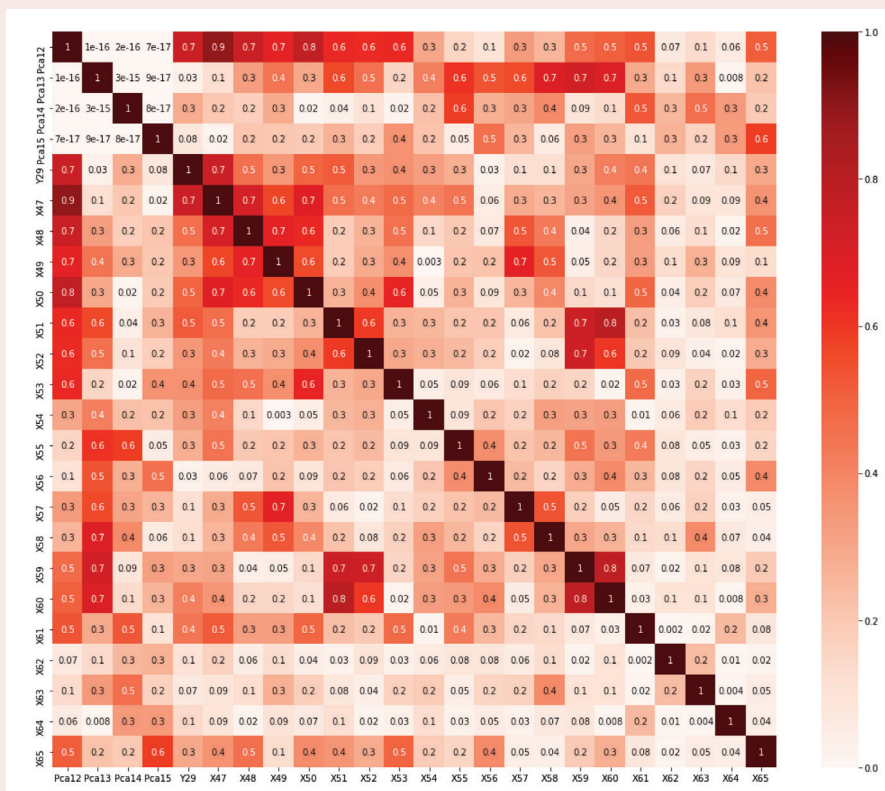
Source: own compilation.

The study shows that after the transition to unit variables and reducing the dimensionality of the initial indicators of socio-economic development of regions, 15 indicators can be used for clustering. As a result, the transformed dataset contains 1,275 records. *Figure 4* shows the pairwise correlation diagrams for the principal components of the transformed data set and their histograms.

Visually, there are no close links between the indicators of socio-economic development of the regions, so it is advisable to conduct multi-dimensional clustering for all indicators.

Solving the problem of clustering regions by level of socio-economic development

As mentioned above, among the effective methods of clustering is the *k*-means method, the optimal number of which is determined based on the analysis of the total square of the distances from the assumed centers to the regions in the cluster *(Fig. 5)*. The k-means method was implemented in Python using the Sklearn library and its built-in cluster.KMeans function ()[3].

From the graph shown in Figure 5, we can see that when the number of clusters changes

Figure 4. Pairwise graphs of development indicators and their histograms
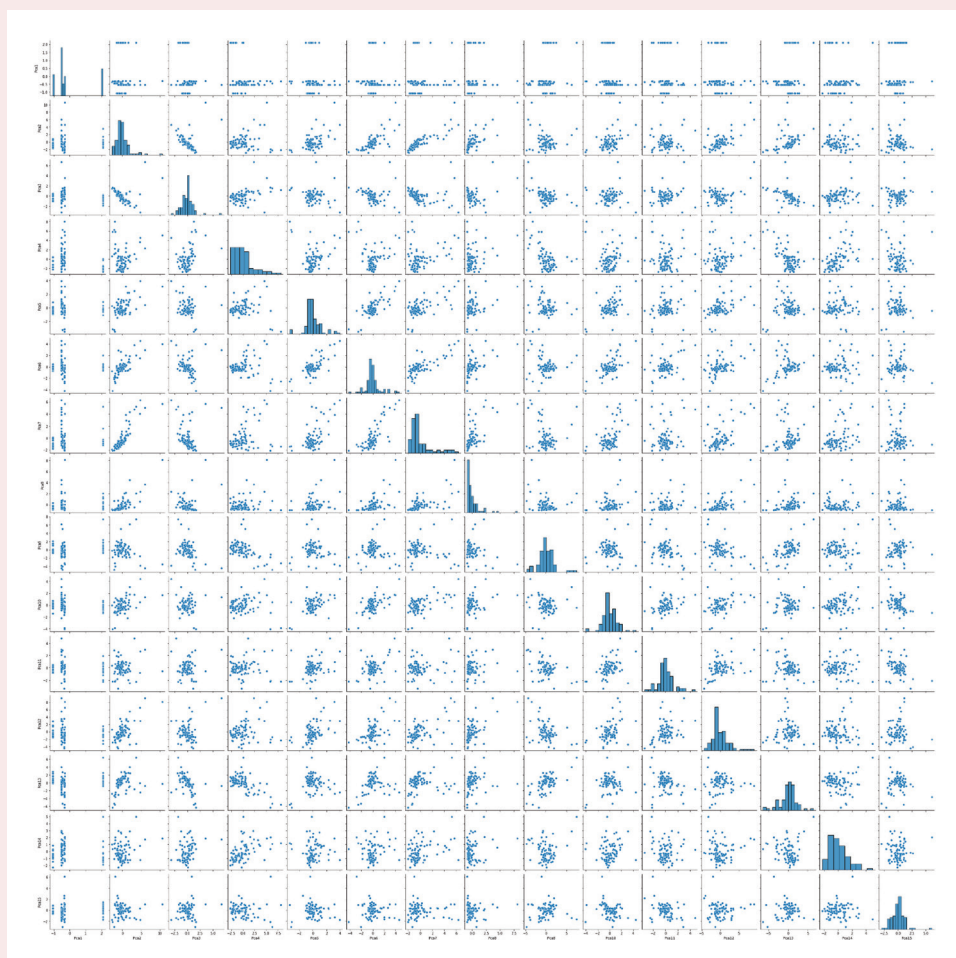
Source: own compilation.

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[3] Machine learning. Clustering. KMeans. Available at: https://scikit-learn.org/stable/modules/generated/sklearn.cluster.KMeans.html

from 4 to 5, the total distance from the centers to the cluster objects decreases dramatically, while for the number of clusters greater than 5 this indicator decreases slightly; using $k > 5$ is not reasonable (check performed by F-test using the library *SciPy*). Thus, it is economically feasible to allocate 5 regional clusters *(Tab. 2)*.

Figure 5. Dependence of the distance from the assumed centers to the regions in the cluster and the number of clusters
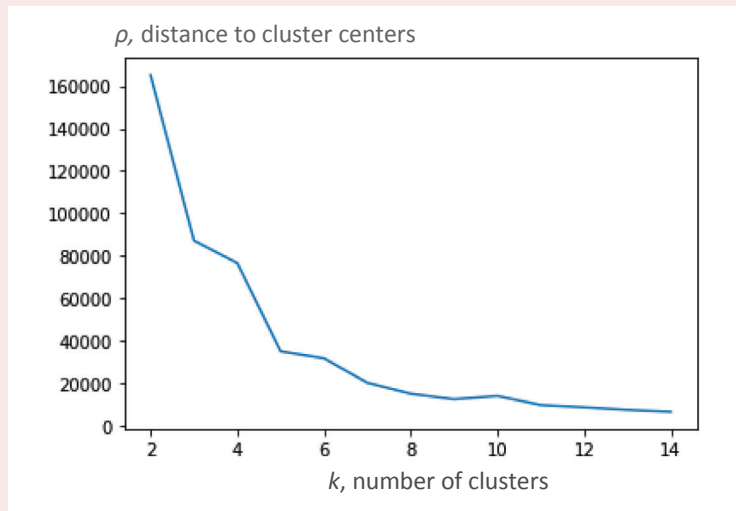
Source: own compilation.

Table 2. Clustering of regions by level of socio-economic development considering sectoral structure

Cluster	Regions
1	Moscow, Saint Petersburg
2	Belgorod Oblast, Bryansk Oblast, Vladimir Oblast, Voronezh Oblast, Ivanovo Oblast, Kaluga Oblast, Kostroma Oblast, Kursk Oblast, Lipetsk Oblast, Moscow Oblast, Oryol Oblast, Ryazan Oblast, Smolensk Oblast, Tambov Oblast, Tver Oblast, Tula Oblast, Yaroslavl Oblast
3	Altai Krai, Amur Oblast, Arkhangelsk Oblast, Astrakhan Oblast, Volgograd Oblast, Vologda Oblast, Jewish Autonomous Oblast, Zabaykalsky Krai, Irkutsk Oblast, Kaliningrad Oblast, Kamchatka Krai, Kemerovo Oblast, Kirov Oblast, Krasnodar Krai, Krasnoyarsk Krai, Kurgan Oblast, Leningrad Oblast, Murmansk Oblast, Nizhny Novgorod Oblast, Novgorod Oblast, Novosibirsk Oblast, Omsk Oblast, Orenburg Oblast, Penza Oblast, Perm Krai, Primorsky Krai, Pskov Oblast, Republic of Adygea, Republic of Bashkortostan, Republic of Karelia, Komi Republic, Mari El Republic, Republic of Mordovia, Republic of Tatarstan, Republic of Khakassia, Rostov Oblast, Samara Oblast, Saratov Oblast, Sverdlovsk Oblast, Stavropol Krai, Tomsk Oblast, Tumen Oblast, Udmurt Republic, Ulyanovsk Oblast, Khabarovsk Krai, Chelyabinsk Oblast, Chuvash Republic
4	Kabardino-Balkarian Republic, Karachay-Cherkess Republic, Altai Republic, Republic of Buryatia, Republic of Dagestan, Republic of Ingushetia, Republic of Kalmykia, Republic of Crimea, Republic of North Ossetia–Alania, Tuva Republic, Chechen Republic, Sevastopol
5	Magadan Oblast, Nenets Autonomous Okrug, Republic of Sakha (Yakutia), Sakhalin Oblast, Khanty-Mansi Autonomous Okrug–Yugra, Chukotka Autonomous Okrug, Yamalo-Nenets Autonomous Okrug
Source: own compiation.	

The first cluster includes the federal cities of Moscow and Saint Petersburg, and the second cluster includes regions only from the Central Federal District. The third cluster consists of constituent entities of the Volga Federal District (30%), the Northwestern Federal District (20%), the Siberian Federal District (17%), the Far Eastern Federal District (13%), the Southern Federal District (11%), and the Urals Federal District (9%). In the fourth cluster, 50% are occupied by constituent entities of the North Caucasian Federal District, 25% by the Southern Federal District, 17% by the Siberian Federal District, and 8% by the Far Eastern Federal District. The fifth cluster comprises 57% of regions of the Far Eastern Federal District, 29% of the Ural Federal District, and 14% of the Northwestern Federal District.

The color chart of the cluster distribution of the constituent entities of the Russian Federation by level of socio-economic development is shown in *Figure 6*.

Table 3 shows the values of various indicators characterizing the socio-economic development of regions, on average for the selected cluster.

According to the analysis of the data on the level of socio-economic development of the regions, considering the sectoral structure, we can conclude that:

— the first cluster is characterized by a high proportion in the structure of GRP of wholesale and retail trade, a high proportion of real estate operations, professional, scientific and technical activities, information and communication

Table 3. Average values of a number of indicators by cluster for 2019

Cluster number	Cluster 1	Cluster 2	Cluster 3	Cluster 4	Cluster 5
Specific GRP (Y_{29}), thousand rubles/person	1 250.5	430.7	496.8	238.4	3 290.5
Specific value of fixed assets (Y_1), thousand rubles/person	4 670.4	1 766.7	1 827.3	904.2	11 119.5
Proportion of employed people in the total population, % (Y_9)	64.5	46.0	45.4	38.3	64.8
Unemployment rates (X_{18}), %	1.4	4.0	5.2	11.6	4.7
Average per capita income of the population (X_{23}), rubles/months	60 611.0	29 548.4	29 074.0	22 173.3	67 221.7
Consumer spending on average per capita (X_{24}), rubles/months	48 040.0	24 114.8	23 720.0	16 873.8	36 079.6
Proportion of the mining industry in GRP (X_{47}), %	0.2	2.1	10.3	2.9	60.3
Proportion of wholesale and retail trade in GRP (X_{48}), %	20.7	13.8	10.8	12.2	3.8
Proportion of the information and communication industry in GRP (X_{49}), %	6.2	2.1	2.0	2.1	0.6
Proportion of real estate operations in GRP (X_{50}), %	14.8	11.1	9.4	11.3	2.1
Proportion of agriculture, forestry, hunting, fishing and fish farming in GRP (X_{54}), %	0.1	10.1	7.3	11.5	2.0
Proportion of manufacturing in GRP (X_{55}), %	14.8	22.5	19.0	5.1	1.6
Proportion of construction in GRP (X_{56}), %	3.6	5.7	5.7	9.1	6.6
Proportion of professional, scientific and technical activities in GRP (X_{58}), %	8.2	2.6	2.7	1.2	0.9
Share of public administration and military security, social security (X_{59}), %	5.2	6.3	7.2	15.1	5.3
Proportion of education in GRP (X_{60}), %	2.9	3.7	3.6	7.2	2.3
Source: own compilation.					

Figure 6. Color chart of the cluster distribution of constituent entities of the Russian Federation by level of socio-economic development
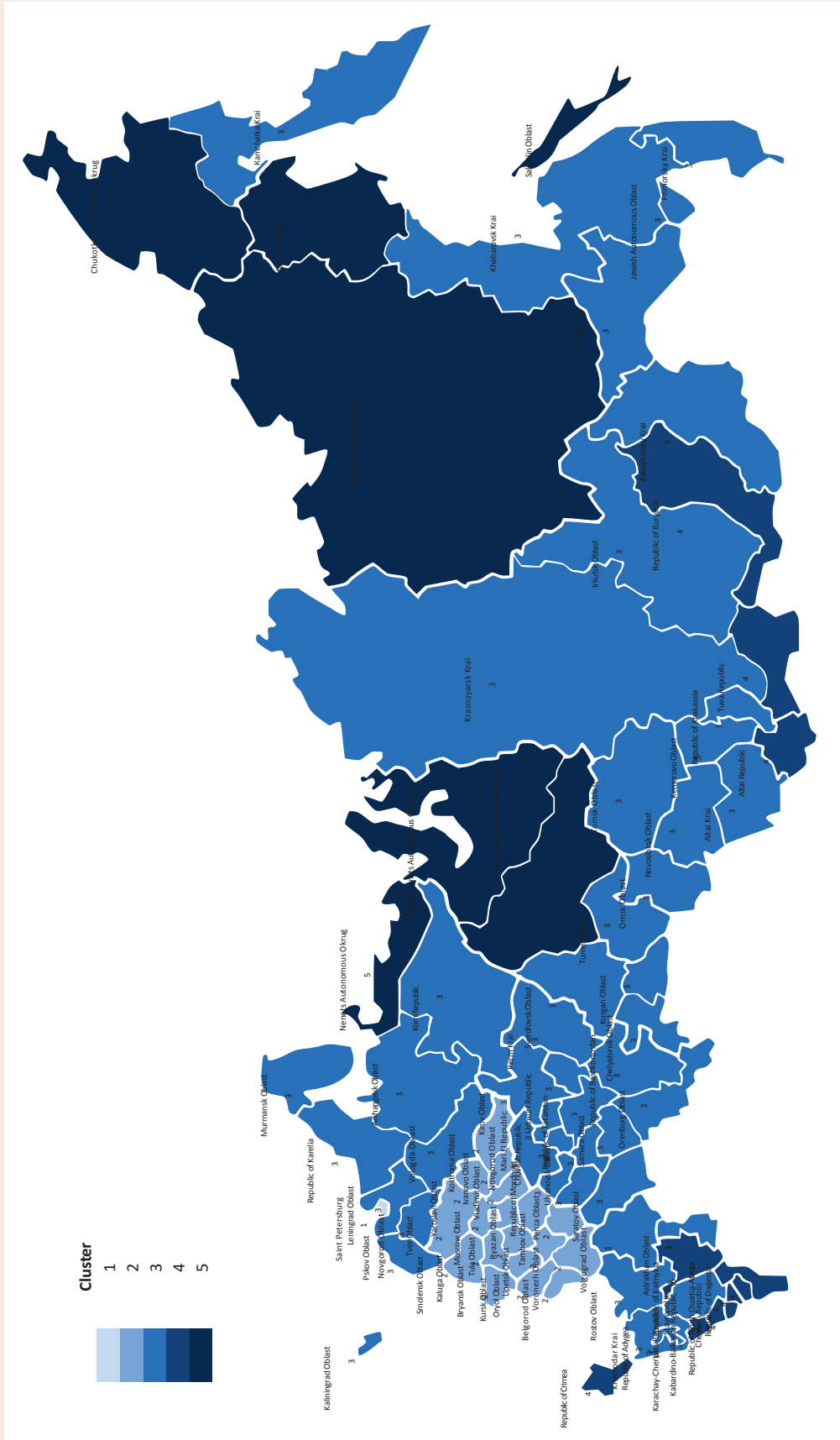
Source: own compilation.

industry; this cluster is characterized by a high proportion of employed in the economy, low unemployment rate, and high average per capita cash income and expenses;

— the second cluster specializes in manufacturing, wholesale and retail trade, real estate operations, agriculture, and forestry;

— the third cluster, containing the largest number of regions, can be described as a cluster with a mixed economy, which is characterized by the average values of the main socio-economic indicators in RF;

— the fourth cluster is characterized by low values of socio-economic indicators; in its regions of this cluster there is a high level of unemployment, the proportion of those employed in the economy is only 38%; in contrast to the others, the fourth cluster revealed a high proportion of public administration, and military security, social security, education, construction;

— the fifth cluster specializes in mining, its regions are characterized by the maximum average per capita income of the population in Russia.

Conclusion

The study involved the clustering of Russian regions according to the level of their socio-economic development and the sectoral structure of gross regional product. We used such methods of machine learning without a teacher, as methods of the principal components and k-means to carry out the cluster analysis.

The initial data set included indicators of regional development by aggregated groups in accordance with the classifiers introduced into statistical practice: basic socio-economic indicators; population; employment and unemployment; living standards; investment; education; health care; culture, recreation and tourism; the size and structure of the gross regional product. For

the indicators of each aggregated group, using the method of principal components, we identified characteristic indicators, due to which we were able to reduce the dimensionality of the original data set from 65 to 15 indicators.

We found that it is advisable to allocate five regional clusters by level of socio-economic development, considering the sectoral structure of the constituent entities.

Using the k-means method, we obtained that the first cluster includes the most developed cities of the Russian Federation: Moscow and Saint Petersburg. It is characterized by a high proportion of people employed in the economy, low unemployment, high average per capita income and expenditure. On the territory of the cluster is developed professional scientific and technical activity, actively functioning information and communication industry, developed trade.

The second cluster contains regions of the Central Federal District. It is characterized by well-developed manufacturing, agriculture, forestry, and trade.

The third cluster, the largest by number of regions, consists of the Volga Federal District constituent entities (30% in the cluster structure), the Northwestern Federal District (20%), and the Siberian (17%), Far Eastern (13%), Southern (11%), and Ural (9%) federal districts. This is a cluster with a mixed economy, which is characterized by average values for the main socio-economic indicators in the Russian Federation.

The fourth cluster contains the least developed regions of the Russian Federation and, accordingly, is characterized by low values of socio-economic indicators. Half consists of the constituent entities of the North Caucasian Federal District, a quarter of the constituent entities of the Southern Federal District, 17% of the Siberian and 8% of

the Far Eastern federal districts. This cluster has a high proportion of public administration and military security, social security, education, and construction. Its facilities are characterized by a high unemployment rate, the proportion of those employed in the economy being only 38%.

The fifth cluster specializes in the extraction of minerals. It includes regions of the Far Eastern (57%), Ural (29%), Northwestern (14%) federal districts. The regions of the fifth cluster are characterized by the maximum average per capita income of the population in the Russian Federation.

Thus, the developed methodology of cluster analysis allows forming sustainable regional clusters according to the socio-economic development of the constituent entities of the Russian Federation. The performed clustering, considering the sectoral structure of regional economies, can be used in the implementation of cluster-oriented state policy in order to support the accelerated development of the constituent entities.

References

1. Golova I.M., Sukhovey A.F. Differentiation of innovative development strategies considering specific characteristics of the Russian regions. *Economy of Region,* 2019, vol.15, pp. 1294–1308. DOI:10.17059/2019-4-25

2. Mariev O., Pushkarev A. Clustering Russian regions by innovative outputs using a multi indicator approach. In: *Proceedings of the 7th International Conference Innovation Management, Entrepreneurship and Sustainability (IMES)*, 2019. Pp. 519–533.

3. Ketova K.V., Vavilova D.D. Neural network forecasting algorithm as a tool for assessing human capital trends of the socio-economic system. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2020, vol. 13, no. 6, pp. 117–133. DOI:10.15838/esc.2020.6.72.7 (in Russian).

4. Shubat O.M., Bagirova A.P., Akishev A.A. Methodology for analyzing the demographic potential of Russian regions using fuzzy clustering. *Economy of Region*, vol. 15, pp. 178–190. DOI:10.17059/2019-1-14

5. Ketova K.V., Trushkova E.V. The solution of the logistics task of fuel supply for the regional distributed heat supply system. *Komp'yuternye issledovaniya i modelirovanie=Computer Research and Modeling,* 2012, vol. 4, no. 2, pp. 451–470 (in Russian).

6. Lokosov V.V., Ryumina E.V., Ul'yanov V.V. Clustering of regions by indicators of quality of life and quality of population. *Narodonaselenie=Population,* 2019, vol. 22, no. 4, pp. 4–17 (in Russian).

7. Kostina S.N., Trynov A.V. Cluster analysis of the dynamics of the birth rate of fourth and subsequent children in Russian regions. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2021, vol. 14, no 3, pp. 232–245. DOI:10.15838/esc.2021.3.75.14 (in Russian).

8. Lavrinenko P.A., Rybakova D.A. Comparative analysis of regional differences in healthcare, environment, and public health. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2015, no. 5(41), pp. 198–210 (in Russian).

9. Petrykina I.N. Cluster analysis of regions of the Central Federal District in terms of human capital development. *Vestnik Voronezhskogo gosudarstvennogo universiteta. Ekonomika i upravlenie=Proceedings of Voronezh State University. Series: Economics and Management,* 2013, no. 1, pp. 72–80 (in Russian).

10. Demichev V.V., Maslakova V.V., Nestratova A.A. Clustering Russian regions by level of agricultural efficiency. *Bukhuchet v sel'skom khozyaistve=Accounting in Agriculture,* 2020, no. 12, pp. 58–66. DOI:10.33920/sel-11-2012-06 (in Russian).

11. Aksenov I.A. Clustering of foreign economic activity of regions. *Ekonomika i menedzhment sistem upravleniya=Economics and Systems Management,* 2016, no. 1–3, pp. 309–315 (in Russian).

12. Marchenko E.M., Belova T.D. Clustering of regions taking into account the energy efficiency. *Regional'naya ekonomika: teoriya i praktika=Regional Economics: Theory and Practice,* 2016, no. 1(424), pp. 51−60 (in Russian).

13. Paul S., Alvi A.M., Nirjhor M.A., Rahman S., Orcho A.K., Rahman R.M. Analyzing accident prone regions by clustering. *Advanced Topics in Intelligent Information and Database Systems*, 2017, vol. 710, pp. 3−13.

14. Orlova I.V., Filonova E.S. Cluster analysis of the regions of the central federal district socio-economic and demographic indicators. *Statistika i ekonomika=Statistics and Economics,* 2015, no. 5, pp. 111−115. DOI: 10.21686/2500-3925-2015-5-136-142 (in Russian).

15. Ultsch A., Lotsch J. Machine-learned cluster identification in high-dimensional data. *Journal of Biomedical Informatics*, 2017, vol. 66, pp. 95−104. DOI: 10.1016/j.jbi.2016.12.011

16. Khan I., Luo Z., Shaikh A.K., Hedjam R. Ensemble clustering using extended fuzzy k-means for cancer data analysis. *Expert Systems with Applications*, 2021, vol. 172, 114622. DOI: 10.1016/j.eswa.2021.114622

17. Ming F., Stephen T.A Machine learning based asset pricing factor model comparison on anomaly portfolios. *Economics Letters*, 2021, vol. 204, 109919. DOI: 10.1016/j.econlet.2021.109919

18. Blekanov I., Krylatov A., Ivanov D., Bubnova Y. Big data analysis in social networks for managing risks in clothing industry. *IFAC PapersOnLin*e, 2019, vol. 52 (13), pp. 1710−1714. DOI: 10.1016/j.ifacol.2019.11.447

19. Arthur D., Vassilvitskii S. K-means++: The advantages of careful seeding. In: *Conference: Proceedings of the Eighteenth Annual ACM-SIAM Symposium on Discrete Algorithms*, *SODA 2007, New Orleans, Louisiana, USA*. DOI: 10.1145/1283383.1283494

20. Ozgur O., Akkoc U. Inflation forecasting in an emerging economy: Selecting variables with machine learning algorithms. *International Journal of Emerging Markets*, 2020. DOI: 10.1108/IJOEM-05-2020-0577

21. Faizullin R.V. Simulator of the navigation equipped with LIDAR of the mobile robot based on the neural network. *IOP Conference Series: Materials Science and Engineering*, 2020, vol. 873, no. 1. DOI: 10.1088/1757-899X/873/1/012023

22. De Sousa J.M., Santos R.L.D., Lopes L.A., Machado V.P., Silva I.S. Automatic labelling of clusters with discrete and continuous data using supervised machine learning. In: *Proceedings of the 35th International Conference of the Chilean Computer Science Society (SCCC)*. 2016.

23. Lee C.H., Steigerwald D.G. Inference for clustered data. *Stata Journal*, 2018, vol. 18, no. 2, pp. 447−460. DOI: 10.1177/1536867X1801800210

24. Mitra D., Chu Y., Cetin K. Cluster analysis of occupancy schedules in residential buildings in the United States. *Energy and Buildings*, 2021, vol. 236, 110791, DOI: 10.1016/j.enbuild.2021.110791

25. Ofetotse E.L., Essah E.A., Yao R. Evaluating the determinants of household electricity consumption using cluster analysis. *Journal of Building Engineering*, 2021, vol. 43, 102487, DOI: 10.1016/j.jobe.2021.102487

26. Aivazian S., Afanasiev M., Kudrov A. Indicators of the main directions of socio-economic development in the space of characteristics of regional differentiation. *Applied Econometrics*, 2019, vol. 54, pp. 51−69. DOI: 10.24411/1993-7601-2019-10003

27. Kasatkina E.V., Vavilova D.D. Information-analytical system to forecast the factors of regional development. *Problemy upravleniya=Control Siences,* 2015, no. 4, pp. 25−34 (in Russian).

28. Omuya E.O., Okeyo G.O., Kimwele M.W. Feature selection for classification using principal component analysis and information gain. *Expert Systems with Applications*, 2021, vol. 174, 114765. DOI: 10.1016/j.eswa.2021.114765

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On the Methodology of Checking Integral Estimates of Socio-Economic Objects*
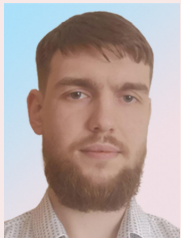
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Abstract. A reliable and high-quality assessment of scientific, technological, and innovative development of territories helps to define socio-economic conditions and forecast economic growth dynamics of a given subject. The usage of integral indicators is among the most popular approaches toward assessing science, innovative activity, and other socio-economic objects. However, since a collective synthetic category is estimated, accuracy of this metric's characterization of an intangible subject is uncertain. In this regard, issues related to the development of methodology for checking aforementioned provisions are relevant. The purpose of the study is to define the reliability of artificially derived integral complex estimates that in turn describe various socio-economic processes and phenomena. Scientific novelty of the research is to develop an approach to determining the reliability of integral metrics based on mathematical statistical tools. We attempted to determine the quality of artificially derived integrated estimates that, according to their creators, characterize various manifestations of science, innovation, and technology. We applied corresponding methods (variance, correlation, and regression analysis) using the Innovation Development Index of RF constituent entities and assessment of territories' scientific and technological potential. The results obtained are of practical importance in relation to the evaluation practices of the scientific and innovative sphere carried out in the Russian economy. The theoretical significance of the study is characterized by the development of an approach that can be applied to other socio-economic objects. We conclude that integral assessments become an extremely subjective tool when applied to humanitarian areas. They can be used correctly if there is a confirmed connection with the indicators: integral assessments should influence them or have a strong response from them.

Key words: scientific and technological development, integral estimate, analysis of variance, correlation analysis, regression analysis, logit function, economic growth, innovation activity.

Introduction

Prediction of the economic growth, development, and social consequences is an important task for government agencies. Using this tool, they can anticipate the consequences of planned actions and correctly adjust their activities with policies to avoid serious socio-economic shocks or accelerate the onset of any positive events.

To assess a territory's economic and social well-being, the GDP indicator has been used for many years (the equivalent for lower-level economic entities is the GRP value) [1; 2]. It is intended to characterize the economic growth dynamics. When assessing business entities, the most developed territories are determined by this metric.

In accordance, the search for "levers" of regulation is an important scientific problem. In other words, the scientific community needs to identify the factors by changing which it is possible to increase or decrease the value of GDP (GRP), and therefore influence economic growth or development.

Such key factors include scientific and technological (in older sources, "scientific and technical") progress and associated innovative activities of enterprises and organizations [3; 4; 5]. According to several authors [6–11], science and technology are the engine of socio-economic development. Therefore, the state should implement a policy of supporting science and the research sector to increase its competitiveness in the international arena, as well as to improve citizens' living conditions in a particular territory [12; 13; 14].

In this regard, various economic and mathematical models are being developed [15; 16] (R.M. Solow [8], S. Rebelo [9], K. Arrow [17], P.M. Romer [18], R. Lucas [19], D. Grossman and

E. Helpman [20], K. Freeman and B.-A. Lundvall [21], C. Griliches [22]). Depending on the indicators chosen and justified by scientists and researchers, they describe functional relationships between economic growth and any economic object (costs for science; amount of research and development works carried out; human capital; enterprises that carry out and implement innovative activities; educational institutions; dynamics of innovative ideas). These models have both a theoretical theoretical justification and some empirical implementation that, to a certain extent, is their approbation and confirmation of the formulated ideas.

Scientists also attempt to conduct a comprehensive assessment of scientific and technological changes in the economic environment. For this purpose, various kinds of "integral" estimates are developed and calculated. An example is the index of the scientific and technical potential of a region, the calculation method of which is published in the works of K.A. Zadumkin and I.A. Kondakov [23], or the assessment of the scientific and technological potential of the territories, presented in an article by a team of authors led by K.A. Gulin [24]. A prominent and fundamental work is the draft "Russian Regional Innovation Ranking", developed and published from 2012 to 2019 by a team of authors of the Institute for Statistical Studies and Economics of Knowledge, part of the HSE[1]. This methodology includes an assessment of 37 indicators and has a significant calculation period (7 years).

The mentioned works attempted to assess the cumulative impact of scientific, technological, and innovative development factors on the territories' socio-economic level (Russia as a separate state, and districts or regions that are part of it, representing similar units of smaller size). As a result of the complexity of the estimates obtained,

their interpretation is a kind of conditional unit that characterizes a generalized process or phenomenon (in our case, scientific and technological potential, innovative development, etc.), but does not have an explicit quantitative interpretation that can be obtained during measurement procedures. As a result, the question about the adequacy and reliability of the processes, described by such integral assessments, arises. Their reliability can be confirmed only sometime later, which significantly reduces the significance and practical applicability of such models.

A person often encounters the need to evaluate objects that are characterized by heterogeneous parameters. Most often, such an assessment is carried out intuitively and, as a result, there is a negative result. The use of integral estimates is also associated with several problems, which can be characterized as follows[2] [25; 26; 27]:

— need to consider the weight and significance of each of the parameters included in the overall assessment;

— need to specify a way of translating qualitative assessments into quantitative ones;

— distribution of the assessed objects into the corresponding groups, characterized by the magnitude of the levels identified in the study;

— possibility of comparing estimates with the ones that will be obtained in the future (socio-economic indicators are often non-permanent and may become irrelevant over time, unlike physical quantities that are measured by objects of the natural sciences).

The problematic aspects of integral assessments described above are also indicated in several domestic scientific papers, which attempt to systematize advantages and disadvantages of such approach regarding the interpretation of socio-

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[1] Russian Regional Innovation Ranking. Available at: https://issek.hse.ru/rir

[2] Minaker B.E., Bychovskyi M.V. Problems of integral assessments of technical systems. **TRIZ-Summit – 2006**. Saint Petersburg, October 13–14, 2006. Available at: https://www.metodolog.ru/00821/00821.html

economic objects. Thus, in the E.N. Volkova's article, a methodology for characterizing the socio-economic development of the region is formed and described on the basis of an integral assessment [28]. In the work of E.V. Klyushnikova and E.M. Shitova, the features of constructing integral estimates in accordance with the main stages of modeling are outlined: normalization, aggregation, weighing [29]. Similar studies are being conducted abroad. One of these works is the publication of a team of scientists led by M.-S. Saib [30], in which the authors use an integral indicator to assess the inequality of the population of territories in terms of conditions and factors affecting health.

Among the modern works, special attention should be paid to the publication of A.A. Sidorov [31]. He meticulously systematizes and describes the mathematical nature of the integral approach, thus continuing the work of the famous Russian econometrician S.A. Ayvazyan [32; 33; 34]. In the foreign environment, there are also studies related to the mathematical construction of an integral indicator. Thus, a team of authors led by P. Zhou [35] proposes a variant of aggregating an integral estimate based on the product of adjusted partial values of the included indicators.

Despite the wide variety of works on the use of the integral approach in relation to socio-economic objects, one point is omitted in them – do integral indicators correctly characterize what they are intended to describe? Although nearly all the studies reviewed stipulate that such assessments carry a fair share of indefinite subjectivism.

In this regard, we aim to determine the reliability of artificially derived integral complex estimates by means of mathematical and statistical methods, which, in turn, describe various socio-economic processes and phenomena.

"Reliability" of the estimates, indicated in the work, means their ability to explicitly describe the processes and phenomena that they should characterize.

To achieve this goal, we have solved several tasks in this work:

– defined and described the methods of mathematical statistics, with the help of which the search for the relationship between economic growth and the assessment of scientific and technological development is carried out;

– formed a sample of data for the calculations indicated in the work;

– carried out and described the results of calculations, based on which the relevant conclusions and recommendations were formulated.

Research methods

One-way analysis of variance

In mathematical statistics, analysis of variance is used to investigate the presence of the influence of qualitative factors on the values of a quantitative indicator. In our case, the resulting indicator will be $y : GRP$, and for the factor $x : x \in (I_1 || I_2)$, $(I_1 || I_2) \supset S_1 \& S_2 \& S_3 \& S_4$, where I_1 is the Russian Regional Innovation Index, I_2 is comprehensive assessment of scientific and technological potential, and $\{S_n\}_{n=1}^4$ is their constituent sub-indexes.

Using the one-way analysis of variance, we attempt to define whether the difference y in the Russian Federation subjects, observed on $k = 4$ levels (socio-economic conditions, scientific and technical potential, innovation activity, quality of innovation policy in one case and research and development, personnel, technology, and innovation in the other) is statistically significant.

Algorithm of sample formation for the one-way analysis of variance

The algorithm for selecting elements of four different samples in accordance with levels I_1 will be formed based on the ratings of the subjects of the Russian Federation according to the sub-indexes of the Russian Regional Innovation Index. The distributions obtained by scientists and researchers of the ISSEK include four groups that can be characterized as follows (the groups are modeled

by the authors of the questioned study, but there is no explicit justification for the boundary values in them; a variant of a possible interpretation is presented below):

I group – cities of federal significance (Moscow, St. Petersburg) that have the best indicators for most statistical metrics characterizing socio-economic development. By their nature, their estimates are several times different from other similar objects (regional territorial units), which is why they are clearly out of the overall distribution picture and look like outliers. In this regard, while conducting the one-way analysis of variance, they will be excluded from our study, which will allow evaluating truly equivalent objects among themselves;

II group – regional territorial entities that have the best values for the assessed characteristics (except for objects included in group I), often exceeding the average national estimates. Such subjects can be regarded the ones that have the studied feature;

III group – the RF regions, which often have values according to S_n estimates that are smaller than the average Russian characteristics; these territories only approach the qualitative level of the studied features I, and therefore they cannot be considered the ones possessing the studied characteristics. It means they should be excluded from further calculations;

IV group – territorial units with the lowest values according to the considered characteristics; they can be characterized by a strong spread of estimates in the context of dynamics, instability of growth rates, and the absence of pronounced trends; in this regard, such objects will not be included in the studied sample.

The algorithm for selecting elements of four different samples in accordance with levels I_2 will be formed based on the ratings of the subjects of the Russian Federation by sub-indexes of the assessment of the territories' scientific and technological potential. The distributions, obtained by scientists and researchers of the VolRC RAS, include five groups (levels: high, above average, average, below average, low), which can be characterized as equally distributed and scaled to a whole dozen ($I_2 \in [0; 10]$).

In accordance with the above-mentioned rule of inclusion of observations in the analysis of variance (by analogy with the rating of the subjects of the Russian Federation), we are interested in the "average" and "above average" level groups. In them, as in the previous version, we imply the presence of the considered integrated assessment, therefore, the observation data should be reflected in the change in the dynamics of GRP. The territories included in the high-level sample are unique single objects, and they represent outliers of some kind. The "below average" and "low" level groups include the bulk of observations and, in fact, are identical objects without any prominent features (in 2015, their shares in the sample groups were 93.75; 95; 95, and 98.75%, respectively, in accordance with the selected subindex).

This is the end of the sampling algorithm, and then the algorithm of the one-way analysis of variance continues.

After sampling the regions of the Russian Federation, we determine the number of objects, included in each of the k levels ($k = 4$) as the sum of the elements included in the considered set, and denote it by m_n, where n is the ordinal number of the level.

Then we determine the total number (m) of objects included in all the samples (*formula 1*):

$$m = \sum_{n=1}^{k} m_n . \qquad (1)$$

Next, we calculate the average GRP value for each of the formed k groups (*formula 2*):

$$\overline{y_n} = \frac{1}{m_n} \sum_{i=1}^{m_n} y_{ni} , \qquad (2)$$

where y_{ni} is the GRP value, corresponding to i-region in the sample n.

Next, we will find the average value of the resulting variable y for all available values included in all samples n (*formula 3*):

$$\bar{y} = \frac{1}{m}\sum_{n=1}^{k}\sum_{i=1}^{m_n} y_{ni} \leftrightarrow \frac{1}{m}\sum_{n=1}^{k}\overline{y_n}m_n. \qquad (3)$$

The next stage is the search for the sum of squared deviations of the resulting estimates (y_{ni}) by samples from the common average ($\bar{y}$) (*formula 4*):

$$S^2 = \sum_{n=1}^{k}\sum_{i=1}^{m_n}(y_{ni} - \bar{y})^2. \qquad (4)$$

Then, sum of squared deviations of averages by groups ($\overline{y_n}$) from the total average ($\bar{y}$) (*formula 5*):

$$S_F^2 = \sum_{n=1}^{k}(\overline{y_n} - \bar{y})^2 m_n. \qquad (5)$$

Next, we calculate the residual sum of the squares of the deviations as the sum of the squares of the difference of the resulting values (y_{ni}) from the average values ($\bar{y}$), included in the same sample (*formula 6*):

$$S_{res}^2 = \sum_{n=1}^{k}\sum_{i=1}^{m_n}(y_{ni} - \overline{y_n})^2. \qquad (6)$$

To check S^2 (formula 4), the following equality can be used (*formula 7*):

$$S_F^2 + S_{res}^2 = S^2. \qquad (7)$$

Let us calculate the factor variance (*formula 8*):

$$\sigma_F^2 = \frac{S_F^2}{k-1}. \qquad (8)$$

Calculate the residual variance (*formula 9*):

$$\sigma_{res}^2 = \frac{S_{res}^2}{m-k}. \qquad (9)$$

Next, we find the value F_f according to the formula of private factor variance (σ_F^2) to residual (σ_{res}^2) (*formula 10*):

$$F_f = \frac{\sigma_F^2}{\sigma_{res}^2}. \qquad (10)$$

Using the Fisher–Snedecor distribution, a given level of significance (α), and two degrees of freedom (*formula 11 and 12*), we can define the metric value F_k:

$$df1 = k - 1; \qquad (11)$$

$$df2 = m - k. \qquad (12)$$

To find F_k, classical Fisher–Snedecor distribution tables, which appear in reference books on mathematical statistics, can be used, but a scientist may encounter a several problems using them. These include the absence of necessary numerical values, which the study is based on. A similar situation associated with the choice of the level of reliability (in the reference literature, there are often only $\alpha: \alpha = 0.1 || 0.05 || 0.01$). Such problem is currently easy to solve using the capabilities of computational computer programs (for example, function "F_k" Python "Scipy" libraries).

As a result, it is necessary to compare the values obtained $F_f \& F_k$ (*formula 13*):

$$F_f > F_k \rightarrow A, \qquad (13)$$

where A is the statement that the investigated qualitative features really have an impact on the value of the resulting indicator.

Correlation analysis algorithm

Using the correlation analysis, the presence of a statistical relationship between several random variables is determined. One of these tools is the Pearson correlation coefficient (r), which indicates the presence of a linear relationship. This indicator takes values from -1 to 1 inclusive and, in case of a negative value, indicates a decrease in the resulting estimate relative to an increase in the factorial one. In case of a positive value of the metric r, the situation is drastically opposite. The closer the absolute value r to one, the greater the linear relationship between the indicators is. It is worth noting that, at $r = 0$, there is no linear relationship, but the possibility of describing it through a

nonlinear function or the functional exist. The correlation coefficient between indicators, factors, or the resulting feature (r_{xy}) can be found as the ratio of covariance between them (cov_{xy}) and the product of the corresponding mean square deviations ($\sigma_x \& \sigma_y$) (*formula 14*):

$$r_{xy} = \frac{\text{cov}_{xy}}{\sigma_x \sigma_y} \,,$$

where $\text{cov}_{xy} = \text{M}\left((x_n - \mu(x_n))(y_n - \mu(y_n))\right) \leftrightarrow$ (14)

$\leftrightarrow \text{M}(x_n y_n) - \mu(y_n)\mu(x_n);$

M() is the unbiased estimation of the mathematical expectation of the sample;

$\mu()$ is the average value of the studied observations.

Algorithm for constructing the multiple linear regression model

The multiple linear regression model is a tool used in multivariate statistical analysis to describe the relationship of signs (causes) with any result or consequence. Its general form is represented by the analytical formula (*formula 15*):

$$y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \cdots + \beta_n x_n + \cdots, \quad (15)$$

where $\{\beta_n\}_{n=1}^k$ is regression coefficients showing the degree of influence of the factor on the resulting feature;

β_0 is a free parameter of the model that allows the curve to be optimally positioned in space in such a way that the sum of squared deviations (OLS) is the smallest.

To calculate coefficients β, it is convenient to use the matrix search method (*formula 16*):

$$\begin{pmatrix} y_1 \\ y_2 \\ \vdots \\ y_z \end{pmatrix} = \begin{pmatrix} 1 & x_{11} & x_{12} & \cdots & x_{1n} \\ 1 & x_{21} & x_{22} & \cdots & x_{2n} \\ \vdots & \vdots & \vdots & \vdots & \vdots \\ 1 & x_{z1} & x_{z2} & \cdots & x_{zn} \end{pmatrix} \begin{pmatrix} \beta_0 \\ \beta_1 \\ \beta_2 \\ \vdots \\ \beta_n \end{pmatrix} \rightarrow \quad (16)$$

$$\rightarrow \hat{B} = (X^T X)^{-1} X^T Y$$

After building the model itself, it is necessary to evaluate its accuracy and significance. The accuracy of the multiple linear regression model is determined using the coefficient of determination (R^2), which can be found by the following formula (*formula 17*):

$$R^2 = \frac{SS_f}{SS} \,, \quad (17)$$

where $SS_f = \sum_{j=1}^z (\hat{y}_i - \bar{y})^2$ is the explained sum of regression squares;

$SS = \sum_{j=1}^z (y_i - \bar{y})^2$ is the total sum of regression squares;

j is the ordinal number of the observation included in the generated model.

The closer this metric to one, the better the constructed model approximates the available empirical data.

To compare the accuracy of identical models that differ in the number of regressors, a different metric is used. It is because the coefficient of determination calculated by the method according to formula 17 will always be better with a larger number of parameters. To compare the quality of such regressions, we should use the adjusted R^2 (*formula 18*):

$$R_{adj}^2 = 1 - \frac{(1 - R^2) \cdot (z - 1)}{z - n - 1} \,. \quad (18)$$

At the final stage, the significance of the constructed model is evaluated. It is determined using Fisher's F-test. To do this, the required level of significance (α) is needed, and we calculate the following characteristics (*formula 19*):

$$SS_o = \sum_{j=1}^z (y_i - \hat{y}_i)^2 \leftrightarrow SS - SS_f \text{ — is the}$$

residual sum of regression squares;

$(df1_p = n) \& (df2_p = z - (n + 1))$ — is (19)

a number of degrees of freedom;

$$\left(MS_f = \frac{SS_f}{df1_p} \& MS_o = \frac{SS_o}{df2_p} \right) \rightarrow (F_k)_p = \frac{MS_f}{MS_o} .$$

Determination of $(F_\text{к})_\text{p}$ happens similarly to the procedure of searching for $(F_\text{к})$, however, in this case, instead of $df1$ (formula 11) and $df2$ (formula 12), we take accordingly $df1_\text{p} \& df2_\text{p}$ (formula 19). Then, similarly to formula 13, the new corresponding values obtained are compared.

Algorithm for determining the significance of multiple linear regression coefficients

In order to determine the significance of the coefficients of multiple linear regression, the Student's *t*-test is used. It allows answering the question: "Can the coefficients obtained in the model be interpreted?".

The observed values, obtained from the constructed statistical model, are calculated using the standard error of the parameters $(l_{\beta_0} \& l_{\beta_n})$ $\beta_0 \& \beta_n$ accordingly (*formula 20*):

$$t_{\beta_0} = \frac{\beta_0}{l_{\beta_0}} \ \& \ t_{\beta_n} = \frac{\beta_n}{l_{\beta_n}}; t = t_{\beta_0}||t_{\beta_n}. \quad (20)$$

Standard errors can be found from formula 16 using the matrix A (*formula 21*):

$$A = (X^T X)^{-1}. \quad (21)$$

This matrix is square and is determined by the size $(k+1) \times (k+1)$. Therefore, its diagonal element can be denoted as a_{nn} (*formula 22*):

$$l_{\beta_0}{}^2 = MS_0 a_{00},$$
$$l_{\beta_n}{}^2 = MS_0 a_{nn}, n = \overline{1,k}, \ k = 4. \quad (22)$$

The values obtained in formula 21 are compared with the two-way critical point of the Student's distribution $- t_\text{к}(\alpha; z - n - 1)$. With $|t| > t_\text{к}$, the corresponding parameter of multiple linear regression is considered statistically significant, the null hypothesis of the form $H_0 : \beta_0 || \beta_n = 0$ is rejected.

Algorithm for constructing logistic regression

Using this method, the potential probability of the occurrence of an event can be determined. In our case, the probability of an increase in the GRP dynamics depending on the cumulative annual change of *k*-factors

In general, the model looks like this (*formula 23*):

$$\hat{P} = p_0 + p_1 \cdot \Delta x_1 + \\ + p_2 \cdot \Delta x_2 + \cdots + p_n \cdot \Delta x_n + \cdots \ , \quad (23)$$

where $\hat{P}$ is preliminary assessment of the probability of occurrence of a certain event;

$\{p_n\}_{n=0}^k$ is regression coefficients similar to those that characterize the model (formula 15);

$\{\Delta x_n\}_{n=1}^k$ is the values of the annual change of the corresponding factor.

The final transformation $(\hat{P}')$ can be performed using the *sigmoid* function, and it looks like this (*formula 24*):

$$\hat{P}' = sigmoid(\hat{P}) = \frac{1}{(1 + e^{-\hat{P}})}. \quad (24)$$

Algorithm for converting annual GRP dynamics into Boolean function values

If *y* is a current GRP value, and y^{-1} is a previous one, then Δy is favorable dynamics of *y* by absolute deviation from y^{-1}. Then *P* can be obtained (*formula 25*):

$$\Delta y \to P = \begin{bmatrix} 1, \text{if } \Delta y > 0 \\ 0, \text{if } \Delta y \le 0 \end{bmatrix}. \quad (25)$$

In accordance with the discussed methods, necessary statistical forms are presented below. They were developed by the authors to conduct appropriate statistical assessments, as well as the calculated results and the resulting comments and conclusions.

Table 1. Part of posteriori data set for the one-way analysis of variance

1. Russian Regional Innovation Index of HSE

Regional territorial unit	Gross regional product, mil. rub. (y)	Socio-economic conditions of innovation activity (n = 1)	Scientific and technical potential (n = 2)	Innovative activity (n = 3)	Quality of innovation policy (n = 4)
Altai Krai	487903.3			0.4003	0.4948
Astrakhan Oblast	322303.0	0.4431			
Vladimir Oblast	368489.2			0.3688	
Volgograd Oblast	740458.0				0.4828
Vologda Oblast	478893.0				0.4986
Ivanovo Oblast	180517.5		0.3968		
Irkutsk Oblast	1001717.6		0.3821		
Kaliningrad Oblast	349818.6	0.4675			
Kaluga Oblast	339760.8	0.4829	0.4385		
Kamchatka Oblast	175404.8				0.4444
....	....	....	....	....	....
Number of sample elements	**m = 82***	**m₁ = 28**	**m₂ = 16**	**m₃ = 15**	**m₄ = 23**

2. Assessment of scientific and technological potential of VolRC RAS

	Research and development (n = 1)	Personnel (n = 2)	Technology (n = 3)	Innovation (n = 4)
Number of sample elements	**m₁ = 4**	**m₂ = 3**	**m₃ = 3**	**m₄ = 1**

(m = 11*)

* Total number of objects included in all *k* samples.
Compiled according to: Rating of innovative development of the subjects of the Russian Federation. Issue 5. Moscow: NRU HSE, 2017. 260 p. Available at: https://issek.hse.ru/news/206633461.html; K.A. Gulin et al. Scientific and technological potential of a territory and its comparative appraisal. *Problems of Territory's Development*, 2017, no. 1 (87), pp. 7–26. Available at: http://pdt.vscc.ac.ru/article/2102. Federal State Statistics Service. Gross Regional Product (in current basic prices – total (1998–2017). Ed. March 1, 2019. Available at: http://www.gks.ru/free_doc/new_site/vvp/vrp98-17.xlsx (accessed: April 20, 2021).

Table 2. Results obtained during the analysis of variance

Content of the indicator	Unit of measurement	Symbolic designation	Calculated value	
			I_1	I_2
Average GRP value for the group S_1	mil. rub.	$\overline{y_1}$	1 183 444	1 204 667
Average GRP value for the group S_2	mil. rub.	$\overline{y_2}$	1 338 762	1 577 121
Average GRP value for the group S_3	mil. rub.	$\overline{y_3}$	1 810 813	4 743 038
Average GRP value for the group S_4	mil. rub.	$\overline{y_4}$	1 181 169	837 495
Average GRP value for all sample objects	mil. rub.	$\overline{y}$	1 327 875	2 237 876
Value of Fisher's calculated statistics	cond. un.	F_f	0.4422	0.4837
Value of Fisher's critical statistics	cond. un.	F_K	2.7218*	4.3468*

* With $\alpha = 0.05$.
Complied according to Table 1.

Results

Analysis of variance

To carry out the analysis of variance according to the algorithm described in the first paragraph of the "Research methods", an array of data was formed (*Tab. 1*). It presents the values of key sub-indexes (socio-economic conditions, scientific and technical potential, innovation activity, quality of innovation policy) included in the overall assessment of the "Russian Regional Innovation Ranking", developed by the ISSEK, and similar indicators (research and development, personnel, technology, innovation) to assess the scientific and technological potential of VolRC RAS. Data are taken in accordance with the latest current calculations carried out at the time of the study described in the 2015 work.

Each of the four groups included those GRP values of the regions. For them, the condition of getting the corresponding index in the significance group was met – group II for the HSE methodology and groups of the "average" and "above average" level for the methodology of VolRC RAS.

In accordance with formulas 1–13 and a posteriori data set, statistical metrics were obtained from table 1 (*Tab. 2*). They can be used to interpret the analysis of variance carried out in the work to determine the significant impact of the sub-indexes of the studied methods on the level of territories' economic growth, expressed in the values of the GRP indicator.

During the variance analysis, we tested the hypothesis about the impact and influence of artificially derived integral assessments of the rating of the Russian Regional Innovation Index and estimates of scientific and technological potential on the value of the territories' gross regional product (dynamics of economic growth). While selecting territories where the corresponding ratings were recorded for four sub-indexes for each method, eight samples were formed respectively, which are characterized by a high manifestation of the processes inherent in one of the four key groups of the studied ratings.

The calculated value of the F-statistics in both cases ($F_{f1} = 0.4422$, $F_{f2} = 0.4837$) turned out to be significantly less than the critical value ($F_{K1} = 2.7118$, $F_{K2} = 4.3468$) with a given reliability level of 5% and the corresponding degrees of freedom obtained ($df1_{1||2} = 3$ & ($df2_1 = 78 \parallel df2_2 = 7$)) (Tab. 2). We may conclude that the differences between the groups of regions, included in the samples by large values (not the maximum possible ones) of the key indicators of the studied methods, are statistically insignificant in relation to the GRP differences. This may indicate two things: either these indicators do not have a significant impact on the regions' economic growth changes, or the compared comprehensive estimates are mutually dependent.

Table 3. Part of posteriori data set for conducting correlation analysis, building a model of multiple linear and logistic regression

Territory	GRP, 2014 (mil. rub.)		GRP, 2015 (mil. rub.)	Growth dynamics	Soc. and econom.cond. of innov. act., 2014 (n = 1)	Soc. and econom.cond. of innov. act., 2015 (n = 1)	Δn_i by absolute value
	in current prices	in 2015 prices*					
1	2	3	4	5	6	7	8
•••	•••	•••	•••	•••	•••	•••	•••
Altai Krai	446023.8	479475.6	487903.3	↗1	0.3042	0.3038	-0.0207
Amur Oblast	232053.0	249457.0	277380.4	↗1	0.2893	0.3151	-0.0667
Arkhangelsk Oblast	542695.3	583397.4	627698.1	↗1	0.3317	0.2977	-0.0243
Astrakhan Oblast	296319.3	318543.2	322303.0	↗1	0.3997	0.4431	-0.0509
Belgorod Oblast	619677.7	666153.5	693379.4	↗1	0.4049	0.3946	-0.0191
Bryansk Oblast	242722.4	260926.6	271782.5	↗1	0.3245	0.3446	0.0456
Vladimir Oblast	328064.2	352669.0	368489.2	↗1	0.3755	0.3651	-0.0101
Volgograd Oblast	715409.6	769065.3	740458.0	↗0	0.3255	0.3435	-0.0947
Vologda Oblast	387211.7	416252.6	478893.0	↗1	0.3110	0.3191	-0.0215
Voronezh Oblast	717667.2	771492.2	805969.6	↗1	0.4253	0.3993	-0.0391
....	....	....	....	....	....	....	....

* Deflator Index – 1.075 cond.un.
Complied according to: Rating of innovative development of the subjects of the Russian Federation. Issue 5. Moscow: NRU HSE, 2017. 260 p. Available at: https://issek.hse.ru/news/206633461.html;
Gulin K.A. et al. Scientific and technological potential of a territory and its comparative appraisal. *Problems of Territory's Development*, 2017, no. 1 (87), pp. 7–26. Available at: http://pdt.vscc.ac.ru/article/2102.
Federal State Statistics Service. Gross Regional Product (in current basic prices – total (1998-2017). Ed. March 1, 2019. Available at: http://www.gks.ru/free_doc/new_site/vvp/vrp98-17.xlsx (accessed: April 20, 2021).

Data panel for performing correlation analysis, building multiple linear regression and a logit model

To carry out the selected analyses and modeling options, a statistical panel was formed. It compares the values of changes in the dynamics of the sub-indexes of the Russian Regional Innovation Ranking and the assessment of the RF territories' scientific and technological potential (Δn — column 8, etc., *Tab. 3*) with the fact of the GRP dynamics' growth (column 5, Tab. 3). The generated data were used in the correlation analysis, where information on 2015 sub-indexes was used (column 7, etc., Tab. 3) and the corresponding data characterizing this year's GRP values (column 4, Tab. 3). The same data set was used in the construction of the multiple linear regression model. To create a logit model, it was necessary to establish the fact of the GRP growth (column 5, Tab. 3) being a positive deviation from the previous year with an absolute deviation of the factors (column 8, etc., Tab. 3), potentially influencing this process.

Correlation analysis

The matrix from *Table 4* characterizes the linear relationship between the resulting indicator of the region's economic growth (GRP) and indicators that are the key sub-indexes of the Russian Regional Innovation Ranking. The data analysis was carried out based on statistics for 2015.

In accordance with the key indicators of the Russian Regional Innovation Ranking and the GRP value, inherent in the studied territories, we have made several relevant conclusions.

Gross regional product

There is a linear relationship between socio-economic conditions of work. A response from the values of the indicator characterizing the scientific and technical potential was revealed. Indicators describing the level of innovation activity and the quality of innovation policy have almost no linear effect on the growth or decline of economic growth in the regions of the Russian Federation.

Socio-economic conditions of innovation activity

This indicator strongly correlates with the values of the indicator characterizing the scientific and technical potential of the RF regions. This may be caused by high correlation between GRP and scientific and technical potential. There is a connection with the indicators of innovation activity, but it is insignificant with the quality of innovation policy.

Scientific and technical potential

The values of this indicator correlate with the values of indicators characterizing the innovative activity of the Russian regions. There is a stronger relationship with the quality of innovation policy than in previous indicators.

Scientific and technological potential

These indicators are more correlated with each other than the rest.

General conclusion

There is a pronounced interdependence between the studied metrics. It confirms the conclusions obtained during the analysis of variance, which showed the absence of a statistically significant

Table 4. The results of the correlation analysis carried out using the ISSEK methodology

	GRP	n_1	n_2	n_3	n_4
GRP	1	0.6669	0.4540	0.2652	0.1571
n_1	0.6669	1	0.5905	0.3935	0.2289
n_2	0.4540	0.5905	1	0.4007	0.2897
n_3	0.2652	0.3935	0.4007	1	0.4892
n_4	0.1571	0.2289	0.2897	0.4892	1
Complied according to Table 3.					

Table 5. Results of the correlation analysis held according to the VolRC RAS methodology

	GRP	n_1	n_2	n_3	n_4
GRP	1	0.6674	0.6862	0.4558	0.3051
n_1	0.6674	1	0.8034	0.8205	0.3481
n_2	0.6862	0.8034	1	0.6430	0.2631
n_3	0.4558	0.8205	0.6430	1	0.3783
n_4	0.3051	0.3481	0.2631	0.3783	1
Complied according to Table 3.					

difference between the GRP value of objects belonging to different categorical groups according to the levels of regions' innovative development.

The matrix from *Table 5* characterizes the linear relationship between GRP and the key sub-indexes of the rating, which assesses the territories' scientific and technological potential (2015).

1) Gross regional product

In accordance with the practice of econometric modeling, the relationship of GRP with indicators, which are chosen as predictors, is weak and cannot be properly used to predict or interpret the movement of the dynamics of the resulting estimate as a linear response from them.

2) Research and developments

The group of indicators that has the highest correlating values for all the studied sets of sub-indexes of the VolRC RAS methodology. Its significant level is observed for the indicators of the "Technology" (0.8) and "Innovation" (0.82) groups. At the same time, these groups correlate with each other much less (0.64). Perhaps, it can be successfully used to build a model of multiple linear regression, where "Research and development" will act as the resulting estimate.

3) Technologies

Weak linear relationship with the group of indicators "Innovation" and "Personnel".

4) Innovation

There is practically no linear relationship with the last group of indicators characterizing the abstract systematization of scientific personnel.

General conclusion

There is a situation similar to the case with the correlation analysis conducted according to the rating of the assessment of innovation development of the RF subjects. Specifically, it is necessary to highlight the relationship of the indicators in the "Technology" and "Innovation" groups with "Research and development". Nevertheless, there is still a strong interdependence of some metrics with others used to calculate the final resulting estimate, It indicates the need to use an effective method of searching for weights when forming the final calculation, or reducing the dimension of a number of predictors by eliminating irrelevant factors.

Multiple linear regression

Table 6 shows the main statistical metrics of the results obtained according to the statistical models of multiple linear regression constructed in the work. Namely, parameters of the regression model, both basic and modified; coefficients of determination and their adjusted estimate; calculated and critical Fisher *F*-statistics at a given reliability level of 5% and assessment of the significance of the obtained model parameters using *t*-statistics.

The graph of actual 2015 values of the regions' GRP, sorted by ascending values of the sub-index of the Rating of Innovation Development of the Russian subjects (*Fig. 1*) that characterize the socio-economic conditions for the implementation and carrying out of innovative activities in the country's territorial subjects, is given below. This

Figure 1. Graphical visualization of regression modeling using the HSE methodology
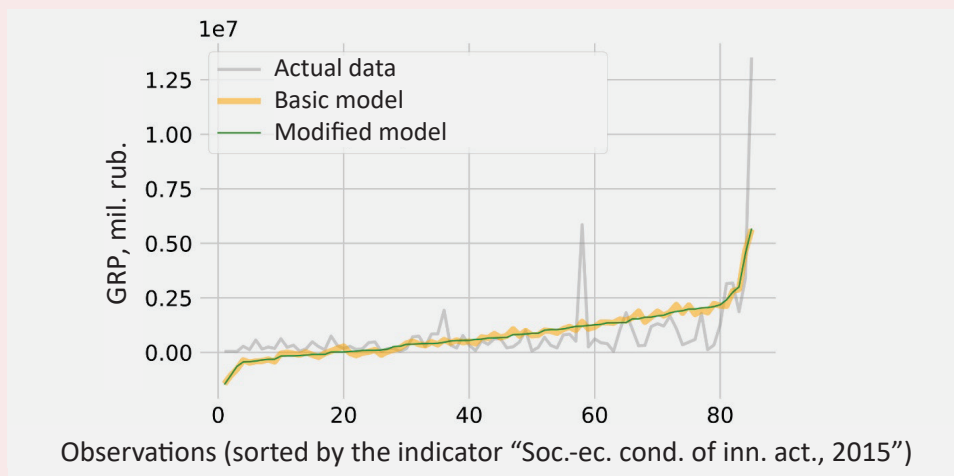
Complied according to Table 3.

ranking is caused by the presence of the GRP values approximated by the only parameter, specified before, in the model. In this regard, we can try to graphically display the dependence of the studied value (gross regional product) on a specifically established predictor (integral assessment of socio-economic conditions of innovation activity).

Since the value F of the calculated statistics $((F_f)_p = 16.3967)$ exceeds the critical value $((F_k)_p = 2.4859)$ at the given significance level of 5%, then the hypothesis that all predictors in the regression model are simultaneously equal to zero is rejected, i.e. the constructed basic statistical model is statistically significant (*Tab. 6*). However, with a more detailed examination of it and tests for the obtained parameters, biased estimates were identified into t-statistics. Among five coefficients, including "intercept", only two were significant: "intercept" and the parameter β_1, which characterizes the socio-economic conditions of innovation activity. Insignificant parameters (β_2 — scientific and technical potential; β_3 — innovation activity;

β_4 — quality of innovation policy) were excluded from the modified model, and a new statistical model, corresponding to the conditions of F and t statistics was obtained. It was also possible to increase the value of the adjusted R^2 from 0.42 to 0.44.

Similarly to the previous one, the results of modeling according to the methodology of VolRC RAS (*Fig. 2*) are presented. The sorting of the resulting and actual GRP values was carried out according to the "Frames" indicator in accordance with the highest value obtained when calculating its t-statistics (3.1554).

During the initial examination, we may note that the regressions constructed according to the second studied indicator (I_2) more accurately repeat the dynamics of actual GRP values. This is also evidenced by the adjusted coefficient of determination $R_{adj}^2{'}(I_2) = 0.4962$ larger $R_{adj}^2{'}(I_1) = 0.4380$. It may be caused by the decrease in the dimension of the indicators included in the second methodology. That is why the averaging of the studied estimates is not so pronounced. To some extent, this is

Table 6. Regression modeling results

Indicator's name	Symbolic designation	Calculated value	
		I_1	I_2
1. Basic regression model: $y = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4$			
$y_{I_1} = -3964780.87 + 11310999.28 x_1 + 1854358.59 x_2 - 173667.55 x_3 - 50769.69 x_4$			
$y_{I_2} = -663095.39 + 564364.88 x_1 + 533221.86 x_2 - 335361.73 x_3 + 201959.81 x_4$			
intercept	β_0	-3 964 780.9	-663 095.39
Calculated t-statistics for β_0	t_{β_0}	6.2250	2.7310
Socio-economic conditions of innovation activity / Research and development	β_1	11 310 999	564 364.88
Calculated t-statistics for β_1	t_{β_1}	5.8615	3.0278
Scientific and technical potential / Personnel	β_2	1 854 358.6	533 221.86
Calculated t-statistics for β_2	t_{β_2}	0.9157	3.1671
Innovation activities / Technologies	β_3	-173 667.55	-335 361.73
Calculated t-statistics for β_3	t_{β_3}	0.1326	2.1266
Quality of innovation policy / Innovations	β_4	-50 769.69	201 959.81
Calculated t-statistics for β_4	t_{β_4}	0.0564	1.4406
Critical point of Student's distribution	t_k	1.9901	1.9921
Coefficient of determination	R^2	0.4505	0.5437
Adjusted coefficient of determination	R^2_{adj}	0.4230	0.5194
Fisher's F-criterion, calculated	$(F_f)_p$	16.3967	22.3439
Critical value of Fisher's distribution	$(F_k)_p$	2.4859	2.4936
2. Modified regression model: $y'_{I_1} = \beta_0' + \beta_1' x_1$			
$y'_{I_1} = -3813320.76 + 12243723.31 x_1$			
New intercept	β_0'	-3 813 320.76	
Calculated t-statistics for β_0'	t_{β_0}'	6.5117	
Socio-economic conditions of innovation activity (unbiased assessment)	β_1'	12 243 723.31	
Calculated t-statistics for β_1'	t_{β_1}'	8.1531	
New critical point of Student's distribution	t_k'	1.9890	
New coefficient of determination	$R^{2'}$	0.4447	
New adjusted coefficient of determination	$R^2_{adj}{}'$	0.4380	
New Fisher's F-criterion, calculated	$(F_f)_p'$	66.4736	
New critical value of Fisher's distribution	$(F_k)_p'$	3.9560	
3. Modified regression model: $y'_{I_2} = \beta_0' + \beta_1' x_1 + \beta_2' x_2$			
$y'_{I_2} = -393469.1 + 346573.61 x_1 + 543161.88 x_2$			
New intercept	β_0'	-393 469.10	
Calculated t-statistics for β_0'	t_{β_0}'	2.0592	
Research and development (unbiased assessment)	β_1'	346 573.61	
Calculated t-statistics for β_1'	t_{β_1}'	2.4416	
Personnel (unbiased assessment)	β_2'	543 161.88	
Calculated t-statistics for β_2'	t_{β_2}'	3.1554	
New critical point of Student's distribution	t_k'	1.9912	
New coefficient of determination	$R^{2'}$	0.5090	
New adjusted coefficient of determination	$R^2_{adj}{}'$	0.4962	
New Fisher's F-criterion, calculated	$(F_f)_p'$	39.9059	
New critical value ofFisher's distribution	$(F_k)_p'$	3.1154	
Complied according to Table 3.			

Figure 2. Graphical visualization of regression modeling by the VolRC RAS methodology
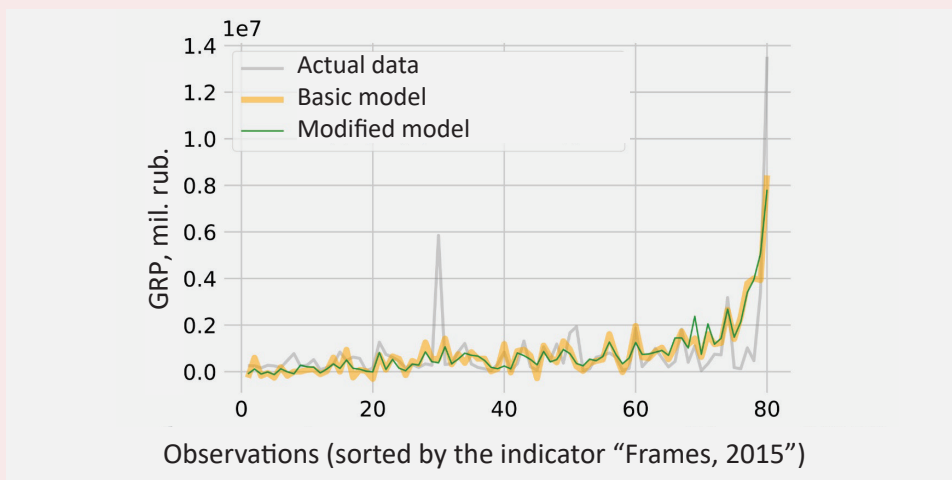
Complied according to Table 3.

an advantage of the VolRC RAS methodology in relation to the one developed by HSE researchers.

By modified regression y'_{I_2} in comparison with y'_{I_1}, we should note that it has a greater number of degrees of freedom (per predictor). It provides appropriate flexibility and independence in predicting the resulting estimate.

Conducted research once again showed the absence of a significant influence of factors appearing in the Russian Regional Innovation Index and the Index of Scientific and Technological Potential, which, in turn, determine scientific and technological development and innovative activity in Russia. Although, in accordance with the provisions of the economic theory, they should have a direct impact on the dynamics of economic growth and development of the business entity. Considering all this, we may conclude that artificially derived indicators do not adequately characterize the territories' scientific and technological potential, innovative activities, and innovative policies carried out in a particular region.

Logistic regression

Table 7 provides the main estimates based on the developed and tested logit model that predicts the probability of the GRP growth in accordance with the absolute change in the sub-indexes of the rating of the Russian Regional Innovation Index and the assessment of scientific and technological potential. The basic logistic regression includes all four key indicators available in the rating, but due to the model's inconsistency (insignificance according to Fisher statistics and coefficients for the indicators included in the *t*-statistics model), there is no modification of it.

According to the obtained values of the *F*-test (Table 7), the compiled models are statistically insignificant, i.e. the cumulative change in the model parameters characterizing the change of socio-economic conditions of innovation activity, scientific and technical potential, innovation activity, quality of innovation policy or innovations, technology, personnel and research, and development in the regions does not manifest itself in a change in the GRP dynamics.

Table 7. Results of regression modeling of the logit model

Indicator's name	Symbolic designation	Calculated value	
		I_1	I_2
Logistic regression model: $\hat{P}' = \frac{1}{1+e^{-(p_0+p_1\cdot\Delta x_1+p_2\cdot\Delta x_2+p_3\cdot\Delta x_3+p_4\cdot\Delta x_4)}}$			
$\hat{P}'_{I_1} = \frac{1}{1+e^{-(0.7466-1.4252\cdot\Delta x_1+1.8070\cdot\Delta x_2-1.7907\cdot\Delta x_3+0.3162\cdot\Delta x_4)}}$			
$\hat{P}'_{I_2} = \frac{1}{1+e^{-(0.7111+0.0775\cdot\Delta x_1+0.1452\cdot\Delta x_2-0.1321\cdot\Delta x_3+0.1373\cdot\Delta x_4)}}$			
intercept	p_0	0.7466	-0.7111
Calculated t-statistics for p_0	t_{p_0}	13.4386	11.3365
Changes of socio-economic conditions of innovation activity	p_1	-1.4252	0.0775
Calculated t-statistics for p_1	t_{p_1}	1.0734	0.3926
Changes of scientific and technical potential	p_2	1.8070	0.1452
Calculated t-statistics for p_2	t_{p_2}	1.2301	0.4324
Changes of innovation activity	p_3	-1.7907	-0.1321
Calculated t-statistics for p_3	t_{p_3}	1.8590	2.0185
Changes of the quality of innovation policy	p_4	0.3162	0.1373
Calculated t-statistics for p_4	t_{p_4}	0.4394	1.9119
Critical point of Student's distribution	t_k	1.9908	1.9921
Fisher's F-criterion, calculated	$(F_f)_p$	1.9378	1.4182
Critical value of Fisher's distribution	$(F_k)_p$	2.4889	2.4937
Complied according to Table 3.			

Thus, we may draw the following conclusion: considered artificially derived estimates do not effectively reflect the processes and phenomena of scientific and technological development, which, in turn, should directly affect the values of economic growth indicators.

Regarding partial coefficients of the obtained model, we may note that their values also turned out to be untenable in most cases in accordance with the t-test. The only exception is the "intercept" element, which does not carry any interpretation, but it is responsible for optimizing the spatial location of the resulting model's graph. Once again, it indicates the absence of a relationship between GRP changes and indicators of scientific and technological development. It is necessary to look for other parameters to determine the probability of a positive change of the gross regional product.

We should mention that one of the parameters included in the basic model $\hat{P}'_{I_2}$, characterizing "Technologies" (p_3), has t-statistics acceptable (2.0185) in comparison with the calculated critical level of 1.9921. However, the hypothesis of its difference from zero was not confirmed with the further exclusion of insignificant predictors from the model. In this case, only the "intercept" parameter remained significant. It is characterized by other conditions that are not included in the model and cannot be adequately interpreted.

Conclusion

To conclude, we might say the following about integral assessments characterizing the territory's aggregate level of scientific and technological development: such metrics do not adequately characterize the processes and phenomena they are intended for. Their reliability is doubtful, and it is caused by the fact that the studied object is often an artificially derived category, which is interpreted differently by scientists and researchers.

It could be compared to a diagnosis, which allows saying that a patient is sick. But what exactly is the problem? Such an approach does not provide

Figure 3. Assessment of the reliability of integrated assessments of socio-economic objects

1. Linking the integrated assessment to the resulting indicator, which will be influenced by changing integral assessment				
2.1. One-way analysis of variance	2.2. Correlation analysis	2.3. Multiple linear regression	2.4. Logistic regression of changes in dynamics	2.5. Other methods of statistical analysis and data processing

Source: own compilation.

an answer. As a result, we cannot take appropriate measures to eliminate negative effects.

We should also mention the specifics of socio-economic indicators. Unlike the natural sciences, simulations based on such estimates cannot be reproduced for testing in laboratory conditions. In this regard, the reliability and adequacy of such models is based only on theoretical propositions that may turn out to be both correct and refuted over time.

In addition, let us note that the nature of socio-economic metrics is unstable and changeable. That is, the same indicator can mean different things at different times. These indicators are narrow-profile, and they characterize various unique objects, which cannot be stated about the mass of a material object, the speed of movement, the presence of a certain set of genes and other things, inherent in the objects of natural sciences research.

Largely, the bias of the estimates obtained is caused by the fact that duplicate (highly correlated) indicators are used in their compilation. With their significant share in the final calculation, the value of the integral indicator is averaged, and it does not reflect the differentiation in the totality of the studied objects.

To avoid such problems, discussed statistical methods can be used. At the same time, they can be applied separately and in combination, complementing and confirming the corresponding statistical hypotheses, or indicating the need for additional research (*Fig. 3*).

In accordance with figure 3, a stable indicator should be determined first. It is recorded in statistical reports without any changes and will potentially be used. Then we need to establish a connection between it and the integral assessment (as shown in the work, it can be done by means of variance, correlation, and regression analysis), which will allow assessing the reliability of the developed integral methodology. The more statistical tests are applied to the assessment of the relationship between the resulting metric and the integral one, and the more coincidences there are between them, the more stable and reliable the conclusions are, which can be obtained when comparing socio-economic objects evaluated using integral methods, are.

Methods designed to reduce the dimensionality and the number of studied processes and phenomena are also important in solving this problem. The final model should include significant factors, which is shown by the methods discussed.

We should also mention the approach associated with the use of narrow-profile econometric models that consider spatial locations of the studied object;

time lag of the manifestation of an event; the nonlinear nature of the process, etc. These problems and questions are not trivial, and they are more applicable to metrics and indicators that can be removed from the studied object. In case of assessments similar to integral or comprehensive one, such approach is unlikely to be successful, since it includes things that occur independently in various manifestations. It will just confuse the researcher during mathematical modeling.

The materials of the publication might be used by experts specializing in scientific and technological development, innovation, and technological promotion, as well as by scientists and researchers engaged in statistical processing and data analysis.

References

1. Abalkin L.I. *Logika ekonomicheskogo rosta* [Logic of Economic Growth]. Moscow: Inst. of Econ. RAS, 2002. 228 p.

2. Uskova T.V. et al. *Problemy ekonomicheskogo rosta territorii: monografiya* [Problems of Economic Growth of a Territory: Monograph]. Vologda: ISEDT RAS, 2013. 170 p.

3. Shumpeter J.A. *Capitalism, Socialism and Democracy*. London & New York: Routledge, 2003. 460 p.

4. Foster R., Kaplan S. *Creative Destruction: Why Companies That Are Built to Last Underperform the Market – and How to Successfully Transform Them*. Crown Business, 2001. 384 p.

5. Schumpeter J.A. *The Theory of Economic Development*. Moscow: Progress, 1982. 401 p.

6. Grasmik K.I. Innovative activity of firms during the economic crisis. *Problemy teorii i praktiki upravleniya=Problems of Management Theory and Practice*, 2017, no. 2, pp. 58−64. Available at: https://elibrary.ru/item.asp?id=28289539 (in Russian).

7. Kornai J. Innovation and dynamism. Interaction between systems and technical progress. *Voprosy Ekonomiki*, 2012, no. 4, pp. 4−31. DOI: 10.32609/0042-8736-2012-4-4-31 (in Russian).

8. Solow R. Contribution to the theory of economic growth. *Quarterly Journal of Economics*, 1957, no. 70 (1), pp. 65−94.

9. Rebelo S. Long-run policy analysis and long-run growth. *Journal of Political Economy*, 1991, no. 3, pp. 500−521 (in Russian).

10. Komkov N.I. Scientific and technological development: limitations and opportunities. *Problemy prognozirovaniya=Studies on Russian Economic Development*, 2017, no. 5, pp. 11−21. Available at: https://ecfor.ru/publication/nauchno-tehnologicheskoe-razvitie-ogranicheniya-i-vozmozhnosti/ (in Russian).

11. Chernykh S., Frolova N. On the participation of Russian business in the financing of scientific and technological research and development (economic and ideological aspects). *Obschestvo and ekonomika=Society and Economy*, 2018, no. 11, pp. 86−97 (in Russian).

12. Ross A. *Industries of the Future*. Moscow: AST, 2017. 351 p.

13. Schwab K. *The Fourth Industrial Revolution*. Moscow: Eksmo, 2018. 288 p.

14. Schwab K. *Shaping the Fourth Industrial Revolution*. Moscow: Eksmo, 2018. 320 p.

15. Kaneva M.A., Untura G.A. Evolution of theories and empirical models of a relationship between economic growth, science, and innovations (Part I). *Mir ekonomiki i upravleniya=World of Economics and Management*, 2017, vol. 17, no. 4, pp. 5−21. DOI: 10.25205/2542-0429-2017-17-4-5-21 (in Russian).

16. Kaneva M.A., Untura G.A. Evolution of theories and empirical models of a relationship between economic growth, science, and innovations (Part II). *Mir ekonomiki I upravleniya=World of Economics and Management*, 2018, vol. 18, no. 1, pp. 5−17. DOI: 10.25205/2542-0429-2018-18-1-5-17 (in Russian).

17. Arrow K. Economic welfare and allocation of resources for invention. In: *The Rate and Direction of Inventive Activity*. Princeton Uni. Press, 1962. Pp. 609–625.

18. Romer P.M. Increasing returns and long-run growth. *Journal of Political Economy*, 1986, no. 94 (5), pp. 1002–1037.

19. Lucas R. On the mechanics of economic development. *Journal of Monetary Economics*, 1988, no. 22, pp. 3–42.

20. Grossman G.M., Helpman E. *Innovation and Growth in the Global Economy*. Cambridge: MIT Press, 1991. 384 p.

21. Freeman C. *Technology Policy and Economic Performance: Lessons from Japan*. London: Pinter, 1987. 155 p.

22. Griliches Z. Issues in assessing the contribution of research and development to productivity growth. *The Bell Journal of Economics*, 1979, no. 10, pp. 92–116.

23. Zadumkin K.A., Kondakov I.A. *Nauchno-tehnicheskii potentsial regiona: otsenka sostoyaniya i perspektivy razvitiya: monographiya* [Scientific and Technical Potential of the Region: Assessment of the State and Prospects of Development: Monograph]. Vologda: ISEDT RAS, 2010. 205 p.

24. Gulin K.A. et al. Scientific and technological potential of a territory and its comparative appraisal. *Problemy Razvitiya Territorii=Problems of Territory's Development*, 2017, no. 1 (87), pp. 7–26. Available at: http://pdt.vscc.ac.ru/article/2102 (in Russian).

25. Epstein N.D., Karmanov M.V., Vasileva A.V. Problems of integrated assessment and security demographic security. *Statistika i ekonomika=Statistics and Economics*, 2015, no 3, pp. 233–237. DOI: 10.21686/2500-3925-2015-3-233-237 (in Russian).

26. Taylor G. *An Introduction to Error Analysis*. Translated from English Moscow: Mir, 1985. 272 p.

27. Sveshnikov A.A. *Osnovy teorii oshibok* [Fundamentals of Error Theory]. Leningrad: LGU Publ., 1972. 122 p.

28. Volkova E.N. Problems of integral statistical evaluation of social-economic development region. *Ekonomika i statiskika=Statistics and Economics*, 2015, no. 3, pp. 170–175. Available at: https://core.ac.uk/download/pdf/234096888.pdf (in Russian).

29. Klyushnikova E.V., Shitova E.M. Methodological approaches to calculation of integral index, ranking methods. *InnoCenter*, 2016, no. 1 (10). Available at: http://innoj.tversu.ru/number10.html (in Russian).

30. Saib M-S., Caudeville J., Beauchamp M. et al. Building spatial composite indicators to analyze environmental health inequalities on a regional scale. *Environ Health*, 2015. Nj. 68. DOI: 10.1186/s12940-015-0054-3

31. Sidorov A.A. Methodological approach to composite estimation of status and dynamics of multi-dimensional objects of social and economic nature// *Problemy upravlenya=Control Sciences*, 2016, no. 3, pp. 32–40. Available at: http://pu.mtas.ru/archive/pu_316.php (in Russian).

32. Aivazian S.A. On the methodology of measuring synthetic categories of the quality of life of the population. *Ekonomika i matematicheskie metody=Economics and Mathematical Methods*, 2003, vol. 39, no. 2, pp. 33–53 (in Russian).

33. Aivazian S.A. Empirical analysis of synthetic categories of the quality of life of the population. *Ekonomika i matematicheskie metody=Economics and Mathematical Methods*, 2003, vol. 39, no. 2, pp. 19–53 (in Russian).

34. Aivazian S.A., Stepanov V.S., Kozlova M.I. Measuring the Synthetic Categories of Quality of Life in a Region and Identification of Main Trends to Improve the Social and Economic Policy (Samara Region and its Constituent Territories). *Prikladnaya ekonometrika=Applied Econometrics*, 2006, no. 2, pp. 18–84. Available at: https://ideas.repec.org/a/ris/apltrx/0086.html (in Russian).

35. Zhou P., Ang B.W., Zhou D.Q. Weighting and aggregation in composite indicator construction: A multiplicative optimization approach. *Social Indicators Research*, 2010, no. 96 (1), pp. 169–181. DOI: 10.1007/s11205-009-9472-3

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A Forecasting Assessment of the Affordability of a Balanced Diet for Residents of Russian Regions: An Agent-Based Approach*

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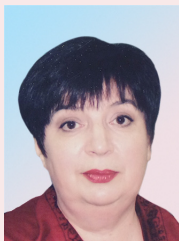ORCID: 0000-0002-9857-8956; ResearcherID: F-4593-2018

Abstract. Amid the coronavirus pandemic in Russia, the financial situation of households is deteriorating, as well as their ability to provide themselves with a full-fledged and balanced diet with an optimal content of nutrients, vitamins and minerals. The aim of the work is to conduct a forecasting assessment of the affordability of a balanced diet for households in the context of various scenarios of the economic and epidemiological situation. The applied research methodology involves creating a comprehensive agent-based model reflecting the course of demographic and economic processes that determine food production, people's income and health. When assessing the affordability of a balanced diet, we consider the number and income of households and the share of income allocated for the purchase of foodstuffs. The information content of the model is based on data arrays available at the websites of the Federal State Statistics Service of Russia, ministries and departments; we also use the data of a product prices monitoring conducted specifically for this purpose. We develop balanced diets that ensure the intake of 75 and 90% of key vitamins and minerals with the necessary caloric content. The products included in the diets are optimized by price; on the basis of the results of the prices monitoring, we estimate the cost of the diets and their affordability for the population in each region of the Russian Federation, according to the data as of 2020. The affordability of diets in different regions varies greatly: from 35% in the Chechen Republic to 95% in Moscow, with an average value of 83%. Scenario-based modeling of the affordability of high-quality food for Russian population is carried out for the period through to 2025. Under the optimistic scenario, there is a decrease in the affordability of diets to 81%; under the conservative and pessimistic scenarios, we observe a steady decline in the affordability of vitamin diets to 76 and 72%, respectively. The results we have obtained indicate serious risk of deterioration of the quality of nutrition of Russian residents; it is associated with falling incomes and rising food prices. Besides, within the framework of scenario-based calculations, we have determined the amount of subsidies to be provided to low-income population groups so that they could afford a balanced diet.

Key words: standard of living, food affordability, balanced diet, agent-based modeling, computational experiment, prices monitoring.

Introduction

The decline in the population's income and an increase in food prices during the pandemic not only affect the overall standard of living, but also threaten to worsen health by reducing the diet quality and the lack of key micronutrients that affect vital processes in the body. Dealing with this problem is one of the key directions of Russia's economic policy. Measures introduced by the government to stabilize the prices of a number of products are an example of a regulatory policy, but not effective enough to fundamentally improve the situation.

Since the end of 2019, our team of authors has been implementing the international project "Study of anemia risk indicators among young children and adolescents in BRICS countries (India, South Africa, Russia) using machine learning and agent-based modeling", funded by the Russian Foundation for Basic Research, the Department of Science and Technology of India, and the National Research Foundation of South Africa. The beginning of the pandemic, which coincided with project implementation, determined a special attention to economic factors affecting anemia

risks, in particular the deterioration of households' financial state and their ability to provide a balanced diet, by which we mean a diet balanced in nutrients (proteins, fats and carbohydrates), vitamins and minerals. A balanced diet for a healthy lifestyle includes fruits, vegetables, meat and cereals, with a reduced intake of salt, sugar and animal fats and an increased intake of proteins relative to carbohydrates. An unbalanced diet leads to a corresponding imbalance in micro- and macronutrients (deficiency of some and excess of others). As a result, this can lead to the development of various diseases, including iron deficiency anemia, which in childhood and adolescence causes the risks of impaired development and increased mortality. Thus, ensuring access to a balanced diet is vital for all population groups, especially the younger generation. The social and economic benefits of widespread implementation of healthy eating standards are also evident, in particular support for local producers of vegetables, fruits, and dairy products. Informing the population about the nutritional value of affordable products and their contribution to a balanced diet plays an important role[1].

In the "Concept of improving food security of the CIS countries" adopted in 2010, the level of economic affordability of food is defined as the proportion of spending on food in total expenditure on all types of goods and services[2]. The Food Security Doctrine gives a broader interpretation, considering the food affordability as an opportunity to purchase food in amounts and assortments not less than the established rational norms of consumption, provided by the appropriate level of income of the population[3].

Studies of food affordability are mainly statistically oriented [1; 2; 3]. The work [4] proposes a method of comparative analysis of food affordability in certain regions with different levels of income and food prices, based on the definition of regional standard units, reflecting the proportion of total income spent in the region under consideration on food. The methodology allows taking into account the effects of the absolute value of income, food prices in the country and the region, the balance of the consumer's diet, the national or local proportion of spending on food. An empirical assessment of food affordability in Russia and its constituent entities identified regions with unsatisfactory levels of affordability and showed that the most vulnerable in this regard is the first quintile group, which confirms the need for state support measures.

The purpose of our work is a predictive assessment of the affordability of a balanced diet for households. This requires:

— first, to make a balanced diet of products affordable to the population;

— second, to obtain an actual estimate of the cost of such a diet in various regions of Russia;

— third, to conduct a forecast of the population's income under the dynamics of the economic situation, subject to the influence of epidemiological risks.

An artificial society simulator developed by our team, reflecting the population, production, educational, financial and budgetary system of Russia, integrated into an agent-based model of the dynamics of anemia, is used to conduct forecasts of the Russian economy and population income dynamics.

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[1] World Health Organization. Towards a healthy Russia. Healthy nutrition: Plan of action to develop regional programmes in the Russian Federation. 2001. Available at: https://www.euro.who.int/__data/assets/pdf_file/0020/150158/E73401.pdf (accessed: June 29, 2021)

[2] The concept of improving food security of the CIS member states. *Rosselkhoznadzor, Federal Service for Veterinary and Phytosanitary Surveillance*, 2010. Available at: http://www.fsvps.ru/fsvps-docs/ru/news/files/3143/concept.pdf

[3] On Approval of the Food Security Doctrine of the Russian Federation: Presidential Decree no. 120, dated January 30, 2010. *Rossiiskaya gazeta*. Federal issue no. 5100 (21). February 3, 2010. Available at: https://rg.ru/2010/02/03/prod-dok.html

Research methods

The main method of research is agent-based modeling – a special type of simulation modeling, which reproduces the dynamics of the system as a result of the interaction of micro-level agents. Agents in such models are characterized by the following features:

– heterogeneity, i.e. they have a set of parameters that distinguish them from each other: gender, age, marital status, occupation, income, region of residence;

– the ability to interact with each other and the environment by exchanging information, changing social status (e.g., applicants – student – graduate);

– limited rationality, which allows them to reflect the information available to them and to use functions other than maximizing expected utility in their decision-making (e.g., following the example of others or accepting the default option) [5].

The dynamics of agent-based models is nonequilibrium, since it is composed of the decisions and interactions of individual agents, which, in turn, are determined by stochastic functions [6]. This feature allows using the method of agent-based modeling to assess the effects of control actions on socio-economic systems. This class of models is called agent-based computational economy (ACE) [7]. ACE-models are simulators for assessing various options of tax [8], investment [9; 10] and monetary [11–14] policies, labor market regulation [15–17], financial system [18–21] and environmental protection [22].

A number of agent-based models have also been developed to assess the quality and affordability of a diet at the level of countries and regions. In the work [23] an agent-based model of world trade is presented, which takes into account socio-economic, geopolitical, environmental factors, as well as the required nutritional value of diets. The model analyzes how international trade restrictions affect food security and nutrition in the world, including the balance of micro and macronutrients in the diet. The results show that fully free world trade increases the affordability and quality of a diet in Africa, Asia, and Latin America, as people in these regions gain access to a wide range of foods.

The agent-based model of community food security is presented in [24], and by community food security in this study we mean "a situation where all members of the community receive a safe, nutritious and culturally and traditionally acceptable diet". The modeling methodology considers employment and income, food support programs for low-income households, and access to clean water and cooking fuel. The model is used to analyze food security in developing countries, particularly Malawi, where the problem is particularly acute.

The model in the work [25] reproduces the interaction between consumers, food vendors, and quality assessment inspections. The purpose of the modeling is to assess the impact of regulatory rules on improving food quality and safety. Aspects of social responsibility in food production are considered in the agent-based model presented in [26]. The model reproduces the public debate on food production and the corresponding changes in the food industry influenced by public opinion.

The methodology used in the research of our group of authors implies the creation of complex agent-based models, reflecting the course of various socio-economic processes (demographic, educational, migration, production), their impact on the lives of individuals and the relationship with each other. In the context of creating a model of the dynamics of anemia, the key processes will be demographic (since the need for nutrients depends on age) and economic (determining, on the one hand, the production of various foods, on the other,

the income of the population that allows purchasing these products). The model also reflects the work of the tax and budget systems, including the payment of benefits to various categories of the population (pensions, unemployment benefits, child care benefits for children aged under three years old and for children from three to seven years old for low-income families), financing public sector organizations (education, healthcare, defense and security), subsidizing key industries *(Fig. 1)*. The structure of the model's budget system is presented in [27].

The population in the model is reproduced considering the sex-age structure, composition of households and regional distribution. A key role in the model is played by such parameter as a resident's health status, which implies the presence or absence of iron deficiency anemia (if anemia is present, its stage is detailed: storage depletion, mild deficiency or iron deficiency anemia). The agents in the model are combined into households with a common budget that includes the salaries and benefits of all household members. The reproduction of demographic processes in the model is considered in [28].

Production in the model reflects the sectoral structure of the economy (the key sectors here are agriculture, fishing and food production) and the financial system. The population is connected with the economic system in the processes of employment and consumption. As employees, residents receive wages, and as consumers, they purchase products and services. Food purchases detail the amount of cereals, meat, fish, dairy products, fruits and vegetables consumed by households.

Figure 1. Scheme of dynamics model of anemia spreading
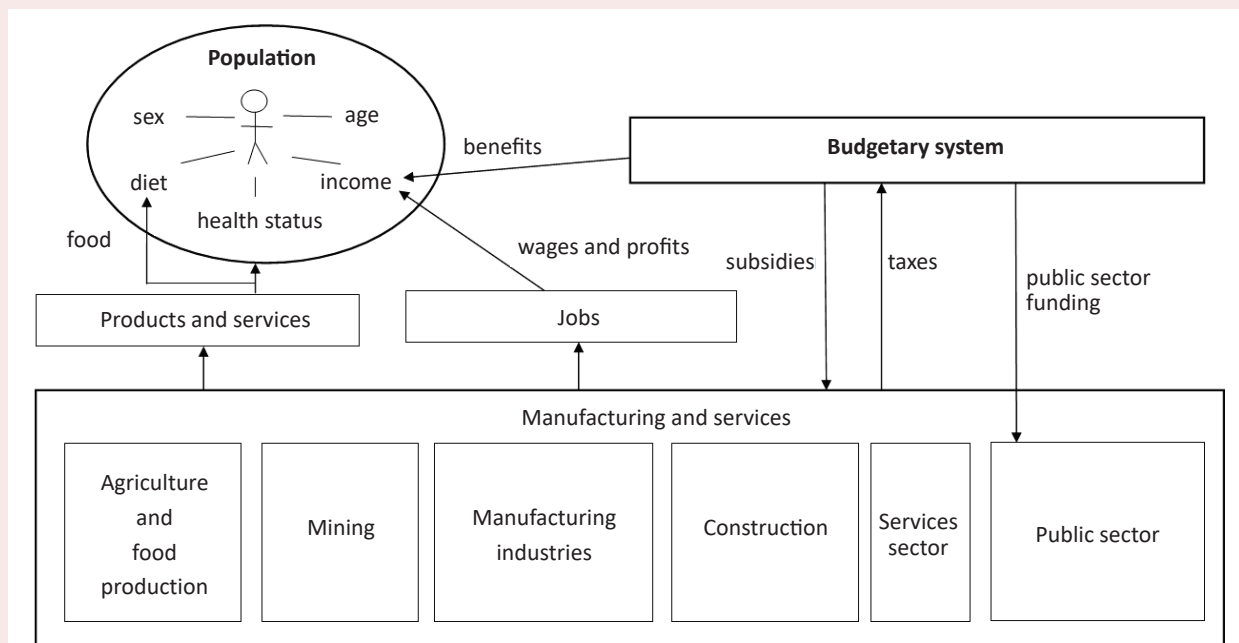
Source: own compilation.

The state in the model regulates food production and consumption through the following types of control actions:

— investments in production expansion and import substitution programs for domestic food producers;

— regulation of exports and imports of agricultural products;

— tax incentives for industries — producers of food products;

— payment of benefits to low-income families.

For assessing the affordability of a balanced diet for Russian population, the key algorithm for calculating the amount allocated for the purchase of food *(Fig. 2)*, and the algorithms for paying

Figure 2. Algorithm for assessing the affordability of a balanced diet to households
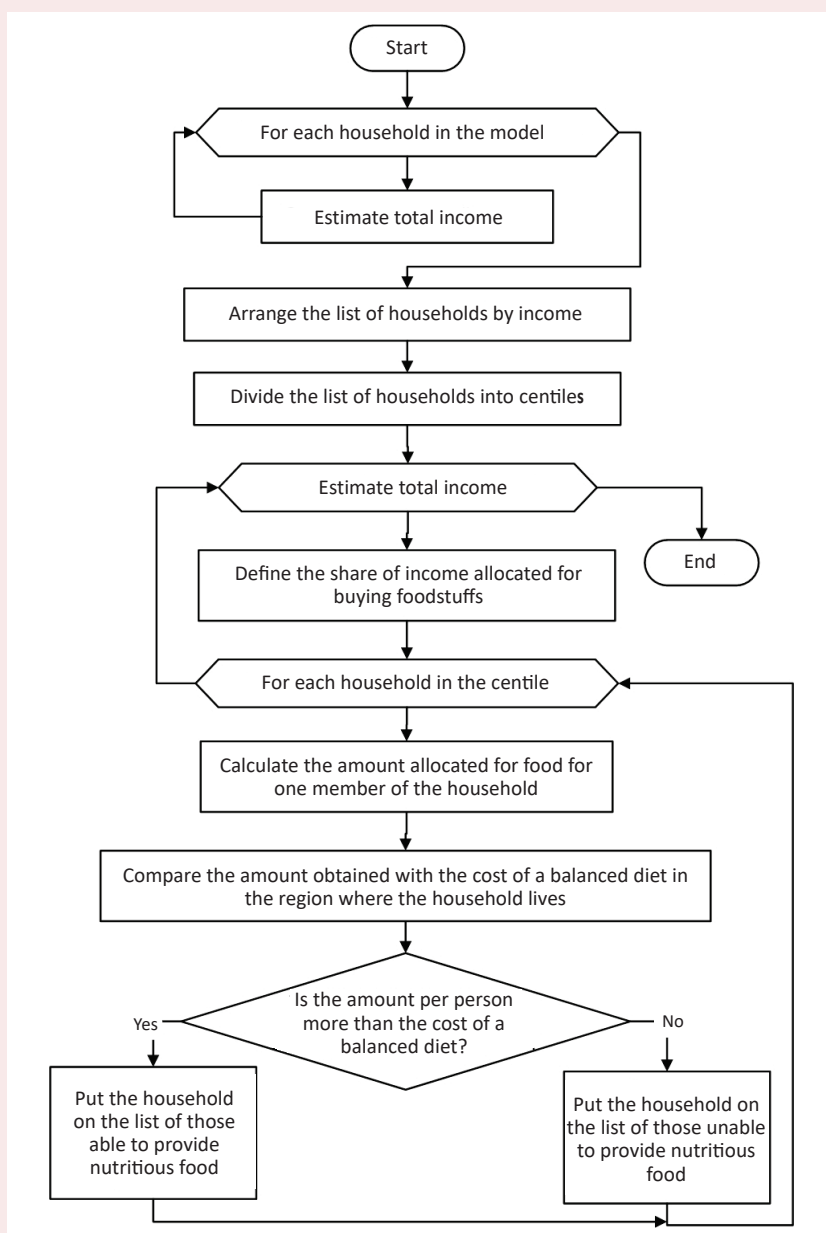
Source: own compilation.

wages and benefits, of which household income is made up, are auxiliary. After calculating the total household income, the list is sorted and divided into centiles by income level.

For each centile we determine the proportion of income spent on food (according to statistical data), and for each household included in the centile we calculate S — the amount spent on food per household member:

$$S = D \times F / N,$$

where D — total household income;

F — the proportion of income spent on of food,

N — the number of households.

The resulting amount is compared with the cost of a balanced diet, and depending on the result of the comparison, the household is placed on one of the lists: either of households that have access to a balanced diet or those that do not.

The agent-based model of anemia distribution dynamics has been implemented in Microsoft VisualStudio in C#. *Figure 3* presents the model interface, showing the forecast of the gender-age structure of the population in 2025.

Figure 3. Prediction of the gender-age structure of the population in the anemia prevalence dynamics model
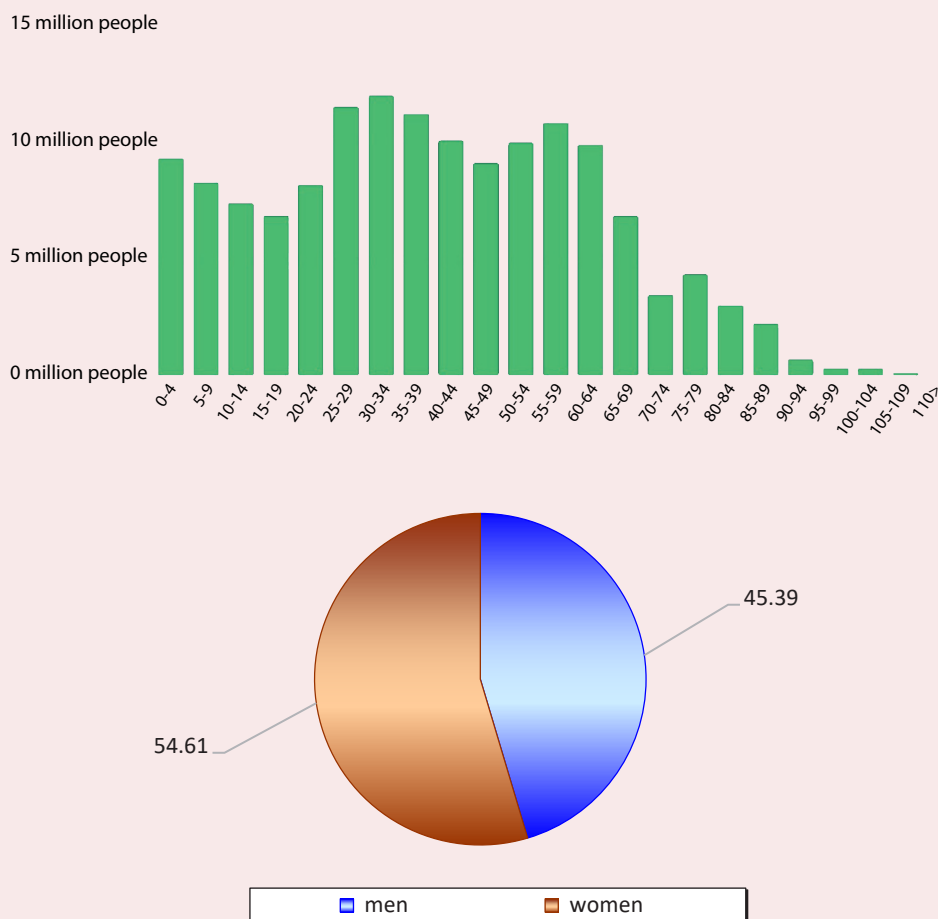
Source: own compilation.

Data of a more complex structure is unloaded from the model database into Excel files, on the basis of which the final tables and graphs are built.

Baseline modeling data

Obtaining baseline modeling data is a key task in our study, because they allow reproducing the current state of the system in the geographic and socio-economic context, thereby increasing the accuracy of the forecast and expanding the possibilities of its interpretation for real management tasks.

For the information content of the model we use the data sets presented on the websites of the Federal State Statistics Service, the All-Russian Population Census, the ministries of Finance, Economic Development, Science and Higher education, as well as on the unified portal of the budgetary system of the Russian Federation. The baseline modeling data are reduced to the Excel spreadsheet format to be loaded into the model.

In order to reflect the demographic situation, information on the number of populations by gender-age groups in each region and their belonging to households is necessary. The number of private, collective, and homeless households in the regions is determined on the basis of data from the Russian Census of 2010. Since no scheduled census was conducted in 2020 due to the COVID-19

pandemic, in order to update the 2010 census data, information on the population size of households of different types is reduced to a fraction of the total number, based on which the approximate number of households of each type in 2020 is determined. *Table 1* presents a fragment of the table containing the estimated data on the number of households in the Belgorod Oblast.

The number of registered cases of anemia in Russian regions in different age groups is determined on the basis of data from the collection Health Care in Russia of the Federal State Statistics Service.

For modeling production and services, we use information on the gross regional product and its sectoral structure, data from official "input-output" tables, reflecting the supply of organizations, imports and exports for 2017.

Information on the structure and composition of the labor force and the average wage of workers in organizations in various industries and regions is used to establish the link between resident agents and jobs.

The proportion of income devoted to buying food is determined by the Federal State Statistics Service, depending on the income level of households. *Table 2* shows the percentage of spending on food depending on whether the household belongs to a certain income centile.

Table 1. The number of households in the Belgorod Oblast

	Total population, people	including the population of		
		private households	collective household	homeless households
Population living in households				
Urban settlements	1,012,932	1,002,677	10,137	118
Rural-type settlements	519,594	517,986	1,591	17
Proportion of the population living in households (estimated value)				
Urban settlements	100	98.9876	1.0008	0.0116
Rural-type settlements	100	99.6905	0.3062	0.0033
Population living in households (January 1, 2020, estimated value)				
Urban settlements	1,045,518	1,034,933	10,464	121
Rural-type settlements	503,633	502,074	1,542	17
Source: compilation according to the Russian Census data. Available at: http://www.gks.ru/free_doc/new_site/perepis2010/croc/perepis_itogi1612.htm				

Table 2. Household consumption structure depending on income

Percentage of income for food consumption	Income Centile									
	1	2	3	4	5	6	7	8	9	10
	48.1	45.9	44.1	41.3	39.1	37.3	35.3	32.3	28.3	18.4
Source: compilation according to Federal State Statistics Service data. Available at: https://rosstat.gov.ru/										

In order to assess the affordability of high-quality food for residents of Russian regions, it is necessary, in addition to data on income, to have data on the composition of a balanced diet and its cost in different regions of Russia.

In collaboration with nutritionist Dr. Natisha Dukhi, our team developed diets that provide 75% (diet I) and 90% (diet II) of the key vitamins and minerals while providing the necessary caloric intake and a balanced macronutrient (protein, fat and carbohydrate) intake. The diets were based on the norms of physiological requirements for energy and nutrients for various groups of the Russian Federation population as determined by the Russian Academy of Medical Sciences and approved by the Federal Service for Supervision of Consumer Rights Protection and Human Welfare. The developed diets contain products available for purchase in most retail outlets in all regions of Russia. In order to achieve the necessary nutritional value, the basket of products was optimized by price, that is, from similar nutritional products (for example, shrimp, squid, and pollock) the cheapest alternative (pollock) was chosen. *Table 3* shows the

Table 3. Food basket composition of type I and type II diets

Product	diet 1, g	diet 2, g	Product	diet 1, g	diet 2, g
Cereals and bread			**Vegetables**		
Buckwheat	1,000	1,000	Broccoli	0	500
Oats	1,000	1,000	Kidney bean	0	500
Wheat groats	1,000	500	Cabbage	2,000	2,000
Millet groats	500	500	Potato	2,000	2,000
Pasta	2,000	500	Carrot	2,000	2,000
Wheat bread	2,000	1,000	Beet	1,000	1,000
Rye bread	3,500	4,000	Onion	1,500	1,500
White rice	1,000	1,000	Garlic	100	100
Beans, grains	0	500	Spinach	150	300
Pearl barley	1,000	500	**Fruits**		
Wheat flour	1,500	1,000	Orange	500	2,000
White sugar	500	70	Banana	500	5,000
Dairy products			Strawberry	0	1,000
Milk, 3.2% fat	4,500	6,000	Lemon	0	200
Butter, 72.5% fat	50	50	Apple	500	3,000
Kefir, 2.5% fat	1,500	4,000	**Oils and nuts**		
Sour cream, 15% fat	200	200	Peanut	200	200
Rossijsky cheese	200	800	Sunflower seeds	50	50
Quark 5% fat	500	1,000	Pumpkin seeds	0	50
Meat and eggs			Sunflower oil	600	300
Beef tenderloin	0	500	**Fish and seafood**		
Pork tenderloin	2,000	2,000	Pollock	2,000	2,000
Dressed chicken	2,000	2,000	Cod liver	70	100
Pig liver	1,000	1,000	Atlantic herring	500	500
Egg	1,500	2,000	Atlantic scomber	600	600
Source: own compilation.					

composition of type I and type II diets that provide the average daily nutrient requirement for an adult male (2,500 kcal).

Both diets are balanced in terms of macro-nutrients, with type I having a higher proportion of carbohydrates (65% vs. 60%), making it cheaper than type II.

Figure 4 shows the structure of the diets described above by food groups. As shown in the diagrams, the proportions of vegetable, meat, and fish consumption are similar in both diets, while the predominance of cereals and bread in type I diet is replaced by an increase in the proportion of fruits and dairy products in type II diet.

In order to calculate the cost of the described diets in different regions of Russia, it is necessary to monitor the prices of products at the sales outlets, which can be done in several ways. First, major retail chains publish assortments with product prices on their websites. Restrictions on the mobility of citizens caused by the spread of COVID-19 prompted retailers to more actively develop online commerce [29], so federal and regional outlet operators fully disclosed the catalogs of their online stores. This situation makes it possible to observe prices in the cities — centers of the RF constituent entities directly on the websites, providing the agent model with

Figure 4. Structure of diets by product groups: a) type I; b) type II, %
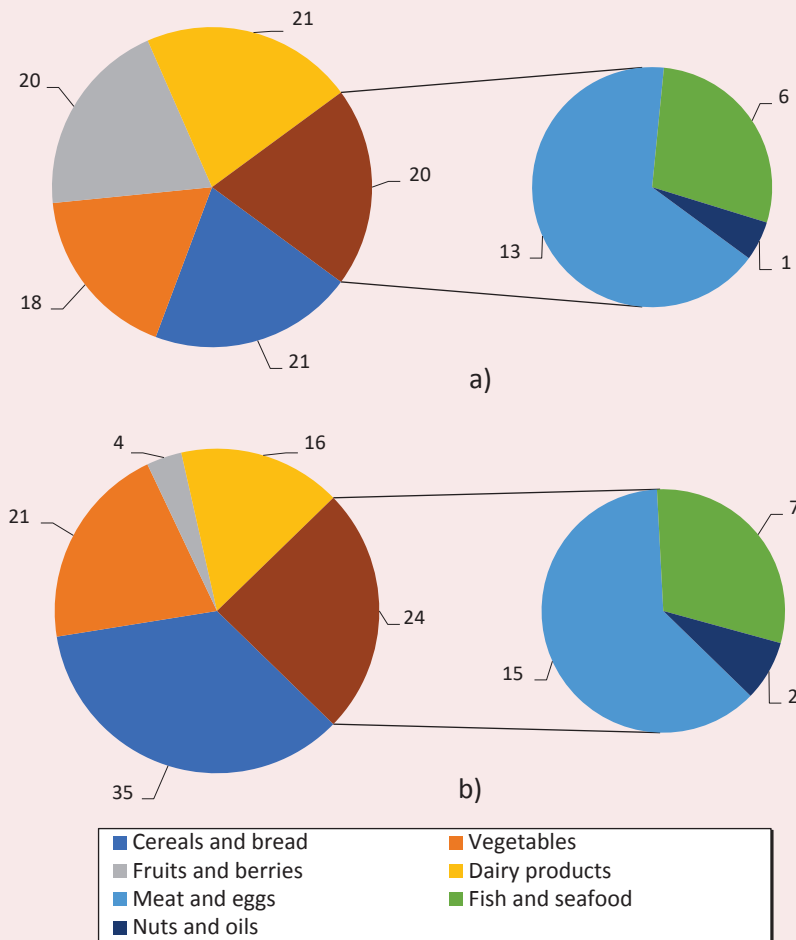
Source: own compilation.

data in the regional context. Although in recent years online sales in the structure of retailing have been growing [29; 30], the disadvantage of this method is the inability to guarantee that the price on the website corresponds to the price of the same product at the sales outlet.

Second, it is possible to monitor prices by specially hired and trained auditors in the field. On the one hand, this makes it possible to cover sales outlets even in rural areas, where representatives of large chains are rarely found, and accurately establish the price as well as the range of offerings. Indeed, a website may show the price of a product, but says little about its presence on the shelf. Sales outlets monitoring provides prices for only those items on a broad list of items interesting to researchers that are actually offered to the public. On the other hand, this method requires high costs associated with finding and training auditors.

The second method of price monitoring was chosen to populate the data of the agent-based model, the task of which was to enumerate price tags for predetermined groups of goods in the cities – centers of the RF constituent entities and in two rural retail outlets. The groups of goods covered foodstuffs, the consumption of which significantly affects the development of iron deficiency anemia, according to an expert assessment based on the

experience of many years of research. 98 products are combined into 21 groups. Of course, on the shelves there is an assortment of the same type of goods – for example, the products of several milk producers of different packaging and different fat content. In order to assess the affordability of the diet, priority is given to the so-called first-price goods – the cheapest among similar ones without taking into account the loyalty card. Thus, if we talk about dairy products, the cheapest offer of sour cream 15% fat without milk fat substitutes per unit weight is selected. Priority for observation was the retail chain "Magnit", in the absence of chain stores in the city – the nearest store of a large retail chain to the auditor and, finally, in the absence of chain stores (which is typical for rural areas) – the store closest to home.

According to the results of the monitoring in 77 constituent entities of the Russian Federation, data were collected on the prices of 31,354 products. 4,848 of them were found to be minimum prices for certain products in their regions. Information on the regions not covered by the monitoring was taken from the Unified Interdepartmental Information and Statistical System (EMISS). *Table 4* shows the regions in which the cost of type I diets is the highest and the lowest.

The map in *Figure 5* shows the cost of type I diet in different regions.

Table 4. Cost of type I diets in Russian regions, rubles

Region	Cost	Region	Cost
Belgorod Oblast	3573,65	Chukotka Autonomous Okrug	10207,13
Penza Oblast	3591,62	Sakhalin Oblast	6200,99
Republic of Mordovia	3621,52	Kamchatka Krai	6029,98
Voronezh Oblast	3625,66	Magadan Oblast	5953,77
Vladimir Oblast	3626,06	Jewish Autonomous Oblast	5458,71
Tambov Oblast	3637,01	Khabarovsk Krai	5329,92
Rostov Oblast	3659,93	Republic of Sakha (Yakutia)	5094,67
Yaroslavl Oblast	3675,02	Primorsky Krai	4885,62
Source: compilation according to data from the monitoring of food prices in Russian regions, carried out by OOO Infokommerts within the framework of the RFBR project No. 19-57-80003.			

Figure 5. Map of the cost of type I diets

3,000 − 4,000 rubles
4,001 − 5,000 rubles
5,001 − 6,000 rubles
6,001 − 7,000 rubles
> 7,000 rubles

Source: own compilation.
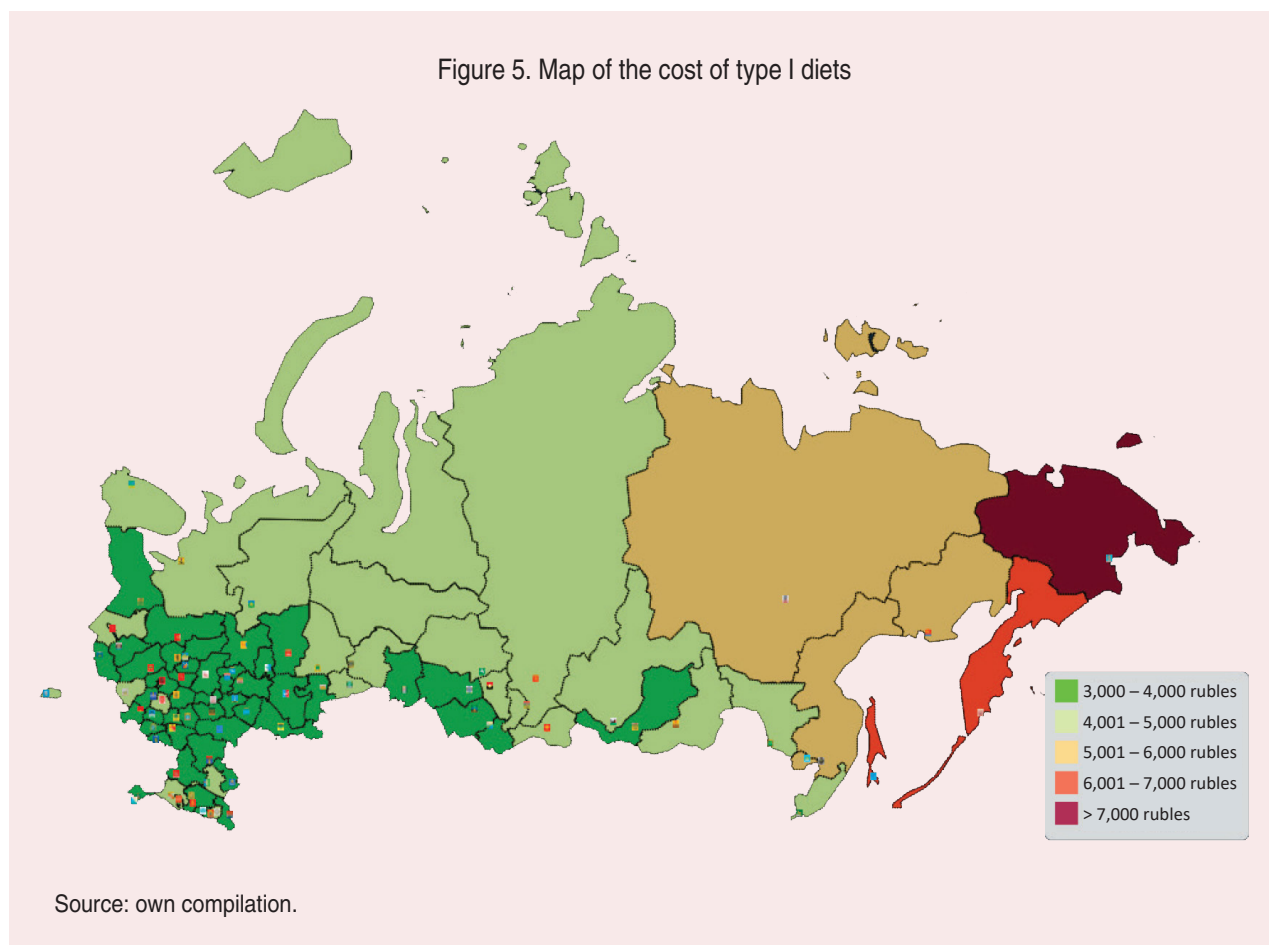
Results and discussion

We modeled diet affordability in Russian regions within the framework of three scenarios, considering epidemiological risks and the resulting dynamics of economic processes.

1. Pessimistic, in which coronavirus waves are regularly repeated due to virus mutation and the emergence of new variants. In this scenario, it is inevitable that restrictive measures will be introduced and global demand will be limited, and it will take several years to restore it to pre-crisis values in all spheres.

2. Conservative, assuming the spread of the coronavirus in 2021−2022 and its completion by the end of 2022. In this case, economic growth (both Russian and global) can be expected in two years.

3. Optimistic, which assumes that the pandemic will subside by the beginning of 2022 and all sectors of the economy will have recovered by that time.

In order to implement the developed scenarios, the model includes forecast series of *(Tab. 5):*

− the ruble exchange rate against the US dollar;

− the price of a barrel of oil in US dollars;

− export volumes of various industries;

− inflation (in particular, the cost of developed diets).

Table 5. Projected values of scenario parameters in 2025

Scenario indicator	Scenario		
	Pessimistic	Conservative	Optimistic
RUB/USD exchange rate, RUB	100	80	60
The price of a barrel of oil, US dollars	30	60	80
Food basket inflation, %	8	6	4
Source: own compilation.			

Modeling the affordability of nutritious diet for the Russian population under different scenarios was carried out for the period through to 2025. *Figure 6* shows the forecast for the affordability of type II diets, providing 90% of the necessary vitamins and minerals. As a basis for comparison we chose the year 2020, in which type II diet was available to 59% of the population. After a fall in 2021, caused by a sharp increase in food prices, this level is reached again only in 2023 under the optimistic scenario. Under the pessimistic scenario, the level of dietary affordability falls to 51% in 2025.

Figure 7 shows the forecasted affordability of a type I or type II diet, i.e., obtaining at least 75% of the micronutrient set. Compared with 83% availability in 2020, the optimistic scenario shows a drop to 81%, a level that persists throughout the modeling period. In the conservative and optimistic scenarios, there is a steady decline in vitamin diet affordability to 76% and 72%, respectively.

Table 6 shows the regions with the highest and lowest affordability of type I or type II diets under the conservative scenario.

As the data in Table 6 show, there is a significant differentiation in the affordability of quality products for the population among the regions. However, the situation in Chechnya and a number of other republics may in practice be much better than the calculated data due to the widespread

Figure 6. Availability of type II diets for the population of the Russian Federation, % of the population
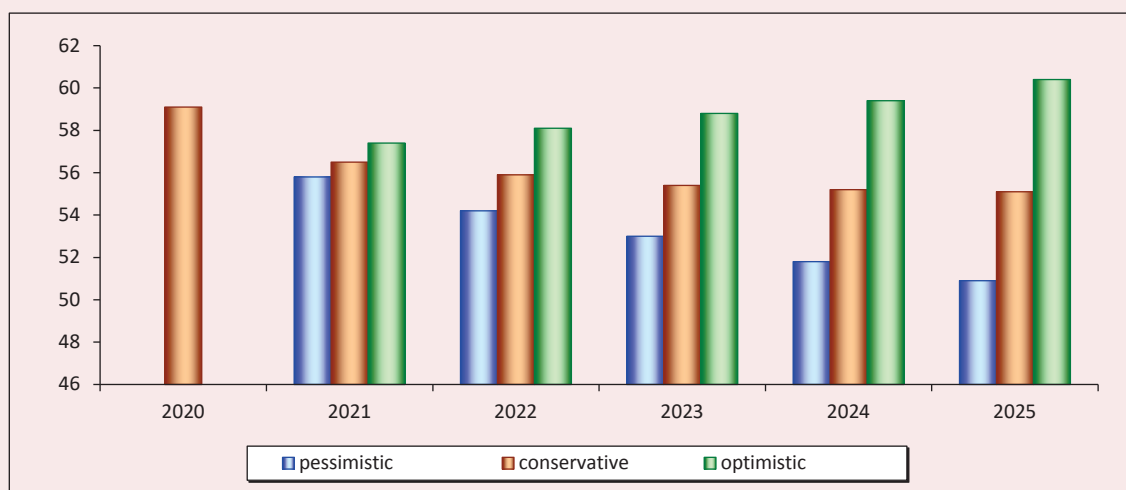
Source: own compilation.

Figure 7. Affordability of type I or type II diets for the population of the Russian Federation, % of the population

Source: own compilation.

Table 6. Affordability of vitamin diets in Russian regions,
% of the population (forecast under the conservative scenario)

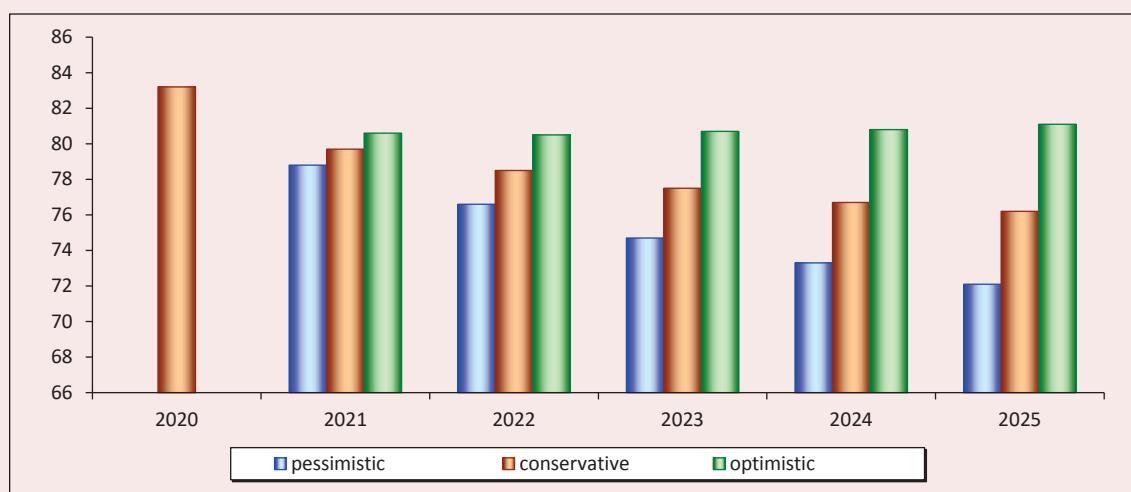| Region	Affordability	Region	Affordability
Chechen Republic	35.0	Moscow	95.5
Republic of Ingushetia	39.1	Moscow Oblast	90.4
Republic of Dagestan	43.7	Saint-Petersburg	89.8
Tuva Republic	45.7	Republic of Kareli	86.2
Altai Republic	46.5	Kaluga Oblast	85
Karachay-Cherkess Republic	47.2	Yaroslavl Oblast	84.5
Republic of Kalmykia	52.4	Tumen Oblast	83.7
Kabardino-Balkarian Republic	53.0	Murmansk Oblast	83.5
Jewish Autonomous Oblast	54.4	Vladimir Oblast	83
Chukotka Autonomous Okrug	56.2	Tula Oblast	82.5
Source: own compilation.			

subsistence economy, which is not reflected in income statistics and provides the population with a high-quality and balanced diet. The situation in the Chukotka Autonomous Okrug is primarily due to the high cost of food, due to climatic features, it cannot be compensated by subsistence economy. The best situation is observed in Moscow, Saint Petersburg and the Moscow Oblast, where relatively high incomes of the population and relatively low cost of products included in the proposed diets are combined. The map in *Figure 8* reflects the forecast of the affordability of type I diet in various regions of Russia in 2025 under a conservative scenario.

Figure 8. Map of the affordability of vitamin diets in the regions of Russia
(forecast under a conservative scenario), % of the population

>90%
80%-90%
70%-80%
60%-70%
50%-60%
40%-50%
30%-40%
<30%

Source: own compilation.
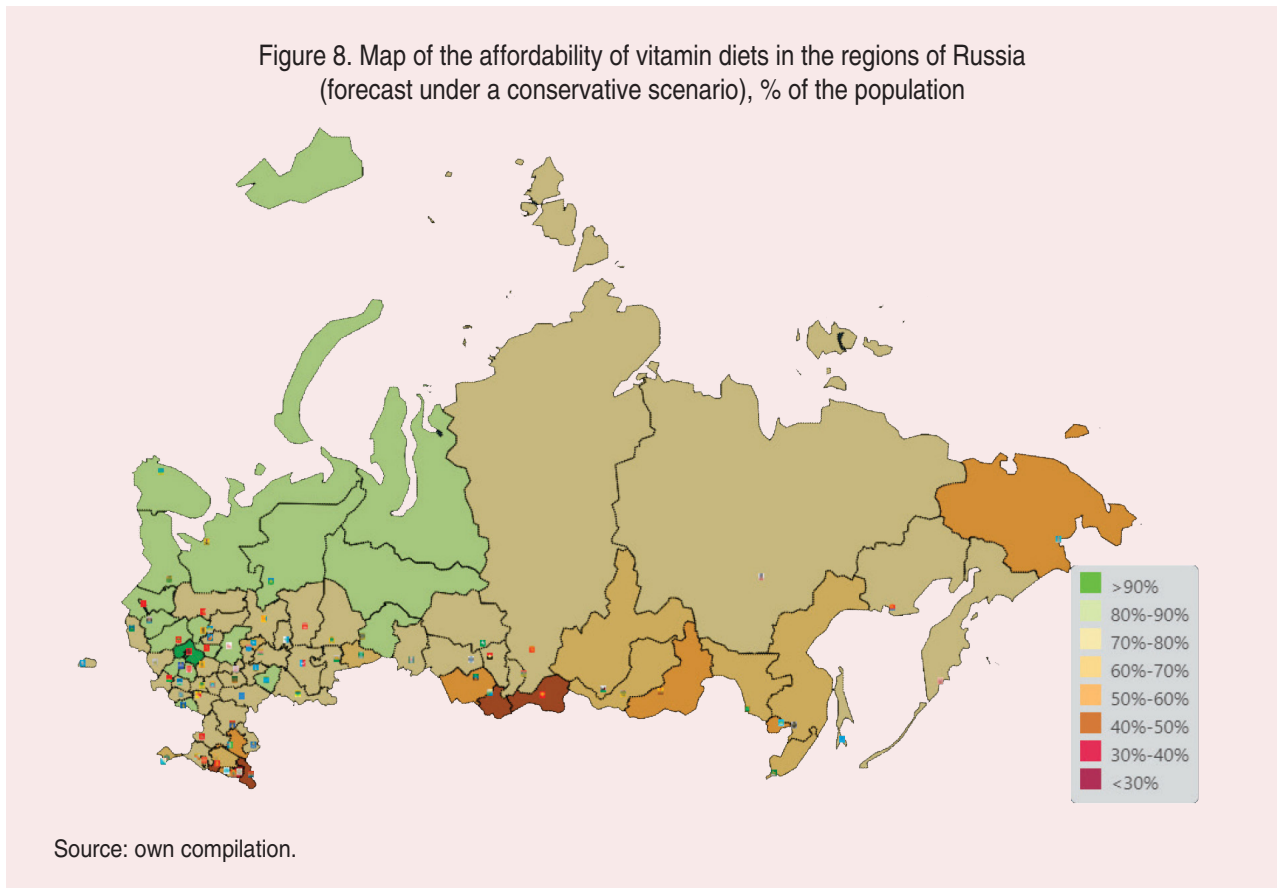
Table 7. Forecast of the necessary amount of subsidies on food for the population, billion rubles

Year	Scenario		
	pessimistic	conservative	optimistic
2021	467.5	443.1	421.6
2022	545.0	487.0	423.2
2023	637.3	532.6	429.4
2024	732.7	577.0	435.9
2025	837.4	622.8	437.7
Source: own compilation.			

The results indicate a serious threat to the diet quality of Russian residents, associated with both a drop in income amid pandemic restrictions and a noticeable increase in food prices. Given the spread of the Covid Indian variant in Russia, conservative and pessimistic scenarios in which the proportion of the population with sufficient money to purchase a nutritious diet decreases by 7−11% seem most likely (Fig. 6). Since part of the population is employed in industries that suffer from the restrictions imposed, for them in a pessimistic scenario an increase in income is difficult to achieve.

In these circumstances, the most effective measure seems to be the implementation of a program of targeted support for low-income families (in the form of benefits or food stamps), which would promote access to a diet that provides at least 75% of the necessary vitamins and minerals for all

Russians. Scenario calculations make it possible to determine the amount of subsidies needed to implement such a program *(Tab. 7)*. At each step of the modeling for households that do not have enough money to purchase at least type I diets, the missing amount for each household member is summed up. The obtained sums are grouped by the modeling years.

Thus, under the optimistic scenario, the standard of living remains fairly stable, as evidenced by the preservation of the required amount of subsidies at the level of 420—440 billion rubles. Under the pessimistic and conservative scenarios, the standard of living falls, and with it the volume of required subsidies increases to 837 and 623 billion rubles, respectively.

The results are based on two assumptions.

The main criterion for a household when choosing a diet is balance in terms of micro- and macronutrient content. Despite the widespread occurrence of ideas about healthy lifestyles in recent years, most of the population still quite seriously deviates from the recommended dietary standards, including in the diet a significant amount of sweet confectionery products and convenience food, which leads to either a more expensive diet (if in addition to these foods all the necessary products containing vitamins and minerals are purchased), or a decrease in its nutritional value (if the purchase of less nutritious products is at the expense of more healthy ones). Consideration of this factor is an important part of the work ahead, while the purpose of our article is to assess the potential affordability of a balanced diet from a financial perspective.

In assessing household income, we took into account the wages of employees of organizations (both official and unreported employment — based on studies in individual industries and regions), entrepreneurial profits and government benefits.

It does not consider the shadow economy, which includes both unreported employment (private tutors, cosmetology services, construction and repair services, etc.) and the criminal sphere. Obtaining more reliable income estimates could adjust the required amount of food subsidies downward, but in practice this problem is solved quite successfully by collecting information on the assets of applicants.

Conclusion

Our research aims to develop a software tool for analyzing diet affordability and anemia spread in the BRICS countries. The proposed tool is founded on an agent-based model and its integration of data on public health and nutritional balance, which are directly linked to the economy — food production and consumption, employment, income of the population. There is a need for new rules for agriculture, food processing, food logistics, and health care.

The scientific significance of the study lies in the development of a methodology based on the integration of big data arrays and computer models of anemia distribution, which allows performing scenario analysis of regulatory impact in the food sphere.

The practical significance of the study lies in the development of tools for predicting the consequences of decisions and identifying priority areas for state intervention. The following controllable parameters of the computer model can be set: the volume of investment in the expansion of production and import substitution programs of Russian food producers; regulation of exports and imports of agricultural products; tax incentives for industries — producers of food and payment of benefits to low-income families. The model provides an assessment of the impact of management decisions on the prevalence of

anemia and the affordability of quality diet for the population. The results of the study can be used by the authorities in the BRICS countries when forming strategies for agricultural development, subsidizing the population, and promoting healthy lifestyles.

References

1. Redchikova N., Semenova A. Economic access to food in the Russian Federation. *Vestnik Tomskogo gosudarstvennogo universiteta. Ekonomika=Tomsk State University Journal of Economics,* 2015, no. 4(32), pp. 71−87 (in Russian).

2. Vodyasov P.V., Minenko A.V. Estimation of economic factors of demand in the food market. *Ekonomika: vchera, segodnya, zavtra=Economics: Yesterday, Today and Tomorrow,* 2018, vol. 8, no. 2A, no. 26−32 (in Russian).

3. Yashkova N.V. Methodology for assessing the physical availability of food. *Fundamental'nye issledovaniya=Fundamental Research,* 2020, no. 8, pp. 92−96. Available at: http://fundamental-research.ru/ru/article/view?id=42833 (accessed: July 7, 2021; in Russian).

4. Borodin K.G. Economic access to food: Factors and methods of assessment. *Ekonomicheskii zhurnal VShE=HSE Economic Journal,* 2018, vol. 22, no. 4, pp. 563−582 (in Russian).

5. Akerlof G.A. Behavioral macroeconomics and macroeconomic behavior. *American Economic Review*, 2002, vol. 92, pp. 411−433. DOI: 10.1257/00028280260136192

6. Fagiolo G., Roventini A. Macroeconomic policy in DSGE and agent-based models redux: New developments and challenges ahead. *Journal of Artificial Societies and Social Simulation,* 2017, vol. 20(1). Available at: http://jasss.soc.surrey.ac.uk/20/1/1.html. DOI: 10.18564/jasss.3280

7. Tesfatsion L., Judd K. (Eds.) *Handbook of Computational Economics, vol. 2: Agent-Based Computational Economics*. Amsterdam, North Holland, 2006. 904 p.

8. Haber G. Monetary and fiscal policies analysis with an agent-based macroeconomic model. *Journal of Economics and Statistics*, 2008, vol. 228, pp. 276−295. DOI: 10.1515/jbnst-2008-2-308

9. Bassi F., Lang D. Investment hysteresis and potential output: A post-Keynesian−Kaleckian agent-based approach. *Economic Modelling*, 2016, vol. 52, pp. 35−49. DOI: 10.1016/j.econmod.2015.06.022

10. Napoletano M., Dosi G., Fagiolo G., Roventini A. Wage formation, investment behavior and growth regimes: An agent-based analysis. *Revue de l'OFCE*, 2012, vol. 124, pp. 235−261 DOI: 10.3917/reof.124.0235.

11. Branch W.A., Evans G.W. Monetary policy and heterogeneous expectations. *Economic Theory*, 2011, vol. 47, pp. 365−393. DOI: 10.1007/s00199-010-0539-9

12. Delli Gatti D., Desiderio S. Monetary policy experiments in an agent-based model with financial frictions. *Journal of Economic Interaction and Coordination,* 2015, vol. 10(2), pp. 265−286, DOI: 10.1007/s11403-014-0123-7

13. Alexandre M., Lima G.T. Combining monetary policy and prudential regulation: An agent-based modeling approach. *J Econ Interact Coord*, 2020, vol. 15, pp. 385−411, DOI: 10.1007/s11403-017-0209-0

14. Popoyan L., Napoletano M. Roventini A. Taming macroeconomic instability: Monetary and macro prudential policy interactions in an agent-based model. *Journal of Economic Behavior & Organization*, 2017, vol. 134 (February), pp. 117−140. DOI: 10.1016/j.jebo.2016.12.017

15. Blanchard O., Galí J. Labor markets and monetary policy: A new Keynesian model with unemployment. *American Economic Journal: Macroeconomics*, 2010, vol. 2, pp.1−30. DOI: 10.2139/ssrn.920959

16. Dawid H., Gemkow S., Harting P., Neugart M. Labor market integration policies and the convergence of regions: The role of skills and technology diffusion. *Journal of Evolutionary Economics*, 2012, vol. 22, pp. 543−562. DOI: 10.1007/s00191-011-0245-1

17. Riccetti L., Russo A., Gallegati M. Unemployment benefits and financial leverage in an agent based macroeconomic model. *Economics: The Open-Access, Open-Assessment E-Journal*, 2013b, vol. 7, no. 2013–42. DOI: 10.5018/economics-ejournal.ja.2013-42

18. Anufriev M., Assenza T., Hommes C., Massaro D. Interest rate rules and macroeconomic stability under heterogeneous expectations. *Macroeconomic Dynamics*, 2013, vol. 17(08), pp.1574–1604. DOI: 10.2139/ssrn.1400748

19. Battiston S., Delli Gatti D., Gallegati M., Greenwald B., Stiglitz J. Liaisons dangereuses: Increasing connectivity, risk sharing, and systemic risk. *Journal of Economic Dynamics & Control*, 2012, vol. 36(8), pp. 1121–1141. DOI: 10.1016/j.jedc.2012.04.001

20. Russo A., Riccetti L., Gallegati M. Increasing inequality, consumer credit and financial fragility in an agent based macroeconomic model. *Journal of Evolutionary Economics*, 2016, vol. 26, pp.25–47. DOI: 10.2139/ssrn.2356249

21. Raberto M., Teglio A., Cincotti S. Integrating real and financial markets in an agent-based economic model: An application to monetary policy design. *Computational Economics*, 2008, vol. 32(1), pp. 147–162. DOI: 10.1007/s10614-008-9138-2,

22. Gerst M., Wang P., Roventini A., Fagiolo G., Dosi G., Howarth R., Borsuk M. Agent-based modeling of climate policy: An introduction to the engage multi-level model framework. *Environmental Modelling & Software*, 2013, vol. 44, pp. 62–75. DOI: 10.1016/j.envsoft.2012.09.002

23. Ge J., Polhill J., Macdiarmid J., Fitton N., Smith P., Clark H., Dawson T., Aphale M. Food and nutrition security under global trade: A relation-driven agent-based global trade model. *Royal Society Open Science*, 2021, vol. 8, no. 201587. DOI: https://doi.org/10.1098/rsos.201587

24. Dobbie S., Schreckenberg K., Dyke J., Schaafsma M., Balbi S. Agent-based modelling to assess community food security and sustainable livelihoods. *Journal of Artificial Societies and Social Simulation*, 2018 vol. 21(1), no. 9. DOI: 10.18564/jasss.3639

25. Buurma J., Hennen W., Verwaart T. How social unrest started innovations in a food supply chain. *Journal of Artificial Societies and Social Simulation*, 2017, vol. 20(1), no. 8. DOI: 10.18564/jasss.3350

26. McPhee-Knowles S. Growing food safety from the bottom up: An agent-based model of food safety inspections. *Journal of Artificial Societies and Social Simulation*, 2015, vol. 18(2), no. 9. DOI: 10.18564/jasss.2717

27. Mashkova A.L., Novikova E.V., Savina O.A., Mamatov A.V., Mashkov E.A. Simulating budget system in the agent model of the Russian Federation spatial development. In: Chugunov A., Khodachek I., Misnikov Y., Trutnev D. (Eds.). *Electronic Governance and Open Society: Challenges in Eurasia. EGOSE 2019. 2020, Communications in Computer and Information Science*. Vol. 1135. Pp.17–31. DOI: 10.1007/978-3-030-39296-3_2.

28. Mashkova A.L., Novikova E.V., Savina O.A., Mashkov E.A. Generating synthetic population for the agent-based model of the Russian Federation spatial development. In: Ahrweiler P., Neumann M. (Eds.). *Advances in Social Simulation. ESSA 2019. Springer Proceedings in Complexity*. Springer, Cham. 2021. Pp. 183–187. DOI: 10.1007/978-3-030-61503-1_17

29. Goncharuk I.V. Review of research on the impact of the COVID-19 pandemic on the development of global and Russian e-commerce. *Tamozhennaya politika Rossii na Dal'nem Vostoke=Customs Policy of Russia in the Far East,* 2021, no. 1(94), pp. 66–82. DOI: 10.24866/1815-0683/2021-1/66-82 (in Russian).

30. Alfonso V., Boar C., Frost J., Gambacorta L., Liu J. E-commerce in the pandemic and beyond. *BIS Bulletin*, 2021, vol. 36, pp. 1–7. Available at: https://www.bis.org/publ/bisbull36.htm

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Forming the Strategies for Enhancing the Effectiveness of Rural Entrepreneurial Organizations in Russia*

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Abstract. Political, economic and social events of recent years, taking place in all of the countries, when economic institutions and systems are destroyed in a short time under the influence of negative external factors, indicate the need to create resilient socio-economic territorial systems. This problem is essential to rural areas that are most vulnerable to negative external impacts, which confirms the relevance of finding ways and directions to ensure their sustainable development. Our previous research has shown that the formation of an entrepreneurial ecosystem of rural areas, substantiating the institutions of their development, can ensure sustainability of socio-economic development of rural areas and increase their resilience. The article proposes a model for building strategies for the development of entrepreneurial organizations within the entrepreneurial ecosystem, aimed at ensuring sustainable socio-economic development of rural areas and increasing the competitive environment of the ecosystem. The purpose of the article is to develop a factor model for building entrepreneurial strategies of entrepreneurial organizations that adequately meet the role of the rural entrepreneurial ecosystem in the current conditions of development of Russian rural areas. The strategic development concept is usually applied in the analysis of large corporate organizations. It is believed that small businesses, exposed to external factors, must use adaptive tactics and cannot formulate and implement a strategy for their development. Based on the analysis of scientific literature and the results of a survey of entrepreneurs on the example of the

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Sverdlovsk Oblast of the Russian Federation, we found that rural entrepreneurs seek to determine strategic directions of their development. The article presents approaches to the disclosure of relevant factors that determine the model for choosing a development strategy for rural entrepreneurial organizations. The information base of the study includes research works of Russian and foreign scientists on the topic under consideration, as well as the results of a thematic survey. The scientific novelty of the work lies in the fact that for the first time an attempt has been made to build a factor model for strategic development of rural entrepreneurs within the concept of entrepreneurial ecosystem of rural areas.

Key words: rural entrepreneurship, entrepreneurial ecosystem, entrepreneurial organizations, strategy, factor model, rural areas, ecosystem resilience.

Introduction

Entrepreneurs aim to make a profit by taking advantage of the opportunities open to them. This is stated not only in scholarly articles on entrepreneurs, but also in legislation. Developing this idea, we argue that entrepreneurship, as a way of commercial thinking, has the most effective impact on territorial development [1]. The fullest realization of commercial opportunities, innovative use of available resources determine the entrepreneurial approach to the development of commercial organization. Thus, it can be argued that entrepreneurial organizations determine the opportunities for sustainable economic development of territories [2]. One should also note that entrepreneurial organizations creating jobs bear an important social burden. It can be considered that entrepreneurship is at the core of the territorial socio-economic system, which is why an increasing number of researchers pay attention to the role of entrepreneurship in ensuring sustainable socio-economic growth of territories [3]. We believe that this role of entrepreneurship is important for rural areas, characterized, as a rule, by a limited number of jobs, which leads to higher than in urban conditions, unemployment and, accordingly, a more tense social situation. Russian [4] and foreign [5] researchers agree that the development of entrepreneurial organizations, especially small and family forms, can have a positive impact on the development of rural areas.

The problems of sustainable socio-economic development of rural areas require the search for a comprehensive solution. In recent years, a number of researchers [6], including us [1], have proposed the concept of rural entrepreneurial ecosystem as the basis for finding a solution to the problem of sustainable socio-economic development of rural areas. The advantage of the proposed concept is the possibility of combining a variety of factors within a single model and determining not only their mutual influence, but also their synergistic effect on the development of rural areas.

Rural entrepreneurial ecosystem is a multi-component socio-economic concept, that takes into account the functional interaction of individual factors, which allows identifying the factors not only directly affecting the strategic development of rural entrepreneurial organizations, but also those indirectly affecting the sustainability of rural socio-economic development and thus creating the foundation for sustainable territorial development.

The advantages of the concept of entrepreneurial ecosystem should also include the ability to analyze, in addition to the actors themselves or elements of the ecosystem, the institutions of their interaction, which makes it possible not only to determine the configuration of the ecosystem, but also to optimize the configuration for a particular rural area to improve the functionality of its socio-economic system [7].

Based on this postulate, we identified rural entrepreneurial organizations as actors in the rural entrepreneurial ecosystem and formulated the purpose of the proposed study: to develop a factor model for building strategies of entrepreneurial organizations that adequately meet the role of rural entrepreneurial ecosystem in modern conditions of development of Russian rural areas. The set goal predetermined the solution of the following tasks: theoretically substantiate the choice of factors determining the strategy building of rural entrepreneurs in the context of rural entrepreneurial ecosystem, develop a methodology to assess the significance of strategic choice factors, identify critical factors and offer a dichotomous model for building the development strategies of rural entrepreneurs.

Theoretical substantiation of the study

The reason for the degradation of the rural economy is its organization, which does not meet the modern requirements of socio-economic development. The only way out of this situation is a paradigm shift, instead of the costly paradigm of sectoral development, the paradigm of entrepreneurial development in its highest manifestation – the concept of entrepreneurial ecosystem should be actively implemented. Believing that the ecosystem approach is more suitable for the scientific study of rural entrepreneurial organizations, we came to the understanding that there is a need to build the concept of rural entrepreneurial ecosystem [1], so we should define a strategy for the development of entrepreneurial organizations in the development options of entrepreneurial ecosystem. We assume that two scenarios of ecosystem development can be proposed as a starting point for the analysis: inertial and intensive. Undoubtedly, the inertial development scenario will not be able to lead to the necessary results ensuring the sustainable development of rural areas. As an alternative to inertial development scenario, the option of

intensive, in this case innovation development, is aimed at improving the business climate through multifaceted measures to promote innovation activities of entrepreneurial organizations and, accordingly, it will serve as a basis for sustainable development of rural areas.

The proposed dichotomy of options for the development of entrepreneurial ecosystem is of a general nature, it lacks the detail, which will allow making a choice of one or another option of strategy of entrepreneurial organizations. We propose to adopt the following typology of options, based on the dichotomy described above, but more detailed and adapted to the problems of formation and development of entrepreneurial ecosystem [8]:

1) territorial competitiveness strategy focused on application of gradual innovations in the market;

2) achieving leadership strategy, aimed at creating a new market segment;

3) specialized development strategy, aimed at performing individual activities in the overall production chain to reduce costs and create cooperative relationships with related organizations that have market prospects;

4) catching-up development strategy, focused on the manufacturing of those products that have a high or potentially high demand in the market;

5) inertial development strategy, aimed at maintaining the current level of production;

6) opportunistic development strategy, focused on the manufacturing of specific products aimed at a limited demand.

In order to choose the right strategy for the development of entrepreneurial organizations, it is advisable to use the analysis of external and internal factors that have an impact on the development of the entrepreneurial ecosystem. At the same time, one should understand, as mentioned above, that for each territory the sequence of formation and development of the territorial entrepreneurial ecosystem is determined in a unique way and cannot be applied to another territory.

Such reasoning leads to the idea that it is impossible to work out a universal variant of strategic development of entrepreneurial organizations, acceptable for any rural entrepreneurial ecosystems, or any standard algorithm of analysis, which would allow coming to the desired results. The maximum possible detailing of the formulation and solution of entrepreneurial problems will consist only in the definition of the basic principles of the analytical approach.

It is necessary to define criteria for choosing a development option. The theoretical substantiation of the choice of criteria determining the construction of entrepreneurial strategies should be based on the concept of rural entrepreneurial ecosystem. We should note that this concept is becoming one of the key ones in the scientific analysis of rural entrepreneurship and socio-economic development processes in rural areas. We can point to a variety of approaches to the study of rural entrepreneurship, from considering the activities of individual entrepreneurial organizations to the study of the rural entrepreneurial system. For the purposes of our study, aimed at substantiating the choice of factors determining the development of entrepreneurial strategies, it is necessary to clarify this concept in order to more reasonably approach the selection of the criteria sought. The key position shared by almost all researchers is to determine the place of entrepreneurship in the territorial socio-economic system [9]. Entrepreneurial organizations are a necessary element of any socio-economic system, some researchers even consider entrepreneurship as the cornerstone that determines its type and nature [10]. We cannot but agree with this position, since it is entrepreneurs who generate new products, new ways of production and new markets. Despite the differences in approaches to the concept of entrepreneurial ecosystem, researchers agree on the understanding of its elemental structure. It is the elemental composition that allows defining it as an ecosystem, that is, a self-sufficient system with

endogenous development abilities and ensuring sustainable socio-economic development of rural areas by adapting the activities of ecosystem components to the influence of both exogenous and endogenous factors.

In previous works [1] we have defined the composition of actors or elements of rural entrepreneurial ecosystem. Continuing the study of individual elements, it is necessary to raise the question of the influencing factors on the development of the ecosystem, their significance in the context of the ecosystem. The first element, both in terms of list and importance, is entrepreneurs themselves. However, recognizing entrepreneurs as a basic element, we should identify their main influencing factors on the ecosystem. Our research has convincingly shown that the main factor of entrepreneurs' influence on ecosystem development, the main entrepreneurial competence that can have a positive impact both on the entrepreneurs themselves and on the rural area as a whole, is their innovativeness, or readiness and ability to recognize the marketing potential of innovations and successfully implement it. Recognizing innovation competencies critical to the formation and development of individual entrepreneurial organizations, one should remember that the ecosystem approach implies the mutual influence of all actors in the ecosystem, the synergistic effect of their joint actions, and therefore it is necessary to expand the area of entrepreneurial competencies to the element of public administration and municipal self-governance. The inability of the state to create conditions for the favorable development of innovation activities of entrepreneurial organizations will definitely lead to a standstill in the development of the entrepreneurial ecosystem.

Consideration of the innovation development factor requires the inclusion of the marketing development factor in the analysis. According to M. Porter's concept of innovation development [11],

innovations are based on commercialization, i.e. the innovator's ability to find a market for a new product, to make it competitive, more attractive in the eyes of a potential consumer than goods offered by other manufacturers. This reasoning leads us to the need to pay careful attention to the issue of researching the potential market for rural entrepreneurs and the inclusion of the potential market among the elements of the rural entrepreneurial ecosystem.

Analyzing the consumer market for rural entrepreneurs implies studying potential demand, which is necessary for successful activity of any entrepreneur. Without bringing up the issues of marketing research determining demand, we want to draw attention to the connection between innovation activities of entrepreneurs, creation of innovative products and potential demand. Understanding the consumer market as an element of the rural entrepreneurial ecosystem can lead to a narrowing of the study area. Assuming that different entrepreneurs will focus their activities on different segments of the consumer market, we will have to recognize that the union of all potential segments of the consumer market will coincide with the general consumer market, so we propose to take the population as a whole, rather than consumers, as an element of the rural entrepreneurial ecosystem. This sentence brings up the question of what kind of population should be included in the ecosystem. Assuming that the ecosystem is territorial in nature, it is appropriate to include the rural population, but on the other hand, as we noted above, we are interested in the consumer market of rural entrepreneurs, which requires the inclusion of the rural entrepreneurial ecosystem of the region population with sustainably sales of the rural entrepreneurial products.

Defining the population as one of the elements of the rural entrepreneurial ecosystem, we fix its role not only as consumers of the rural entrepreneurs' products, but also as a labor force for rural entrepreneurs. Our earlier study of the factors that have a negative impact on the development of entrepreneurial organizations [12] revealed the problem of finding not only specialists with the necessary qualifications, but any employees who are socially ready to work in an entrepreneurial organization. As noted by a number of researchers, the problem of finding employees adapted to work in entrepreneurial structures is not considered inherent only in individual countries, it is a civilizational problem that requires a universal approach to its solution, with possible national adaptations [13].

Another problem that needs to be addressed when considering the population as an element of the entrepreneurial ecosystem is the identification of potential entrepreneurs.

There are many studies by Russian [14] and foreign authors [15] devoted to the problem of identifying entrepreneurial potential and the development of entrepreneurial competencies. Indeed, the very existence of entrepreneurial business (especially small business, and in rural areas it is the vast majority of entrepreneurs) is critical to the presence of entrepreneurial competencies in its organizers. We believe that, basically, there is no need to separate the analysis of the population as consumers, entrepreneurs, and employees. This is confirmed by the results of the works of other researchers who believe that the analysis of the population as an element of the rural entrepreneurial ecosystem should be based on the analysis of similar behavioral and mental characteristics.

We should admit that the "laissez-faire" principle is not considered by researchers to be a valid principle for building economic systems, so it would be appropriate to indicate the state and local self-government as an important element, one of the key actors in the rural entrepreneurial ecosystem. Assuming that the role of the state has already been sufficiently covered in a large number of works by Russian [16] and foreign [17] researchers, we want

to draw attention to the fact that the key goal of the rural entrepreneurial ecosystem is the sustainable socio-economic development of rural areas. Assuming that the main goal of the development of entrepreneurial organizations is to obtain economic benefits for entrepreneurs, we come to understand the need for a counterweight to entrepreneurs. The entrepreneurial ecosystem needs an actor who can create an institutional field that protects the interests of all participants in the ecosystem.

We should also note the possible presence of dichotomy within the element in question [18]. The interests of the state and the municipality will not necessarily coincide, they can be multidirectional, which is confirmed by a number of studies [19], so we must recognize that almost all elements of the rural entrepreneurial ecosystem are not homogeneous, they can and should be recognized as multi-atomic. This will require a more deliberate approach to the study of entrepreneurial strategies within the rural entrepreneurial ecosystem.

Discussing the individual elements that make up an entrepreneurial ecosystem requires a focus on its foundation on which the individual elements are not just based, but interact to fulfill the primary purpose of the rural entrepreneurial ecosystem. The foundation of the rural entrepreneurial ecosystem is its infrastructure. Infrastructure, just like the ecosystem itself, cannot be regarded as something whole and indivisible; it consists of several layers designed to ensure different types of interaction between ecosystem actors.

The first layer of infrastructure is the hard infrastructure, which provides not only the separate activity of individual elements, but also the physical interaction between actors. The physical interaction between actors is the most important type of interaction, since it leads the considered ecosystem to the required results — an increase in the standard of living of the rural population [20].

The second layer of infrastructure can be called intellectual. At this level, there is the internal development of entrepreneurial organizations and the intellectual exchange of ideas between different actors, which creates conditions for the innovation development of entrepreneurship, which is, in our view, the only way for the effective development of the entrepreneurial ecosystem [21].

The third layer of infrastructure, to which more and more attention has been paid recently, is information. The development of information technology has led to the fact that information infrastructure is becoming increasingly important for business participants, even it has not become equal in importance to the physical infrastructure. [22].

Rural socio-economic systems are more vulnerable to negative external influences than urban ones. This is primarily due to the fact that rural systems are much lower in all of the indicators. In the framework of the socialist socio-economic system, there was a tendency to enlarge rural settlements, to divide rural settlements into "promising" and "non-promising" ones. The experience of the socio-economic experiment has shown that such a division, based on exogenous criteria in relation to the rural areas, leads to negative consequences for it. According to Russian scientists, the social mission of the rural area exceeds its economic importance. The purpose of the rural area is to preserve and develop national consciousness, and rural entrepreneurship, developing under the influence of mainly endogenous factors, is more effective in addressing the goal of sustainable rural development than specific programs of external influence[1]. The findings of the scientists also allow concluding that rural entrepreneurial ecosystems should have specific characteristics determined by their territoriality.

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[1] Pokrovskii N.B., Tatarkin A.I., Donnik I.M., Litovchenko V.G., Voronin B.A., Balabaikin V.F., Polbitsyn S.N. On what the Russian land will stand: Once again about the problems of the rural areas. *Personality and Culture*, 2016, no. 1, pp. 9–10.

Strategic planning for entrepreneurial organizations is a long-term, future-oriented, multi-step process that links the current state of the rural entrepreneurial ecosystem and the future state that planning should aim to achieve.

The choice of strategy for entrepreneurial organizations must be based on accurate and reliable information. Intuitive strategic decision-making, not supported by objective analysis of the processes taking place both in the entrepreneurial organization itself and in the rural entrepreneurial ecosystem, is fraught with long-term negative consequences for the entrepreneur.

In the form in which the options for strategies of entrepreneurial organizations were originally proposed, they cannot provide the required reliability of choice, because the description of the current state and prospects for entrepreneurial organizations had only a qualitative, descriptive nature. The choice mechanism of entrepreneurial organizations strategies should be based on quantitative methods. Of course, it is impossible to consider quantitative methods as the only criterion for strategy choice, but they should be at the base of the choice mechanism. Assuming that under conditions of high dependence of the optimal strategy choice mechanism on external hard-to-determine and hard-to-predict factors, the application of complex strategy choice mechanisms will not be reasonable, we believe that a simple and easily implemented mechanism based on indicative analysis will be the most effective and practical.

The analysis of numerous works of Russian and foreign researchers, as well as our results convincingly showed that methodologically it is advisable to choose the factors determining the strategy of rural entrepreneurs within the concept of rural entrepreneurial ecosystems. The ecosystem approach makes it possible to identify all the main critical factors determining the strategic development of entrepreneurial organizations.

Methodology

In order to identify the factors that critically influence the strategizing of entrepreneurial organizations within a rural entrepreneurial ecosystem, it is necessary to investigate the factors that influence not only the performance of the entrepreneur himself, but also the functionality of the rural entrepreneurial ecosystem as a whole. The classic set of factors determining the effectiveness of strategic choice is presented in the works of M. Porter – the so-called Porter's Diamond, or Porter's Five Forces [11]. According to his model, the process of defining an effective competitive strategy is influenced by five driving forces that determine the future effectiveness of corporate strategy. Each force in M. Porter's model represents a separate level of competitiveness of the enterprise in the analyzed market:

— bargaining power of customers;
— bargaining power of suppliers;
— threat of new entrants;
— threat of substitutes;
— competitive rivalry or competition in the industry.

Developing the basic statements of the competitive analysis, it is necessary to pay attention to additional factors which nevertheless have a significant influence on efficiency of enterprise strategy. Applying the analysis of competitiveness factors and the choice of strategies for the case of small entrepreneurial organizations, A. Davis and E. Olson [23] proposed to consider five groups, including 11 factors that determine the effectiveness of the strategy of small entrepreneurial organizations.

1. Suppliers:
   1) relationship to resources;
   2) investor expectations;
   3) shareholder/Investor risk tolerance;
   4) time horizon for results.
2. Customers/Markets:
   5) building on market strengths;

6) size of market.
3. Competition:
7) visibility by (and of) competitors;
8) portfolio management;
9) triage.
4. Regulation:
10) constraints.
5. Internal culture:
11) process.

The proposed classification of factors makes it possible to determine the effectiveness of an individual entrepreneur's strategy. We set ourselves the task of identifying the effectiveness of entrepreneurial strategy in the territorial entrepreneurial ecosystem, so we consider it necessary to supplement the 11 named factors with the factors that determine the functionality of the ecosystem. As noted above, the foundation of the rural entrepreneurial ecosystem is its infrastructure, so we consider it appropriate to include the infrastructure of the ecosystem in the list of factors critical to efficiency.

Infrastructure:
12) Hard infrastructure;
13) Innovation infrastructure;
14) Information infrastructure.

In our opinion, the perception by A. Davis and E. Olson of market regulation as a factor imposing only restrictions on the activities of entrepreneurs is not quite correct. The position of the governments of the vast majority of countries in relation to entrepreneurs is extremely positive. The state perceives entrepreneurs not only as economic subjects, but also as social partners providing social development of territories. Based on this conclusion, we believe it is advisable to add a section on "entrepreneurship support".

Entrepreneurship support:
15) State support;
16) Municipal support;
17) Support of self-regulatory organizations.

Thus, the total list consists of 17 factors affecting entrepreneurial organizations. In the study of industry-specific, entrepreneurial ecosystems, this list can be supplemented by specific factors [24]. In the interest of our study, we consider the proposed list to be sufficient and adequate to meet the objectives of the work.

Results and discussion

An analytical study of the entrepreneurial sector in rural areas of the Russian Federation, which we conducted earlier using materials of the Federal State Statistics Service, allowed concluding that "rural entrepreneurs create a new consumer value with civilizational significance" [10]. It became the basis for the next stage, to which this article is devoted – the alignment of strategies of entrepreneurial organizations within the rural entrepreneurial ecosystem.

We applied the method of case study presented by K. Eisenhardt [25]. We built the case study on a descriptive analysis of rural entrepreneurial organizations of the Sverdlovsk Oblast (agricultural organizations, peasant (farm) enterprises and individual entrepreneurs, as well as households) using open data[2] and results obtained by other researchers [26]. The conditions for classifying organizations as small businesses are defined in Article 4 of Federal Law No. 209-FZ, dated July 24, 2007 "On the Development of Small and Medium Entrepreneurship in the Russian Federatipn". We conducted a telephone survey of rural entrepreneurs in order to identify attention to the critical factors that determine the effectiveness of an entrepreneurial strategy. The questionnaire was designed as a combination of a Likert scale [27], implying a five-level item: (1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree.

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[2] Register of economic entities of the agroindustrial complex of the Sverdlovsk Oblast. *Ministry of Agriculture and Consumer Market of the Sverdlovsk Oblast.* Available at: https://mcxso.midural.ru/article/show/id/1078

For estimating the ratings of individual factors, the obtained results were examined as real numbers. Such a method was proposed by S. Harpe [28]. Initially, the normality of the distribution, confirmed by calculations, was checked. Then we checked for correlations between the individual strategic development factors, as well as with the results of the test questions on the presence of strategy and profits in the enterprise. The test showed the absence of correlation between the factors under consideration and the control questions, which should be perceived as the independence of respondents' perception of individual factors. The results of the one-sample mean comparison test are shown in *Table 1*: the calculated mean values, standard deviations (SD), standard errors, and 95% confidence interval are presented. The calculated values of the ranges allow asserting that the mean values of the factors obtained for the sample reliably reflect the mean values of the whole population of rural entrepreneurial organizations. This allows accepting the null hypotheses about the mean values of the factors. The *Figure* shows a graphical representation of the obtained mean values of each factor.

The results show different attitudes of rural entrepreneurs to the strategic development factors. It is possible to single out a group of factors that entrepreneurs pay the most attention to:

1. Investor expectations.
2. Hard infrastructure.
3. Building on market strength.
4. Market regulation.
5. Relationship to resources.
6. Municipal support.
7. Entrepreneurs pay the least attention to the following factors:
8. Size of market.
9. Visibility by (and of) competitors.
10. Portfolio management.
11. Triage.
12. Support of self-regulatory organizations.
13. Time horizon for results.

Given the results of the study, we can conclude that rural entrepreneurs pay attention primarily to the main, if we may say so, superficial, factors of strategic development. As can be seen from the above research results, inattention of entrepreneurs to most of the factors means only insufficient attention to the design of their development

Table 1. Analysis of strategic development factors

Factor	Mean value	SD	Standard error	95% confidence interval	
Relationship to resources	3.900	0.778	0.123	3.610	4.190
Investor expectations	4.550	0.597	0.094	4.327	4.773
Shareholder / Investor risk tolerance	3.575	0.636	0.101	3.338	3.812
Time horizon for results	2.625	0.628	0.099	2.391	2.859
Building on market strengths	4.000	0.506	0.080	3.811	4.189
Size of market	2.675	0.474	0.075	2.498	2.852
Visibility by (and of) competitors	2.425	0.501	0.079	2.238	2.612
Portfolio management	2.925	0.797	0.126	2.627	3.223
Triage	2.950	0.597	0.094	2.727	3.173
Market regulation	3.975	0.530	0.084	3.777	4.173
Culture development process	3.075	0.656	0.104	2.830	3.320
Hard infrastructure	4.475	0.506	0.080	4.286	4.664
Innovation infrastructure	2.800	0.608	0.096	2.573	3.027
Information infrastructure	3.800	0.687	0.109	3.544	4.056
State support	3.550	0.504	0.080	3.362	3.738
Municipal support	3.975	0.620	0.098	3.744	4.206
Support of self-regulatory organizations	2.525	0.554	0.088	2.318	2.732
Source: own compilation.					

Significance of strategic development factors
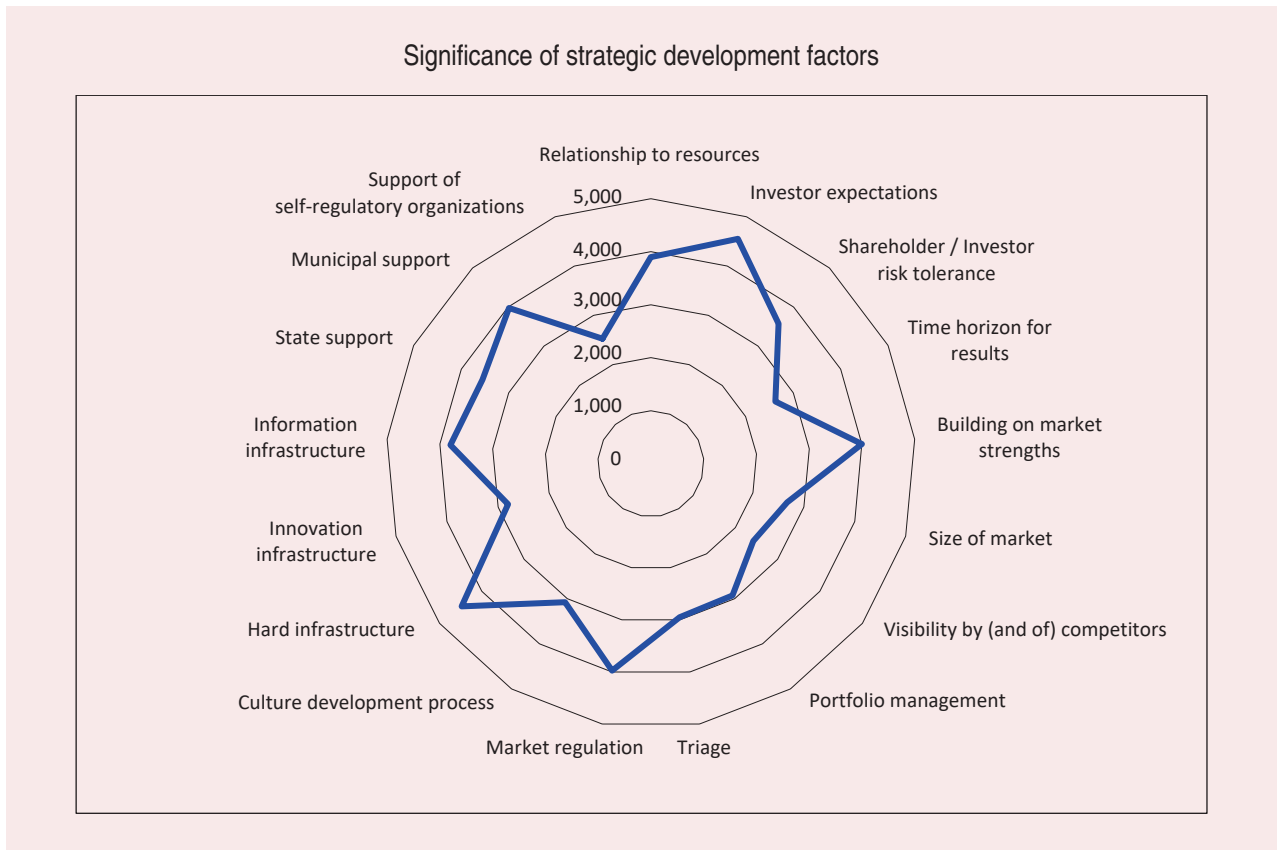
strategies, the determination of appropriate ways of enterprise development. This is also confirmed by the responses received to the control questions about the presence of enterprise strategy and entrepreneurs' satisfaction with the efficiency of their enterprises. Due to the fact that the responses to the control questions were also obtained by the Likert scale, this gave respondents the opportunity not to answer dichotomously to the questions posed. As a result, the majority of respondents found it difficult to answer the question whether they have a development strategy elaborated at the enterprise, which is confirmed by the average value of the received answers – 3.6. The interviews demonstrated the most common position of entrepreneurs: "We have not developed a strategy, but we think strategically".

Without considering an ordinary set of strategies, repeatedly described in a large number of scientific articles and educational materials [29], in development of the above arguments about

the options of strategies for entrepreneurial organizations, we focus on a dichotomous set of strategies: innovation development and sustainable development. The dichotomous division of strategies was studied in our previous works [30], so we considered it possible and appropriate to implement it in this study. The dichotomous separation is based on the choice of two opposing strategies. The opposing strategies are based on the different importance of the factors for their successful implementation. *Table 2* presents the significance of factors for the proposed dichotomous strategies. The importance of the factors was determined by the results of a survey of rural entrepreneurs.

As we can see, for successful implementation of innovation development strategy the importance of factors is higher than for the sustainable develop-ment strategy, which requires more entrepreneurial attention. Strategic choice for the entrepreneur is primarily in their readiness to pay due attention to the strategic development factors.

Table 2. Significance of strategic development factors

Factor	Sustainable development strategy	Innovation development strategy
Relationship to resources	significant	critical
Investor expectations	insignificant	critical
Shareholder / Investor risk tolerance	insignificant	critical
Time horizon for results	significant	critical
Building on market strengths	significant	critical
Size of market	significant	critical
Visibility be (and of) competitors	insignificant	critical
Portfolio management	insignificant	critical
Triage	insignificant	critical
Market regulation	insignificant	critical
Culture development process	significant	significant
Hard infrastructure	significant	significant
Innovation infrastructure	insignificant	critical
Information infrastructure	significant	critical
State support	significant	significant
Municipal support	significant	significant
Support of self-regulatory organizations	insignificant	significant
Source: own compilation.		

The sustainable development strategy is built on the desire of entrepreneurs to avoid economic risks and those types of activities or production, the final result of the implementation of which is extremely difficult to predict. The main goal of a sustainability strategy should be for rural entrepreneurs to maintain their sphere of activity or the sphere of their markets. The focus should be on existing markets, as these are the ones in which the required stability can currently be obtained.

For the successful implementation of this strategy, entrepreneurs must not have serious threats from the consumer, i.e. the consumer must be loyal or interested in the products of local businesses.

The essence of the sustainable development strategy is to improve the main type of business. This option is applicable when there is a need to protect the success already achieved, already won market segment from possible conflicts related to further development of the product and the desire of competitors to use the information obtained and repeat the success of the introduction of a new product. The sustainable development strategy does not require a significant amount of additional financial resources.

Thus, the sustainable development strategy is not a breakthrough strategy of innovation development, it is designed to consolidate the success already achieved, to maintain stability.

The "antipode" of the sustainable development strategy — the innovation development strategy — should be formulated as a variant of the strategy aimed at the conquest of the largest possible market segment. This strategy is based on the development of a new market or expansion of an existing market. For its implementation, there must be a "breaking point" when the consumer begins to show serious interest in the new product due to the identification of significant shortcomings in the old product.

The innovation development strategy is designed for new markets or to expand the geography of sales. It is associated not only with winning or even creating a market, but also with the development of special relationships with suppliers, it implies a higher than usual profit, so suppliers should also

be interested in getting their share of profit and, accordingly, bear their share of responsibility and risk for achieving the goals set in the strategy.

Among the specific properties of entrepreneurial organizations necessary for the successful implementation of this strategy, we should note the mandatory focus on the market, rather than on production. It is the "sense of the market" rather than "technological advancement" that is the main factor for evaluating the prospects of a new idea and implementing it.

This strategy requires significant resources, so rural entrepreneurs who follow it must either have their own resources in sufficient quantities or attract outside investors interested in participating in high-yield, but high-risk projects.

Thus, the strategy of innovative development, which at first consideration seems to be the only possible option for the development of rural entrepreneurial ecosystem, in fact is the most risky option for the development of rural entrepreneurial organizations.

At the same time, one should understand, that for each territory the functionality of the formation and development of the rural entrepreneurial ecosystem and, therefore, the effectiveness of the strategy is determined in a unique way and cannot be transferred to another territory. It follows that the development strategy for each territory will be specific.

The choice of one or another strategy should be determined by the level of cognitive perception of the importance of the above factors of strategic development by entrepreneurs. The innovation strategy can be considered by entrepreneurs only when they are aware of the importance of strategic factors for the successful development of the enterprise, i.e. are able to develop a strategy that takes into account the impact of these factors on the development of the enterprise. Otherwise, if the entrepreneur does not consider these factors significant or believes it impossible to fully analyze

their impact on the development of the enterprise, it is advisable to choose a sustainable development strategy as a conservative-oriented strategy.

Conclusion

The study presented is not aimed at developing a taxonomy of strategies for the development of rural entrepreneurial organizations and an algorithm for the application of strategies. Its purpose is to create a factor model for building strategies of entrepreneurial organizations that adequately respond to the role of rural entrepreneurial ecosystem in the current conditions of Russian rural areas development.

As already noted, the resilience of the ecosystem is not least based on the adequate choice of strategy by actors [31]. The study showed that, at present, rural entrepreneurs do not pay due attention to the long-term development of their enterprises, which leads to the neglect of the factors that have a critical impact on the sustainability of long-term development of enterprises. This neglect eventually leads to a decrease in the resilience of entrepreneurial organizations up to bankruptcy.

The results suggest that the lack of attention from rural entrepreneurs to the analysis of long-term development factors reduces the quality of rural entrepreneurship, the strategic focus of entrepreneurial organizations. The quality and strategic orientation of rural entrepreneurship can be improved if a rural entrepreneurial ecosystem is formed, and, as mentioned above, special attention should be paid to its basis or foundation. The foundation for a rural entrepreneurial ecosystem is its infrastructure, in particular information infrastructure. Small rural entrepreneurs are not able to conduct full-fledged analysis and monitoring of critical factors on a regular basis, but as part of the rural entrepreneurial ecosystem, with the direct participation of other actors, primarily the state and local government, this goal is achievable, which will not only benefit the sustainability of individual entrepreneurial organizations, but will

also synergistically increase the resilience of the entire rural entrepreneurial ecosystem.

Thus, the contribution of this paper to the study of rural entrepreneurship is the creation of a factor model for assessing the strategies of entrepreneurial organizations within the concept of rural entrepreneurial ecosystem, which provides a basis for future research.

Further research on the development strategies of entrepreneurial organizations in rural areas of the Russian Federation will be aimed at developing an index-based economic and mathematical model for assessing the socio-economic functionality of the entrepreneurial ecosystem in rural areas. It should provide comparable information about all aspects of the entrepreneurial ecosystem development of rural areas and timely response to possible deviations.

The scientific novelty and practical significance of the study lie in the development of our own factor model of building strategies for the development of entrepreneurial organizations in the context of the entrepreneurial ecosystem, aimed at ensuring sustainable socio-economic development of rural areas and increasing the competitive environment of the ecosystem. This model can be used in administrative structures in the development of programs to support rural enterprise, as well as in the real economy in the strategic planning and forecasting of development of business organizations.

References

1. Polbitsyn S.N. Russia's rural entrepreneurial ecosystems. *Ekonomika regiona=Economy of Region,* 2019, vol. 15, issue 1, pp. 298−308. DOI: 10.17059/2019-1-23 (in Russian).

2. Malecki E.J. Entrepreneurship and entrepreneurial ecosystems. *Geography Compass*, 2018, no. 12, p. 21. DOI: 10.1111/gec3.12359

3. Solodilova N.Z., Malikov R.I., Grishin K.E. Regional entrepreneurship system: Development parameters and potential of reconfiguration. *Ekonomika regiona=Economy of Region,* 2017, vol. 13, issue 4, pp. 1107−1122. DOI: 10.17059/2017-4-11 (in Russian).

4. Toropov D.I., Kichigina I.S. Small business: Rural dimension. *APK: ekonomika, upravlenie=AIC: Economics, Management,* 2010, no. 2, pp. 39−42 (in Russian).

5. Anthopoulou T., Kaberis N., Petrou M. Aspects and experiences of crisis in rural Greece. Narratives of rural resilience. *Journal of Rural Studies*, 2017, no. 52, pp. 1−11. DOI: 10.1016/j.jrurstud.2017.03.006

6. Acs Z. J., Estrin S., Mickiewicz T., Szerb L. Entrepreneurship, institutional economics, and economic growth: An ecosystem perspective. *Small Business Economics*, 2018, no. 51, pp. 501−514. DOI: 10.1007/s11187-018-0013-9

7. Stam E., van de Ven A. Entrepreneurial ecosystem elements. *Small Business Economics,* 2021, no. 56, pp. 809−832. DOI: 10.1007/s11187-019-00270-6

8. Polbitsyn S.N. *Teoretiko-metodologicheskie podkhody k formirovaniyu agroinnovatsionnoi sistemy* [Theoretical and Methodological Approaches to the Formation of the Agro-Innovation System]. Ur. gos. agrar. un-t, Yekaterinburg, 2015.

9. Stam E. Entrepreneurial ecosystems and regional policy: A sympathetic critique. *European Planning Studies,* 2015, 23, pp. 1759−1769. DOI: 10.1080/09654313.2015.1061484

10. Acs Z. J., Stam E., Audretsch D.B., O'connor A. The lineages of the entrepreneurial ecosystem approach. *Small Business Economics*, 2017, 49, pp. 1−10. DOI: 10.1007/s11187-017-9864-8

11. Porter M.E. How competitive forces shape strategy. *Harvard Business Review*, 1979, no. 57, pp. 137−145.

12. Polbitsyn S.N. Identifying hurdles for innovators: The case of Russian rural areas. In: *Proceedings of the 6th International Conference Innovation Management, Entrepreneurship and Sustainability, Prague, May 31 − June 1, 2018.* Pp. 924−932.

13. Anderson A.R., Jack S.L. The articulation of social capital in entrepreneurial networks: A glue or a lubricant? *Entrepreneurship and Regional Development,* 2002, no. 14, pp. 193–210. DOI: 10.1080/08985620110112079

14. Klyuev A.K., Yashin A.A. Business education programs in a modern university. *Vysshee obrazovanie v Rossii=Higher Education in Russia,* 2016, no. 1, pp. 22–33 (in Russian).

15. Martin B.C., Mcnally J.J., Kay M.J. Examining the formation of human capital in entrepreneurship: A meta-analysis of entrepreneurship education outcomes. *Journal of Business Venturing,* 2013, no. 28, pp. 211–224. DOI: 10.1016/j.jbusvent.2012.03.002

16. Voroshilov N.V. Assessing the socio-economic potential of rural territories. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2021, vol. 14, no. 1, pp. 91–109. DOI: 10.15838/esc.2021.1.73.7 (in Russian).

17. Chen C., Woods M., Chen J., Liu Y., Gao J. Globalization, state intervention, local action and rural locality reconstitution – a case study from rural China. *Habitat International*, 2019, no. 93, 102052. DOI: 10.1016/j.habitatint.2019.102052

18. Attneave F.A. Method of graded dichotomies for the scaling of judgments. *Psychological Review*, 1949, no. 56, pp. 334–340. DOI: 10.1037/h0063110

19. Il'inykh S.A. Entrepreneurship in Russia: Analysis of the factors of influence. *Problemy sovremennoi ekonomiki=Problems of Modern Economics,* 2015, no. 2(54), pp. 153–156 (in Russian).

20. Gineite M., Vilcina A. Interaction of local governments and entrepreneurship. In: *Economic Science for Rural Development: Sustainability.* 2011. Pp. 61–66.

21. Spigel B., Harrison R. Toward a process theory of entrepreneurial ecosystems. *Strategic Entrepreneurship Journal*, 2018, no. 12, pp. 151–168. DOI: 10.1002/sej.1268

22. Sovetova N.P. Rural territories' digitalization: From theory to practice. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2021, vol. 14, no. 2, pp. 105–124. DOI: 10.15838/esc.2021.2.74.7 (in Russian).

23. Davis A., Olson E.M. Critical competitive strategy issues every entrepreneur should consider before going into business. *Business Horizons*, 2008, no. 51, pp. 211–221. DOI: 10.1016/j.bushor.2008.01.010

24. Borubaeva G.N. The system of factors determining the strategy of sustainable development of entrepreneurial activity in agriculture. *Novaya nauka: Sovremennoe sostoyanie i puti razvitiya=The New Science: Current State and Ways of Development,* 2016, no. 8, pp. 204–206 (in Russian).

25. Eisenhardt K.M. Building theories from case-study research. *Academy of Management Review,* 1989, no. 14, pp. 532–550. DOI: 10.2307/258557

26. Mokina L.S. Tendencies of development of the agrarian sector of Sverdlovsk region at the present stage. *Ovoshchi Rossii=Ovoši Rossii,* 2018, no. 4(42), pp. 55–61 (in Russian).

27. Norman G. Likert scales, levels of measurement and the "laws" of statistics. *Advances in Health Sciences Education,* 2010, no. 15, pp. 625–632. DOI: 10.1007/s10459-010-9222-y

28. Harpe S.E. How to analyze Likert and other rating scale data. *Currents in Pharmacy Teaching and Learning*, 2015, no. 7, pp. 836–850. DOI: 10.1016/j.cptl.2015.08.001

29. Murray J.A. A concept of entrepreneurial strategy. *Strat. Mgmt. J.*, 1984, no. 5, pp. 1–13. DOI: https://doi.org/10.1002/smj.4250050102

30. Polbitsyn S.N. The role of entrepreneurship in the sustainable development of rural areas in Russia. *Ekonomika regiona=Economy of Region,* 2021, vol. 17, issue 2, pp. 619–631. DOI: 10.17059/ekon.reg.2021-2-1 (in Russian).

31. Goschin Z. What makes new firms resilient? A spatial analysis for Romania. *Regional Science Policy and Practice*, 2020, no. 12, pp. 907–924. DOI: 10.1111/rsp3.12344

32. Shams R., Kaufmann H.R. Entrepreneurial co-creation: A research vision to be materialised. *Management Decision*, 2016, no. 54(6), pp. 1250–1268. Available at: https://doi.org/10.1108/md-11-2015-0487

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PUBLIC ADMINISTRATION

Inter-Municipal Cooperation in Russia: Status, Problems and Prospects of Development*

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Abstract. The relevance of the studies on features and problems of how inter-municipal cooperation is organized in Russia is due to the need for favorable regulatory, financial and organizational conditions to promote the development of various forms of such cooperation, including increasing the scale of distribution, substantiating the role of this administrative mechanism in the development of municipalities. We also take into account the need for the Government of the Russian Federation to develop in 2021 a draft of new foundations of the state policy of the Russian Federation in the field of local government development until 2030. Accordingly, the article aims to analyze the current state and problems of organizing inter-municipal cooperation in Russia, to determine the criteria for the necessity and choice of the cooperation form, to substantiate the directions for improving its organization. To achieve the goal, we use such scientific methods as economic and statistical analysis, methods of generalization and expert survey (questionnaire survey of heads of municipal entities of RF constituent entities belonging to the European North of Russia). The scientific novelty of the research lies in the substantiation of a model (algorithm) for determining the very expediency and choice of inter-municipal cooperation organization form. The study shows that currently in Russia, inter-municipal cooperation is mainly carried out in the form of the functioning of the councils of municipalities within RF constituent entities, the conclusion of framework agreements, agreements between municipalities on mutual action, coordination of efforts,

and implementation of joint activities. Only 2.8% of the total number of municipalities in the country participate in cooperation most closely (establishing inter-municipal organizations). We have developed appropriate recommendations to the authorities to eliminate the existing obstacles and problems in the development of inter-municipal cooperation. The results of the conducted research can be used in the activities of federal, regional public authorities, local government bodies, and serve as a basis for further research on improving local management system.

Key words: local government, inter-municipal cooperation, municipalities, European North of Russia, constituent entity of the Russian Federation, questionnaire survey.

Introduction

In today's complex and rapidly changing socio-economic conditions, municipalities' sustainable development is possible only with the effective use of the existing potential for territories' development, the formation of favorable external controlled factors for municipalities' development (federal and regional legislation, the fiscal system and the system of inter-budgetary relations, an effective mechanism of interaction between public authorities and local governments, etc.), as well as combining efforts and resources of various municipalities to solve common issues and development problems.

However, the results of a survey of heads of municipal entities of the subjects of the Russian Federation belonging to the European North of Russia[1] (hereinafter − ENR) conducted in 2020 show that the main problems of the institute of local self-government are insufficient financial resources (shortage of own income sources, insufficient financial support from the state); passivity of the local population; insufficiently effective interaction with public authorities (dependence on public authorities of the subject of the Russian Federation,

bureaucratic obstacles in the interaction between the levels of government); general imperfection of legislation concerning municipal powers' functioning and development, and the presence of powers that are not directly related to the institution of local self-government, limited powers in the field of economic development of the municipality (more than half of all respondents indicated these problems and factors).

Most of the Russian municipalities (mainly settlements) currently do not have sufficient funds and material resources necessary for the development and implementation of plans and programs of socio-economic development, focused on both the effective and complete solution of all issues of local importance, and the prompt solution of all existing problems. According to the results of 2020, the share of own (tax and non-tax) revenues in the total volume of local budget revenues amounted to only 33% on average for all municipalities of Russia (and it was minimal in municipal districts making up only 23%; *Tab. 1*). Accordingly, most of the revenues of local budgets are gratuitous receipts from higher budgets (grants, subventions, subsidies and other inter-budget transfers), the volume of which is not stable and cannot be projected for a period of more than 1 year.

We should also note that the majority of municipal districts and rural settlements of the entities of the Russian Federation belonging to the ENR are sparsely populated. At the end of 2019,

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[1] A questionnaire survey of heads of municipalities and of municipalities' administrations of the Arkhangelsk, Vologda, Murmansk oblasts, the Republics of Karelia and Komi, Nenets Autonomous Okrug was conducted with the direct participation of the author of the article in August - December 2020. The questionnaire was sent to all 778 municipalities of these entities of the Russian Federation (to the official municipalities' e-mails). The number of questionnaires received and completed allowed for a sampling error of no more than 5%.

Table 1. Share of own (tax and non-tax) revenues in the total revenue of local budgets in 2020, %

Type of municipality	RF	Republic of Karelia	Komi Republic	Arkhangelsk Oblast	Nenets AO	Vologda Oblast	Murmansk Oblast
Municipal districts	23.4	26.4	27.4	14.8	97.6	27.8	23.8
Municipal okrugs	-	-	-	-	-	-	-
Urban districts	37.2	31.0	30.7	39.3	85.1	38.0	43.3
Urban districts with intra-urban division	34.7	-	-	-	-	-	-
Inner-city districts	44.2	-	-	-	-	-	-
Inner-city territories of cities of federal importance	63.2	-	-	-	-	-	-
Urban settlements	47.8	37.7	52.0	38.1	36.9	35.2	37.5
Rural settlements	31.6	45.0	12.1	26.2	11.1	23.1	37.0
On average for all municipalities	32.6	29.8	29.3	29.4	68.5	32.4	39.1

Source: Reports on the execution of consolidated budgets of entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Official website of the Federal Treasury of the Russian Federation. Available at: https://roskazna.gov.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov/

more than half of the districts had less than 20 thousand inhabitants (the population in 19–20% of the districts of the Vologda and Murmansk oblasts is less than 10 thousand inhabitants)[2]; more than half of rural settlements have a population of less than 1 thousand people (36% of settlements in the Komi Republic have population of less than 500 people). This leads to the fact that such sparsely populated territories cannot attract large investors, as a rule, they are characterized by a lower own budget potential, and also lose competition for migrants, budget support funds from the subject of the Russian Federation to other, more populated municipalities.

Development of inter-municipal cooperation may be one of the ways to solve the problem of insufficiency of the financial and economic base of municipalities. According to E.A. Gutnikova, this means, "combining efforts, material and non-material resources of local self-government bodies of municipalities on a mutually beneficial basis to create public goods or provide public services" [1].

In our opinion, there are two approaches to understanding inter-municipal cooperation: in a broad sense, it is any interaction, contacts of municipalities with each other in order to exchange experience, jointly solve issues and problems of local significance, provide services to the population; in a narrow sense, it is various forms of municipalities' interaction based on agreements, contracts, decisions of local self-government bodies (associative, contractual and economic cooperation). In this study, we will consider precisely the "narrow" understanding of cooperation.

Inter-municipal cooperation helps to reduce the costs of solving individual problems of local importance, the emergence of a cumulative effect in the implementation of projects, and ultimately to increase the overall level of territory's development. Accordingly, from a scientific and practical point of view, it is important to analyze the current state and problems of organizing inter-municipal cooperation in Russia, to determine the criteria for its necessity, to substantiate the directions for improving this management mechanism, which is the purpose of the presented study.

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[2] Population of the Russian Federation by municipality: stat. bulletin. Federal State Statistics Service. Available at: https://rosstat.gov.ru/folder/11110/document/13282

Forms of inter-municipal cooperation in Russia and the countries of the world

The European Charter of Local Self-Government (signed by the member States of the Council of Europe on October 15, 1985 in Strasbourg; in Russia it is ratified by Federal Law 55-FZ of April 11, 1998 and entered into force for the Russian Federation on September 1, 1998) states that "local self-government bodies have the right to cooperate and unite with other local self-government bodies to perform tasks of common interest within the limits established by law".

In foreign practice, inter-municipal cooperation has become widespread and is carried out in various forms: inter-municipal councils (Finland); syndicates (France, Spain); districts, communities, communes, agglomerations, urban communities (France); regional development agencies (Germany); Chicago Metropolitan Planning Agency (USA); joint administrations (Denmark, Germany); transfer of powers between municipalities (Germany); centers, institutes, bureaus, societies, research institutes, Credit Association of Local authorities (within the framework of the activities of the National Association of Local Authorities) (Denmark); cooperative societies, joint-stock companies, partnerships (Denmark); limited liability company (Denmark, Bulgaria); purchase of services by one municipality from another (Denmark) [2].

Associative forms of inter-municipal interaction (associations, councils) have shown the greatest development abroad; they are created not so much for the purpose of protecting the political rights of municipalities and promoting their interests, as for the development of management technologies (creation of various bodies, from coordinating to managing); protection of municipal services' professional interests; pooling the resources of municipalities in the form of various commercial and non-commercial economic entities with associations to provide services to municipalities [2].

In the Federal Republic of Germany (FRG), all communes' tasks of the responsibilities, as well as transferred state powers, can be the subject of inter-municipal cooperation. Separate laws of federal states establish the specifics of the application of various legal cooperation forms. The most common areas of cooperation in Germany are regional marketing and tourism development; water supply and water management; information technology; economic and employment promotion; territorial (spatial) planning [3].

In Germany, there are public and private law forms of inter-municipal cooperation. The most commonly used public law forms are a public law contract (among other things it may provide the transfer of a separate task from one commune to another), merged municipal units or a union of administrative units. In contrast to public legal forms, private legal forms (limited liability companies and target associations) are considered only where cities and communities carry out economic (entrepreneurial) activities [3].

Thus, in many European countries, the legal status of an inter-municipal association as a subject of public law is regulated in sufficient detail, and its activities are controlled from two sides: the state and the local community. In particular, a number of states have adopted special laws in the regions (for example, in the federal states of Germany) regulating the procedure for the creation and functioning of inter-municipal organizations [2]. The forms of economic entities are similar to the Russian ones, but the possibilities for municipalities' participation in them are much wider.

Analysis of the current Russian legislation (in particular Federal Law 131-FZ, dated October 6, 2003 "On the general organizational principles of local self-government in the Russian Federation", hereinafter 131-FZ) allows us to conclude that, depending on the goals and organizational and legal content, inter-municipal cooperation can be carried out in three main forms [4]:

1. *"Associative" cooperation* (councils and other municipal entities associations; Paragraphs 1–3 of Article 8, Articles 66–67 of 131-FZ). An example of this form of cooperation is the creation of a Single All-Russian Association of Municipal Formations – the All-Russian Congress of Municipalities (OKMO) which was founded in 2006 by the municipalities' councils of the entities of the Russian Federation (currently they are functioning in all 85 subjects of the Russian Federation). The purpose of OKMO and the councils' activities is to organize interaction and cooperation of municipalities, to express and protect the municipalities' interests in dialogue with public authorities.

In 2019, the All-Russian Association for Local Self-Government Development was established, which currently includes all 85 regional associations – municipalities' councils of the entities of the Russian Federation. The founders of the association were the All-Russian Congress of Municipal Formations, the All-Russian Council of Local Self-Government, the Union of Russian Cities, the International Assembly of Capitals and Large Cities, the Association for the Development of Urban Settlements "Russian Province", the Association of Closed Administrative-Territorial Entities of the Nuclear Industry, the Association of Volga Region Cities, the Union of Cities of the Center and North-West of Russia.

2. *"Contractual" cooperation* (conclusion of contracts and agreements on cooperation, joint activities between municipalities; Paragraph 4 of Article 8 of 131-FZ). This form of cooperation includes various agreements of intent, agreements on cooperation, exchange of experience, provision of methodological and advisory assistance on various issues related to the jurisdiction of municipalities, as well as agreements between settlements and the municipal district on the transfer of part of the powers from the settlement level to the district level, and vice versa in some cases.

It should be noted that in accordance with Federal Law 307-FZ dated August 2, 2019, the Budget Code of the Russian Federation has been amended to provide for the possibility of providing "horizontal" subsidies at the municipal level, that is, subsidies from one local budget to another local budget, in order to co-finance expenditure obligations arising from the exercise of the powers of local self-government bodies to address issues of local importance. The purposes and conditions for the provision of these subsidies are established by agreements between local administrations concluded in accordance with the procedure established by the decision of the representative body of the municipality which provided the subsidy.

3. *"Economic" cooperation* (creation of economic and non-commercial inter-municipal organizations; Paragraph 4 of Article 8, Articles 68–69 of 131-FZ).

Inter-municipal organizations can be formed in order to combine financial resources, material and other resources to solve issues of local importance. Inter-municipal associations and organizations may not be vested with the powers of local self-government bodies.

In accordance with Article 68 of 131-FZ, the representative bodies of municipal entities may take decisions on establishing inter-municipal business companies in the form of non-public joint stock companies (NAO) and limited liability companies (OOO). Inter-municipal business companies operate in accordance with the Civil Code of the Russian Federation and other federal laws. Local self-government bodies can also act as co-founders of an inter-municipal public mass media. In accordance with Article 69 of 131-FZ, representative bodies of municipalities may take decisions on establishing non-profit organizations (NPOs) in the form of autonomous non-commercial organizations (ANO) and foundations. NPOs of municipalities operate in accordance with the Civil Code of the Russian Federation, the

federal law on non-profit organizations, and other federal laws.

The Spatial Development Strategy of the Russian Federation for the period up to 2025 (approved by the Decree of the Government of the Russian Federation no. 207-p dated February 13, 2019) identifies the unrealized potential of interregional and inter-municipal interaction as one of the problems of the country's spatial development. Accordingly, the promotion of interregional and inter-municipal cooperation is indicated as one of the principles of spatial development. The Strategy pays special attention to the development of inter-municipal cooperation in the largest urban agglomerations.

In March 2020, following the meeting of the Council for the Development of Local Self-Government held on January 30, 2020, the President of the Russian Federation approved a list of instructions. The key task is to instruct the Government of the Russian Federation to submit, by October 1, 2021, a draft of the new Foundations of the State Policy of the Russian Federation in the field of local self-government development until 2030. This conceptual document, which is to define the long-term orientations and the role of the local self-government institution in the country's development, should reflect the organizational foundations of the local self-government functioning and effective mechanisms for its implementation. Inter-municipal cooperation is certainly in this list.

Research methodology and its justification

Foreign [3; 5–13] and Russian [1; 2; 14–31] scientists and experts consider various aspects of the analysis, functioning and development of inter-municipal cooperation in various areas of territorial development: its forms in the countries of the world are revealed; regulatory, organizational and other bases are considered; methodological tools for assessing the effects of the organization of inter-municipal cooperation are proposed;

directions for improving the forms of cooperation and mechanisms for its implementation are substantiated.

The analysis of the existing foreign and Russian practice shows that the main advantages and effects of inter-municipal cooperation are the following[3]:

1) economies due to scale (an increase in the number of consumers and the scale of the service decreases the unit cost of the service provision);

2) improving the services quality (combining financial opportunities to provide a particular service can also improve its quality while maintaining the previous costs through the use of more technological installations, more qualified personnel, etc.);

3) completeness of the coverage of the territory of the services provision (cooperation in the provision of individual services is provided by the costs of all participants in the services provision);

4) ensuring the functioning of inter-municipal infrastructure (tools of inter-municipal cooperation allow solving the problem of joint management of such infrastructure);

5) attracting investments (a larger entity of economic relations appears, which makes it possible to attract investors more effectively and successfully, engage in territory marketing);

6) external financing (within the framework of inter-municipal cooperation, socially and economically significant projects for the regional level can be proposed, which can be supported by financial resources from higher budget levels).

To assess the economic effects of the organization of inter-municipal cooperation (in the framework of such forms as the transfer of powers to another level, the joint solution of individual issues by different municipalities, the transfer of

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[3] Materials for the meeting on the topic "Inter-municipal cooperation: effective practices, problems and development prospects". Council of the Federation of the Federal Assembly of the Russian Federation. Moscow, 2020. 110 p. Available at: http://council.gov.ru/media/files/Q5IE1LyY7WAJI7uUU8ds IsA5pMglm4IT.pdf

the solution of a separate task of local development to a specially created inter-municipal organization), scientists propose various approaches.

Thus, E.S. Arumova[4] formalized and tested an algorithm for calculating the effectiveness of inter-municipal cooperation based on the use of indicators of the expenditure part of budgets and budgetary provision of rural municipalities, which can be used to make a decision on inter-municipal cooperation. To analyze the effectiveness of the cooperation of municipalities, the author proposes to estimate the cost of implementing the authority per inhabitant without taking into account inter-municipal cooperation and considering it. In this case, personnel, administrative, material and technical resources (PAMTR) are also calculated, which affect the cost of providing budgetary services that are spent on the implementation of the authority). The PAMTR indicator is calculated using the following formula:

$$PAMTR = P \cdot BPR_{LR} \cdot BNR_{MTC}, \qquad (1)$$

where P is the total amount of expenses for the implementation of the authority of the municipality; BPR_{LR} is the basic standard for reducing the cost of remuneration of municipal employees of the i-th municipality in the joint exercise of authority; BNR_{MTC} is the basic standard for reducing the cost of material and technical costs per staff unit of the i-th municipality in the joint exercise of authority.

Inter-municipal cooperation is advisable if the cost of implementing the authority per inhabitant in cooperation is less than when performing it independently.

M.V. Zinchenko[5] suggests assessing "the impact of inter-municipal integration on the main indicator

of the development of a municipal area – gross municipal product. Integrated inter-municipal entities provide an additional effect, which is that the total effect of their activities is greater than the sum of the effects of the activities of individual municipalities. When creating an inter-municipal integrated structure, there is also a social effect, which consists primarily in increasing (or preserving) jobs and wage growth".

The effect of inter-municipal integration in the municipal gross product of the district can be represented by the following formula:

$$MGP_{R(IMC)} = \Delta A_M / B_M, \qquad (2)$$

where ΔA_M is the increase in the gross municipal product of the district after the creation of an inter-municipal integrated structure; B_M is the cost of creating and operating an inter-municipal integrated structure.

At the same time, the results of the study of the theoretical aspects of inter-municipal cooperation allow us to assert that the issues of determining the expediency of organizing cooperation itself between various municipalities and its various forms are not fully worked out. In addition, the current Russian practice of transforming the municipal-territorial structure in terms of large-scale unification of rural and urban settlements, as well as the transformation of municipal districts into urban districts (in some subjects of the Russian Federation since 2011) and municipal districts (since 2019) with the liquidation of the settlement level of management indicates the replacement of possible inter-municipal cooperation of settlements by the functioning of local self-government bodies and municipal organizations of a new, unified, larger municipality (enlarged settlement, city or municipal district). These points are taken into account in the approach proposed below to determining the expediency and choosing the form of inter-municipal cooperation, which makes up the scientific novelty of the study. This methodological approach was based on

⁴ Arumova E.S. Organizational schemes and mechanisms of inter-municipal cooperation: Ph.D. in Economics dissertation abstract: 08.00.05. Krasnodar, 2012, 29 pp.

⁵ Zinchenko M.V. Inter-municipal integration as a factor in managing the development of the economic system of the territory: Ph.D. in Economics dissertation abstract. Khabarovsk, 2008, 23 pp.

the analysis, systematization of experience and identification of problems of the inter-municipal cooperation organization in Russia, problems of functioning of the local self-government institute, taking into account current trends in the municipal-territorial structure, the need to create favorable conditions for expanding the practice of applying such a management mechanism.

Conclusions and proposals are substantiated by the results of analysis of not only statistical data (Rosstat information), but also information on the execution of local budgets (database of Russia's municipalities indicators), analysis of organization of various forms of inter-municipal cooperation in the entities of the Russian Federation (data from the Internet and the Federal Tax Service of the Russian Federation), as well as the results of a questionnaire survey of municipalities' heads of the macro-region — the European North of Russia, conducted in 2020 with the direct participation of the author of the article. The research was based on the use of general scientific (analysis, synthesis, generalization, comparison) and applied (statistical and economic analysis) methods.

Research results

As of January 1, 2020, 20,846 municipal entities were functioning on the territory of Russia, which is 3,361 units less than in 2006 and 3,061 less than in 2009 (*Tab. 2*). The most significant reduction in the number of municipalities among the regions of the European North of Russia (by 51%) for 2006–2019 occurred in the Vologda Oblast (due to the active rural settlements unification).

As of the end of 2019, 2,075 municipalities (96.3% of their total number) participated in the activities of associations of municipal entities and inter-municipal non-profit organizations, 521 municipalities (2.8%) — inter-municipal commercial organizations (*Tab. 3*). Over 13 years, the number of municipalities participating in the activities of inter-municipal economic societies in the whole country increased by 346 units or 2.4 times. According to Rosstat data, at the end of 2019, only 18 municipalities in the regions of the European North of Russia (all of them are in the Vologda Oblast) participated in inter-municipal commercial organizations.

The analysis of business companies and non-commercial organizations registered in the regions of the European North of Russia, conducted on the basis of data from the Federal Tax Service of the Russian Federation, showed that they all belong to the housing and utilities sector (types of activities are "management of housing stock operation", "production, transmission and distribution of steam and hot water (thermal energy)", etc.; *Tab. 4*). At the same time, a number of inter-municipal organizations have been liquidated in recent

Table 2. Dynamics of the number of municipalities at the end of the year, units

Territory	2006		2009	2019					2019 to 2006, %	
	Total	RS	Total	Total	MD	UD	US	RS	Total	RS
RF	24207	19919	23907	20846	1673	632	1398	16821	86.1	84.4
Republic of Karelia	127	87	127	125	16	2	22	85	98.4	97.7
Komi Republic	211	175	211	178	14	6	14	144	84.4	82.3
Arkhangelsk Oblast	229	179	229	203	19	7	20	157	88.6	87.7
Nenets Autonomous Okrug	21	18	21	21	1	1	1	18	100.0	100.0
Vologda Oblast	372	322	302	207	26	2	21	158	55.6	49.1
Murmansk Oblast	42	10	40	40	5	12	13	10	95.2	100.0

Designations: MD – municipal district, UD – urban district, US – urban settlement, RS – rural settlement.
Note: at the end of 2019, 33 municipal districts, 3 urban districts with intra-urban division, 19 inner-city districts and 267 inner-city territories of federal cities also functioned in Russia.
According to: Formation of local self-government in the Russian Federation: Statistics bulletin. Federal State Statistics Service. Available at: https://rosstat.gov.ru/folder/11110/document/13263

Table 3. Dynamics of the number of municipalities participating in organizations
of inter-municipal cooperation in 2006-2019, units

Territory	Number of municipalities participating in associations of municipal entities, in inter-municipal NPOs on a voluntary basis				Number of municipalities participating in associations of municipal entities, in inter-municipal NPOs on a voluntary basis			
	2006	2009	2019	2019 to 2006, %	2006	2009	2019	2019 to 2006, %
RF	21798	20890	20075	92.1	241	547	587	243.6
Republic of Karelia	47	47	125	266.0	0	1	0	-
Komi Republic	210	211	178	84.8	0	7	0	-
Arkhangelsk Oblast	214	213	189	88.3	0	0	0	-
Nenets Autonomous Okrug	20	20	18	90.0	0	0	0	-
Vologda Oblast	371	301	207	55.8	27	0	18	66.7
Murmansk Oblast	41	40	40	97.6	0	0	0	-
According to: Formation of local self-government in the Russian Federation: Statistics bulletin. Federal State Statistics Service. Available at: https://rosstat.gov.ru/folder/11110/document/13263								

Table 4. Examples of existing inter-municipal organizations in the territory of the European North of Russia

Organization name	Types of economic activity of the organization
OOO "Inter-municipal Enterprise "Suoyarvi Management Company" (founders: administrations of Suoyarva District, Veshkelsky, Naistenyarvsky, Loymolsky rural settlements of the Republic of Karelia)	68.32.1 Management of the operation of the housing stock for remuneration or on a contractual basis; 37.00 Collection and treatment of wastewater; 41.20 Construction of residential and non-residential buildings, etc.
OOO "Inter-municipal housing and communal organization" (founders: administrations of Valdai, Idel, Popovporozhsky, Chernoporozhsky rural settlements of the Republic of Karelia)	68.32.1 Management of the operation of the housing stock for remuneration or on a contractual basis; 35.11.4 Production of electricity obtained from renewable energy sources, including those generated by solar, wind, geothermal power plants, including activities to ensure their operability; 35.30.14 Production of steam and hot water (thermal energy) by boiler houses, etc.
OOO Inter-municipal enterprise "Inter-district electric heating networks" (founded by the administrations of Kharovsky, Belozersky, Vytegorsky districts of the Vologda Oblast)	35.30.1 Steam and hot water production (thermal energy); 33.14 Repair of electrical equipment; 35.12 Transmission of electricity and technological connection to distribution power grids, etc.
According to: Information on the state registration of legal entities, individual entrepreneurs, farming households. Federal Tax Service of the Russian Federation. Available at: https://egrul.nalog.ru/	

years, or organizations are currently in liquidation or bankruptcy, respectively, they do not carry out their activity any longer. Hence, there are also noticeable discrepancies in the number of municipalities participating in economic inter-municipal cooperation according to Rosstat, and the number of municipalities that are founders of inter-municipal organizations according to the Federal Tax Service.

As an example of specific areas, mechanisms of cooperation between municipalities within the urban agglomeration, we can cite the cooperation of Vologda with three adjacent districts of the region (*Tab. 5*).

According to the results of a survey of the municipalities' heads of the European North of Russia, conducted in 2020, the most common forms of interaction between municipalities were identified as follows:

— exchange of experience in the government bodies' activities in resolving issues and problems of local importance (81% of the surveyed indicated this; *Tab. 6*);

— organizing and holding joint events (44%);

— pendulum migration (regular, daily trips of the population from one settlement, place of residence to another to work or study and vice versa; 43%).

Table 5. Existing forms of interaction between the city of Vologda
and adjacent districts included in the Vologda agglomeration

District	Areas of cooperation
Vologodsky District	– In October 2010, an Agreement on Cooperation between the Vologda City Administration and Vologodsky District was signed, which provides for the creation of conditions for the development of trade and expansion of the agricultural market. - On November 2, 2011, an Agreement on cooperation between the Administration of the city of Vologda and Vologodsky District was signed in the development of small and medium-sized businesses, folk arts and crafts, as well as tourism. - On November 16, 2012, another agreement on cooperation in the field of agriculture and processing industry between the regional center and Vologodsky District was signed. - In 2014, an agreement on cooperation was signed between the municipal formation "City of Vologda" and the municipal formation Vologodsky Municipal District in order to: 1) creating conditions for providing residents of the city of Vologda and Vologodsky Municipal District with trade services; 2) creating conditions for expanding the market for agricultural products, raw materials and food; promoting the development of small and medium-sized businesses; 3) increasing the competitiveness of local producers. The subject of the agreement is to unite the efforts of the city and district authorities aimed at mutually beneficial cooperation of the executive and administrative bodies of local self-government on the implementation of issues of local significance of the city and the municipal district to achieve the goals of the agreement on the principles of equality, mutual understanding, respect and trust. As part of the execution of the agreement, its parties assume the following obligations: to inform the other party about the ongoing fair events, fairs and exhibitions planned to be held in the city of Vologda and Vologodsky District; take part in the organization and conduct of city and regional exhibitions, fairs, celebrations, conferences and forums; take part in the implementation of the project "Zabota" City Discount Card"; ensure that information about the activities carried out is brought to the attention of citizens, small and medium-sized businesses, and other business entities; create optimal conditions for the participation of the population of the city of Vologda and Vologodsky District in fairs, fairs-exhibitions, festive events held at the initiative of the Parties; to assist the development of small and medium-sized businesses in the field of trade and the development of the market for agricultural products, raw materials and food. In order to implement the provisions of the agreement, the parties can create joint working bodies (working groups), as well as develop and adopt joint working documents (programs, plans for joint activities), hold bilateral consultations, working meetings and seminars.
Gryazovetsky District	- On February 15, 2013, a cooperation agreement between the city of Vologda and Gryazovetsky District was signed. The purpose of the agreement is to create conditions for providing residents of the district with trade services (unimpeded participation of the district's commodity producers in exhibitions-fairs in Vologda); promoting the development of small and medium-sized businesses; increasing the competitiveness of local producers; informing the population and producers about cultural events held by both parties; creation of joint working groups, seminars, consultations on various aspects of trading activities. - On July 8, 2014, agreements between the Administration of Gryazovetsky Municipal District and trade organizations for participation in the project "Zabota Card – Gryazovetsky District" were signed.
Sokolsky District	- On March 15, 2016, an agreement between the city of Vologda and Sokolsky District on cooperation on the social project "Discount card Zabota" was signed. On July 19, 2016, a cooperation agreement by the head of the city of Vologda and the head of the town of Kadnikov was signed.
Districts of the region that are not included in the agglomeration	The city of Vologda is cooperating with many districts of the region within the framework of the social project "Zabota", which was launched in Vologda on December 15, 2009, and since 2016, 23 districts of the region have joined it. The project involves the issuance of discount cards to certain categories of citizens (pensioners, veterans, etc.), which can be used in a number of municipalities' shops and gas stations, as well as the creation of cultural and leisure centers "Zabota" in the region's districts, following the example of such a center in Vologda.
According to: Information of the official websites of the Administrations of the city of Vologda, Vologodsky, Gryazovetsky and Sokolsky municipal districts of the Vologda Oblast.

Table 6. Distribution of respondents' answers to the question "What forms of interaction of your municipality with the neighboring (having common borders) ones (settlements, districts, urban districts) do you know?", % of respondents

Answer option	RS	US	MD	UO	On average for all municipalities
Exchange of experience in the authorities' activities in solving issues and problems of local significance	87.8	70.0	79.4	57.1	81.4
Organization and holding of joint events, projects	34.1	60.0	64.7	35.7	43.6
Pendulum migration (regular, daily trips of the population from one locality, place of residence to another to work or study and back)	37.8	60.0	44.1	57.1	42.9
Within the framework of agreements concluded with local self-government bodies	28.0	10.0	44.1	14.3	29.3
Availability of production and economic relations between enterprises, organizations from neighboring municipalities	13.4	20.0	38.2	35.7	22.1
Using the neighboring municipality's resources (natural, etc.)	9.8	10.0	17.6	21.4	12.9
Organization of joint maintenance and development of infra-structure	8.5	20.0	2.9	14.3	8.6
Development of mobile forms of public services	6.1	10.0	8.8	0.0	6.4
According to: Results of the survey of municipalities' heads, 2020 (here and Tables 7, 8).					

In turn, the priority areas of cooperation of municipalities' local self-government bodies, according to the heads, are (on average, more than a third of respondents chose these answer options; *Tab. 7*) creation and development of common links, infrastructure facilities; joint use and development of existing infrastructure (roads, communications, services, etc.); development of industrial and economic ties.

The municipalities' heads advocate the development of closer cooperation with other municipalities in various areas and in various spheres, but in practice only organizational and informational forms of cooperation are being implemented so far. In many ways, this situation is connected with the existence of a number of legislative, organizational, financial and other problems, obstacles, the key of which, according to the heads of municipalities, are: lack of financial opportunities for cooperation, experience in organizing and implementing inter-municipal projects and programs in the social and economic sphere; lack of trained managerial personnel capable of managing these processes effectively (*Tab. 8*).

Table 7. Distribution of respondents' answers to the question "Which areas of inter-municipal cooperation are the most priority for your municipality to participate in it?", % of the number of respondents

Area	RS	US	MD	UO	On average for all municipalities
Creation and development of common links, infrastructure facilities, for example, a single housing and communal services sector, water supply systems, solid waste disposal, etc.	57.1	60.0	32.4	42.9	49.6
Sharing and development of existing infrastructure (roads, communications, services, etc.)	29.9	40.0	50.0	28.6	35.6
Development of industrial and economic relations	22.1	30.0	55.9	42.9	33.3
Involving specialists serving several settlements	39.0	30.0	17.6	7.1	29.6
Development of interrelations in the legislative and legal sphere (association for the protection of common interests at various levels)	35.1	20.0	20.6	7.1	27.4
Transfer of powers for more effective implementation	32.5	20.0	23.5	0.0	25.9
Inter-municipal humanitarian contacts, interaction in the field of culture	19.5	10.0	32.4	28.6	23.0
Solving environmental safety problems	18.2	20.0	29.4	35.7	23.0

Area	RS	US	MD	UO	On average for all municipalities
Development of certain types of economic activity	11.7	0.0	29.4	42.9	18.5
Sharing of natural resources	22.1	10.0	17.6	0.0	17.8
Development of trade relations	13.0	30.0	23.5	14.3	17.0
Development of mobile forms of public services	13.0	0.0	11.8	0.0	10.4
Interaction in the field of education, for example, the creation of school districts	3.9	0.0	11.8	14.3	6.7

Table 8. Distribution of respondents' answers to the question "What, in your opinion, hinders the development of inter-municipal cooperation?", % of respondents

Factor	RS	US	MD	UO	On average for all municipalities
Lack of financial opportunities for such cooperation	69.1	44.4	44.1	71.4	61.6
Lack of experience in organizing and implementing inter-municipal projects and programs in the social and economic spheres	46.9	44.4	61.8	71.4	52.9
Lack of trained managerial personnel capable of effectively managing these processes	35.8	66.7	61.8	28.6	43.5
Lack of interdepartmental coordination and interaction of all levels of government	25.9	33.3	41.2	14.3	29.0
Underdevelopment of the federal and regional legal framework in the field of inter-municipal cooperation	30.9	11.1	35.3	7.1	28.3
Competition between municipalities for resources, primarily financial ones	19.8	11.1	29.4	57.1	25.4
Transport and infrastructure restrictions	23.5	33.3	17.6	35.7	23.9
The problem of property differentiation	21.0	22.2	23.5	35.7	23.2
Lack of analytical information on the opportunities and needs of other municipalities	22.2	22.2	20.6	21.4	21.7
Lack of initiative of local self-government bodies of other municipalities	13.6	22.2	11.8	7.1	13.0
Building barriers by district authorities	13.6	22.2	2.9	0.0	10.1

In our opinion, the assessments of the municipalities' heads of the European North of Russia largely reflects the situation typical for other municipalities of the country, since the existing problems in the organization of inter-municipal cooperation largely arise due to the unsettled nature of these issues in federal legislation, limited powers and financial resources of local governments, lack of highly qualified cadres.

Next, we will present a general model (algorithm) for determining the feasibility of inter-municipal cooperation (*Fig. 1*) and choosing its form (based on the above criteria).

An alternative to cooperation can be the transformation of municipal districts into municipal and urban okrugs (if there are large urban settlements on the territory of the district), as well as the unification of individual settlements of districts (in this case, when the settlement level is eliminated, the possibility of cooperation between settlements is eliminated). At the same time, when converting districts into okrugs, merging settlements, it is desirable to fulfill all the criteria indicated in Figure 1 for the implementation of such transformations. In turn, when organizing inter-municipal cooperation, it is enough to have compliance with several criteria. Further, it is advisable to calculate the economic effects (their types are shown in Figure 1) and other effects from the transformation of municipalities or the organization of inter-municipal cooperation.

Figure 1. Model (algorithm) for determining the feasibility
of inter-municipal cooperation and choosing its form

Transformation of municipal districts into municipal okrugs and urban districts (with the abolition of urban and rural settlements of the transformed districts)	Forms of contractual and economic cooperation between municipalities				Unification of municipalities (settlements, districts, settlements with an urban okrug)
	Agreements on cooperation between municipalities:			Establishment of intermunicipal commercial (in the form of NGO, LLC) and non-profit organizations (in the form of ANO and foundations)	
	- on transferring full-power along the line "settlement-district", "district-settlement"	- on the implementation of joint long-term projects, provision of services by one municipality to another	- on the implementation of joint activities, the formation of joint working bodies (groups)		
Criteria for determining the feasibility of such transformations: 1) the number of residents of the district is less than 10 thousand people; 2) a small number of rural and urban settlements in the district (2–4); 3) low overall level of development district		*It is possible to use the mechanism of horizontal subsidies*		*Criteria for determining the feasibility of such cooperation:* 1) availability of sufficient resources, organizational base in the field of housing and communal services, road facilities, etc. in one of the municipalities 2) willingness to participate in the establishment of the organization by at least three settlements or districts (okrugs)	*Criteria for determining the feasibility of such transformations:* 1) the presence of common borders of municipalities; 2) the number of inhabitants of individual settlements is less than 500 people; 3) the number of rural and urban settlements in the area of 5 or more units; 4) significant differences in the potential and level of development of settlements of the district, the presence of separate sufficiently developed settlements
	Criteria for determining the feasibility of such cooperation: 1) insufficiency of own financial resources of individual municipalities; 2) the need to increase the efficiency of activities and the exhaustion of internal resources of such an increase; 3) the need to improve the quality and expand the types of public services provided to the population organized by local self-government bodies; 4) lack of highly qualified personnel in municipalities; 5) the presence of intermunicipal brands, stable various links between municipalities, including within the framework of urban agglomerations				
Calculation of the effects of transformations: 1) savings due to the liquidation of settlement management bodies; 2) changes in the revenue and expenditure base of local budgets; 3) cost savings for the execution of the powers of the LSG bodies; 4) cost savings of municipal institutions of the new municipality	*Calculation of the effects of such cooperation:* 1) cost savings on the execution of the powers of the LSG bodies; 2) saving the costs of the LSG bodies for the implementation of joint projects, activities 3) possible increase in tax and non-tax revenues to local budgets from the implementation of joint projects, enterprises			*Calculation of the effects of such cooperation:* 1) cost savings on the execution of the powers of the LSG bodies when transferring the relevant functions to the inter-municipal organization; 2) profit from the activities of an inter-municipal non-profit organization	*Calculation of transformations effects:* 1) savings due to the liquidation of settlement management bodies; 2) changes in the revenue and expenditure base of local budgets; 3) cost savings for the execution of the powers of the LSG bodies; 4) cost savings of municipal institutions of the new municipality

Source: own compilation.

It should be noted that when municipal districts are transformed into municipal and urban okrugs, it is advisable to leave 2–3 positions of employees in each of the abolished settlements (they will be listed as employees of the local administration of the newly formed municipality) who will work with the population directly on the ground, coordinate the implementation of measures and projects for the development of territories, perform functions (part of functions) in the field of land relations, etc.

As for the possible transformation of municipal districts into municipal okrugs, there are 12 municipal districts with a population of less than 10 thousand people in the territory of the European North. (from 2 to 12 settlements have been formed on their territory; *Tab. 9*). We should note that over the past 10 years (2010–2020), the population has decreased more noticeably in such municipalities than in other districts of the corresponding region; they also have the highest expenditures on national issues (the functioning of local self-government bodies) per 1 inhabitant. Accordingly, it is necessary to consider the possibility of converting these municipal districts into municipal districts with justification of the effects, determination of the structure and staffing of local self-government bodies planned for the creation of a new municipality, the number of municipal institutions and organizations.

Tables 10–12 present the characteristics of the budgets of the merged municipalities and new, already united rural settlements on the territory

Table 9. Characteristics of municipal districts of the regions of the European North of Russia with a population of less than 10 thousand people

Municipal district's name	Permanent population at the end of the year, people				Expenses of the local budget for NI* in 2020, thousand rubles	Number of urban settlements in the district	Number of rural settlements in the district
	2010	2015	2020	2020 to 2010, %			
All districts of the Republic of Karelia	**351533**	**322715**	**298087**	**84.8**	**3.4**	**22**	**85**
Kalevalsky	8267	7063	6489	78.5	8.3	1	3
Muezersky	12199	10535	9241	75.8	4.6	1	7
All districts of the Komi Republic	**348460**	**321689**	**300477**	**86.2**	**5.3**	**14**	**145**
Koigorodskiy	8393	7630	7152	85.2	6.6	0	8
All districts of the Arkhangelsk Oblast	**447828**	**399898**	**364708**	**81.4**	**3.9**	**20**	**157**
Vilegodsky (municipal okrug since September 30, 2020)	11097	9956	8961	80.8	6.6	0	6
Leshukonsky	7929	6805	5840	73.7	9.9	0	6
Mezensky	10305	9241	8127	78.9	13.4	2	10
All districts of the Vologda Oblast	**578254**	**548544**	**523457**	**90.5**	**4.3**	**21**	**158**
Vashkinsky	8010	7035	6379	79.6	7.7	0	3
Mezhdurechenskiy	6057	5625	5187	85.6	8.8	0	4
Nyuksensky	9687	8789	8291	85.6	7.8	0	4
Syamzhensky	8869	8241	7824	88.2	7.0	0	4
Ust-Kubinsky	8040	7875	7445	92.6	4.5	0	4
All districts of the Murmansk Oblast	**150703**	**140334**	**133044**	**88.3**	**-**	**13**	**10**
Tersky	6250	5420	5091	81.5	-	1	1

* NI – national issues (functioning of local self-government bodies).
According to: Database of municipalities' indicators. Federal State Statistics Service of the Russian Federation. Available at: https://www.gks.ru/dbscripts/munst / (here and in Tables 10–12).

of three municipal districts of the Vologda and Arkhangelsk oblasts. According to the presented data, it can be concluded that after the transformation, the share of own (tax and non-tax) revenues of the local budget in the united municipality has increased markedly in comparison with the average value of these indicators for the combined settlements; the total amount of budget expenditures per 1 resident has also increased. At the same time, unit expenditures on national issues and the national economy have been reduced (it is in these areas that the effects of cost savings are directly manifested due to the centralization of functions as a result of the unification of settlements), which allowed to increase expenditures in other areas (housing, culture, social policy), which go directly to meeting the needs of residents, providing them with appropriate services, and not for direct financing of local governments or municipal institutions.

Table 10. Budget characteristics of the combined settlements and the new rural
settlement of Sheksninsky Municipal District of the Vologda Oblast

Rural settlement's name	Share of OI*, %		E, thousand rubles		NI, thousand rubles		NE, thousand rubles		HCS, thousand rubles		C, thousand rubles		SP, thousand rubles	
	2019**	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Nikolskoye	67.7	-	9.6	-	4.0	-	0.6	-	2.8	-	1.8	-	0.1	-
Yurochenskoye	18.2	-	18.1	-	9.2	-	0.8	-	4.2	-	2.9	-	0.4	-
Nikolskoye	**56.9**	**74.9**	**10.7**	**11.5**	**4.7**	**4.1**	**0.64**	**0.63**	**3.0**	**4.2**	**1.9**	**2.1**	**0.18**	**0.27**

Designations (here and in Tables 11–12): *Share of OI – the share of own (tax and non-tax) income in the total volume of local budget revenues; E – local budget expenditures per 1 resident; NI – expenditures on national issues per 1 resident; NE – expenditures on the national economy per 1 resident; HCS – expenditures on housing and communal services per 1 resident; C – expenditures on culture, cinematography per 1 resident; SP – expenditures on social policy per 1 resident.
A rural settlement formed as a result of the merger of the two above-mentioned settlements is highlighted in bold.
** For 2019, the values of indicators for the settlements that existed at that time and on average for the two settlements that formed a new united settlement in 2020 are presented.

Table 11. Budget characteristics of the merged settlements and the new rural
settlement of Vinogradovsky Municipal District of the Arkhangelsk Oblast

Rural settlement's name	Share of OI*, %		E, thousand rubles		NI, thousand rubles		NE, thousand rubles		HCS, thousand rubles		C, thousand rubles		SP, thousand rubles	
	2019*	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Kitskoe	13.3	-	9.2	-	3.6	-	0.8	-	4.5	-	0.1	-	0.0	-
Bereznikovskoe	35.8	-	12.4	-	1.2	-	3.0	-	2.6	-	5.3	-	0.1	-
Bereznikovskoe	**34.6**	**45.6**	**12.2**	**9.3**	**1.40**	**1.42**	**2.9**	**2.1**	**2.8**	**2.3**	**4.9**	**3.2**	**0.05**	**0.05**

A rural settlement formed as a result of the merger of the two above-mentioned settlements is highlighted in bold.
* For 2019, the values of indicators for then existing settlements are presented on average for two given settlements that formed a new united settlement in 2020.

Table 12. Budget characteristics of the merged settlements and the new rural
settlement of Nikolsky Municipal District of the Vologda Oblast

Rural settlement's name	Share of OI*, %		E, thousand rubles		NI, thousand rubles		NE, thousand rubles		HCS, thousand rubles		C, thousand rubles		SP, thousand rubles	
	2018*	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019	2018	2019
Permasskoye	12.9	-	6.7	-	3.6	-	0.7	-	0.7	-	1.3	-	0.1	-
Krasnopolyanskoye	26.6	-	4.5	-	1.3	-	1.0	-	0.7	-	0.9	-	0.1	-
Krasnopolyanskoye	**24.1**	**17.7**	**4.8**	**6.2**	**1.6**	**1.4**	**0.93**	**0.86**	**0.7**	**2.5**	**0.93**	**1.10**	**0.06**	**0.06**

A rural settlement formed as a result of the merger of the two above-mentioned settlements is highlighted in bold.
* For 2018, the values of indicators for then existing settlements are presented on average for two given settlements that formed a new united settlement in 2019.

As evidenced by world and Russian practice, similar budgetary effects will be observed during the transformation of municipal districts into okrugs, the establishment of inter-municipal organizations, the conclusion of agreements on the transfer of powers of rural settlements to the district level, agreements on the provision of "horizontal subsidies" for co-financing of individual activities, projects or the provision of services by another municipality.

Using the results of the study and its further prospects

The study of the experience of municipalities' interaction in Russia suggests that it is carried out in a variety of forms (functioning of various associations of municipalities, exchange of experience, holding joint meetings, signing and implementation of cooperation agreements, agreements on the transfer of powers, the establishment of joint inter-municipal organizations, etc.). However, such a most promising and cost-effective form of inter-municipal cooperation as the creation of inter-municipal commercial and non-profit organizations has not yet become widespread due to a number of reasons (factors), which include the lack of clear regulation of this sphere in Russia (131-FZ indicates only the general foundations of inter-municipal cooperation); regulatory, organizational and financial difficulties arising when establishing contractual relations and economic interaction of municipalities.

In our opinion, for the inter-municipal cooperation development, it is first of all necessary to develop and adopt the federal law "On inter-municipal cooperation and on amendments to certain legislative acts". In a special federal law, it is advisable to fix the goals and objectives, the main forms of inter-municipal cooperation, the procedure for implementation, and evaluation of effectiveness. The settlement of these issues in a separate federal law will allow regulating all the legal bases for the organization of such cooperation in

detail. In turn, the inclusion of a separate expanded section on inter-municipal cooperation in the 131-FZ would take up a significant part of it if the law on local self-government is retained in the future, but not the adoption of the municipal code instead of it — the code for the development of the local self-government system in Russia, as proposed by a number of experts. Adoption of Separate Law 224-FZ dated July 13, 2015 "On public-private partnership, municipal-private partnership in the Russian Federation and amendments to certain legislative acts of the Russian Federation" nevertheless allowed creating certain prerequisites for the development of complex management institutions (which, of course, include inter-municipal cooperation) in a specific legal framework.

In addition to the adoption of a separate law on inter-municipal cooperation, in our opinion, the state authorities together with local self-government bodies should:

— determine the optimal forms of cooperation between municipalities in solving various issues of local importance and performing the functions of local self-government bodies;

— ensure an increase in the financial and economic independence of local budgets, so that they are formed mainly at the expense of their own revenue sources, and not revenues from higher budgets, the possible instability of which does not allow local governments to plan the implementation of large long-term projects, including joint ones with other municipalities;

— form an open and regularly updated database of the best practices of inter-municipal cooperation in Russia and the countries of the world;

— implement professional development programs for employees of local self-government bodies in this area;

— improve the quality and completeness of official statistics in the context of municipal entities, so that the authorities have objective and reliable

information about the state of municipalities and the needs for certain resources, possible areas of interaction with other territories.

The All-Russian Association for the Development of Local Self-Government[6] has also proposed separate recommendations for the development of inter-municipal cooperation:

1) to work out the issues of legal personality of municipalities and their bodies in matters of establishing business companies; to create a system of motivation and incentives for municipalities to use forms of inter-municipal cooperation in order to improve the efficiency of human capital management, municipal resources and budget expenditures;

2) consider the possibility of creating intermunicipal state and (or) budgetary institutions of the social sphere (culture, education, demography, healthcare, social protection of the population), providing for the possibility of forming a network of branches of intermunicipal institutions;

3) to endow the very concept of inter-municipal economic cooperation with signs of project activity (in this case, such cooperation will include the interaction of municipalities in which the parties conclude an agreement on achieving certain results in certain terms with certain resources from certain sources, agree on their rights and obligations, choose control mechanisms, conditions and forms of responsibility; an inter-municipal project aimed at providing the population with specific life benefits can become a mechanism for the implementation of inter-municipal economic cooperation).

The ideas and recommendations proposed in the article are partly polemical in nature, which opens up opportunities for further discussions on the issues under consideration. Thus, the contribution of the research, the results of which are presented in this article, to the development of theoretical science is to substantiate the model (algorithm) for determining the feasibility and choice of the form of inter-municipal cooperation, and the contribution to the development of applied science is to identify trends and problems in the development of inter-municipal cooperation in Russia (including using the results of a questionnaire survey of municipalities' heads).

References

1. Gutnikova Y.A. Inter-municipal cooperation as a factor promoting the economic and social development. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2012, no. 6 (24), pp. 218–230 (in Russian).

2. Ragozina L.G. *Pravovoe obespechenie i praktika osushchestvleniya razlichnykh form mezhmunitsipal'noi kooperatsii v Rossii i za rubezhom* [Legal Support and Practice of Implementation of Various Forms of Inter-Municipal Cooperation in Russia and Abroad]. Moscow: Institut ekonomiki goroda, 2009. Available at: www.urbaneconomics.ru/download.php?dl_id=3077 (in Russian).

3. Frick H-J., Hokkeler M. *Interkommunale Zusammenarbeit: Handreichung für die Kommunalpolitik*. Bonn: Friedrich-Ebert-Stiftung, KommunalAkademie, 2008. 84 p.

4. *Methodological Recommendations on the Organization of Interregional and Inter-Municipal Cooperation in the Implementation of Expenditure Powers and Issues of Local Importance*. Ministry of Regional Development of the Russian Federation. Moscow, 2010. 66 p.

5. Baba H., Asami Y. Municipal population size and the benefits of inter-municipal cooperation: Panel data evidence from Japan. *Local Government Studies*, 2020, vol. 46, issue 3, pp. 371–393.

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[6] Report of the All-Russian Association for the Development of Local Self-Government "On the state of local self-government in the Russian Federation in 2019, the prospects for its development and proposals for improving the organization of local self-government." M., 2020. 174 p. Available at: http://okmo.news/event.php?43

6. Bakoš E., Němec D., Hrůza F., Mix T. Emerging topics on inter-municipal cooperation in the Czech Republic: Policy networking, regionalization and financial indicators. *Lex Localis*, 2020, vol. 18(3), pp. 579−602.

7. Bel G., Sebo M. Does inter-municipal cooperation really reduce delivery costs? An empirical evaluation of the role of scale economies, transaction costs, and governance arrangements. *Urban Affairs Review*, 2021, vol. 57, issue 1, pp. 153−188.

8. Casula M. A contextual explanation of regional governance in Europe: Insights from inter-municipal cooperation. *Public Management Review*, 2020, vol. 22, issue 12, pp. 1819−1851.

9. Furmankiewicz M., Campbell A. From single-use community facilities support to integrated sustainable development: The aims of inter-municipal cooperation in Poland, 1990−2018. *Sustainability*, 2019, vol. 11, issue 5890. DOI: 10.3390/su11215890

10. Luca D., Modrego F. Stronger together? Assessing the causal effect of inter-municipal cooperation on the efficiency of small Italian municipalities. *Journal of Regional Science*, vol. 61, issue 1, pp. 261−293.

11. Sarra A., Mazzocchitti M., Nissi E. A methodological proposal to determine the optimal levels of intermunicipal cooperation in the organization of solid waste management systems. *Waste Management*, 2020, vol. 115, pp. 56−64.

12. Silva D.P., Silvestre H.C., Embalo A.A. Inter-municipal cooperation in Brazil: The case of solid waste consortia. *Revista de Administracao Publica*, 2020, vol. 54(5), pp. 1239−1259.

13. Zafra-Gómez J.L., Giménez-García V., Campos-Alba C.M. et. al. Direct management or inter-municipal cooperation in smaller municipalities? Exploring cost efficiency and installed capacity in drinking water supply, *Water Resources Management*, 2020, vol. 34, pp. 4289−4302.

14. Adukova A.N. Inter-municipal cooperation as a tool for rural development. *Ekonomika, trud, upravlenie v sel'skom khozyaistve=Economics, Labor, Management in Agriculture*, 2017, no. 4 (33), pp. 42−48 (in Russian).

15. Barabash E.S., Leonov S.N. *Mezhmunitsipal'noe vzaimodeistvie: potentsial i mekhanizm realizatsii* [Inter-Municipal Interaction: Potential and Implementation Mechanism]. Khabarovsk: RITs KhGAEP, 2013. 188 p. (in Russian).

16. Butova T.V., Smirnova A.A., Milovidova N.A. Inter-municipal cooperation as a basis for ensuring the sustainability of the region. *Upravlencheskie nauki=Management Sciences*, 2014, no. 3, pp. 4−15 (in Russian).

17. Bukhval'd E.M. New basic principles of the state policy in an area of local self-government development in Russia. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2020, vol. 13, no. 4, pp. 125−135 (in Russian).

18. Voroshilov N.V. Foreign and domestic experience of inter-municipal cooperation. In: *Problemy ekonomicheskogo rosta i ustoichivogo razvitiya territorii: materialy nauch.-prakt. internet-konferentsii* [Problems of Economic Growth and Sustainable Development of Territories: Materials of an Online Research-to-Practice Conference]. Vologda, April 27−29, 2016. Pp. 107−113 (in Russian).

19. Gainanov D.A., Gataullin R.F., Ataeva A.G. Methodological approach and tools for ensuring region's balanced spatial development. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2021, vol. 14, no. 2, pp. 75−91 (in Russian).

20. Gainanov D.A., Tazhitdinov I.A., Ataeva A.G. Inter-municipal cooperation in the Russian Federation: Theoretical and practical aspects. *Ekonomika i predprinimatel'stvo=Economics and Entrepreneurship*, 2017, no. 8−2 (85), pp. 295−300 (in Russian).

21. Kozlova O.A., Makarova M.N. Inter-municipal cooperation as an institution of strategic development of territories. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2018, vol. 11, no. 3, pp. 132−144 (in Russian).

22. Kokin I.A. Analysis of the Russian experience of creation and functioning of inter-municipal associations and inter-municipal organizations. *Gorodskoe upravlenie=City Administration,* 2010, no. 12 (173), pp. 54−66 (in Russian).

23. Kostyukova A.V. Inter-municipal cooperation as a factor in the development of the Novgorod region. *Vestnik Novgorodskogo filiala RANKhiGS=Bulletin of the Novgorod branch of RANEPA,* 2015, vol. 2, no. 4-2 (2), pp. 129–138 (in Russian).

24. Markvart E., Petukhov R.V. Organizational and legal models of agglomeration management. *Menedzhment i biznes-administrirovanie=Management and Business Administration*, 2016, no. 3, pp. 12–27 (in Russian).

25. Odintsova A.V. Inter-municipal cooperation: lessons from foreign experience. *Federalizm=Federalism,* 2013, no. 2 (70), pp. 145–158 (in Russian).

26. Petukhov R.V. Inter-municipal cooperation as a way of modernization of local self-government. *Trudy Instituta gosudarstva i prava Rossiiskoi akademii nauk=Proceedings of the Institute of State and Law of the Russian Academy of Sciences*, 2012, no. 1, pp. 209–226 (in Russian).

27. Plakhota V.A. *Razvitie mekhanizmov obespecheniya mezhmunitsipal'nogo sotrudnichestva v regionakh Rossii: monografiya*. [Development of Mechanisms for Ensuring Inter-Municipal Cooperation in the Regions of Russia: Monograph]. Cheboksary: Sreda, 2019. 180 p.

28. Popov D.A. Inter-municipal cooperation: Comparative legal analysis of forms of implementation. *Gorodskoe upravlenie=City Administration,* 2012, no. 11 (196), pp. 54–64 (in Russian).

29. Uskova T.V. et al. *Sotsial'no-ekonomicheskie problemy lokal'nykh territorii: monografiya* [Socio-Economic Problems of the Local Territories: Monograph]. Vologda: ISEDT RAS, 2013. 196 p.

30. Turgel I.D. Inter-municipal cooperation in Russia: The experience of economic and statistical analysis. *Munitsipalitet: ekonomika i upravlenie=Municipality: Economics and Management*, 2014, no. 1 (6), pp. 35–40 (in Russian).

31. Shugrina E.S. Expert discussion on the legal foundations of the formation and development of agglomerations in Russia. *Munitsipal'noe imushchestvo: ekonomika, pravo, upravlenie=Municipal Property: Economics, Law, Management*, 2018, no. 2, pp. 8–12 (in Russian).

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PUBLIC FINANCE

Financial Results of the Local Self-Government Reform. Experience of the Regions of the Far East

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Abstract. The article examines the problems and main results of the 30-year reform of local self-government, concerning the positioning of the institution of LSG in the "vertical of power", the definition of the structure of powers and rights, and the formation of the financial base of LSG. The purpose of the work is to determine the basic principles and features of the development of the LSG institute and its financial interaction with the state on the example of municipalities of a large macro-region, which is the Russian Far East. In order to identify statistical patterns, general scientific methods were used based on official data from the Federal Treasury of the Russian Federation, the Ministry of Finance, Rosstat, regional authorities and local authorities of the Far Eastern constituent entities of the Russian Federation. The analysis of the dynamics of changes in the spatial classification of municipalities of the Far East over the years of reform, as well as the state and conditions for the formation of budgets of municipal districts and urban districts of the Far Eastern constituent entities of the Federation for 2011-2019 is carried out. It is shown that in the Far East the situation with the financial security of local self-government is determined not so much by local or Far Eastern, as by all-Russian tendencies. Revealed the presence of a serious stagnation of revenues and expenditure of the municipalities of the Far East; the prevalence of low financial independence of the budgets of the civil society and, especially, of the municipal districts; a decrease in the possibility of free disposal of budgetary resources for municipalities of the Far East, since during the analyzed period the share of grants-in-aid in the revenues of the budgets of municipal districts decreased by 8.6 percentage points, up to 15.9%, and in the revenues of urban districts − to 1.8%, with an increasing share of subventions and subsidies in budget revenues. In general, over the years of reform, the legislative strengthening of the powers and rights of LSG, declared at the federal level, has

not received adequate financial support in the region. Proposals for improving the financial component of the LSG reform in the framework of the evolutionary approach have been substantiated. It is shown that constitutional changes, while remaining formally neutral to LSGs, will require clarification of federal legislation for their implementation, which can give rise to a number of latent threats and undermine the principle of organizational isolation and financial independence of LSG bodies. The novelty of the research task is actualized by considering the aforementioned range of issues in comparison of federal trends and the situation in the macroregion under the conditions of changes in the Constitution of the Russian Federation and an increasing understanding of the need to strengthen the financial base of LSG. The materials of the article can be used in the educational sphere and in the activities of public authorities and LSG.

Key words: local self-government reform, municipal budgets, Far East of Russia.

Introduction

The reform of local self-government (LSG), which began 30 years ago with the adoption of the Law of the Russian Federation "On local self-government in the Russian Federation"[1] in 1991, was conceived with the aim of forming a real institution of LSG in Russia. It was assumed that the new institution, implementing the ideas of the European Charter of Local Self-Government[2], would be able to function in a market economy [1−4] and provide solutions to the financial problems of municipal formations (MFs) through their "self-sufficiency" [5−9].

The experience of developed countries shows that in a steadily developing market economy, the level of development of the tax system and intergovernmental budgetary relations contributes to the formation of generally independent regional and local budgets focused on satisfying people's needs [10−13]. In this regard, it is important to understand the reasons for a number of organizational and financial issues that have arisen during the LSG reform in the Russian Federation.

In Russia, the reform of local self-government received a modern legislative framework when Federal Law 131-FZ, which became the basic law of LSG[3], was adopted in October 2003.

During the years of the reform, the main post-reform law, which became one of the most volatile federal laws[4], has been repeatedly changed, the variety of types of municipalities has increased with a general reduction in their number, the boundaries and powers of regional authorities have been clarified. In these circumstances, it is necessary to talk about the results of the local self-government reform, taking into account a number of points.

First, regional features of the progress of the LSG reform should be considered after the analysis of trends in the development of these processes at the national level, considering the development of regional LSG processes against the background of national patterns.

Second, the work covers the practice of the formation of LSG since 2003, and the issues related to the development of financial and budgetary mechanisms for the functioning of the local self-government system (it is in this area that the main problems of the reform implementation practice are currently concentrated) are considered in detail for the period from 2011 to 2019.

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[1] On local self-government in the Russian Federation: Law of the Russian Federation no. 1550-1, dated July 7, 1991. Available at: https://base.garant.ru/3961383/

[2] European Charter of Local Self-Government. Available at: http://www.coe.int/en/web/conventions/full-list/-/conventions/rms/090000168007a105

[3] On the general principles of organization of local self-government in the Russian Federation: Federal Law no. 131-FZ, dated October 6, 2003. Available at: http://base.garant.ru/186367/

[4] From October 2003 to July 2021, various amendments to Federal Law 131-FZ were made by 136 regulatory and legislative acts.

Third, we analyze the effectiveness of the regional cross-section of the LSG reform on the example of assessing the current state of municipalities of the Far Eastern constituent entities of Russia. We chose municipal formations of the Far East as the object of research due to the fact that this macro-region is traditionally an "experimental" area, it is developing under federal patronage and acts as a kind of economic laboratory for verifying the effectiveness of various methods of regional policy. At the same time, we take into account that during the years of the reform, the borders of the Far East have changed. Since the end of 2018, the Far Eastern Federal District officially includes the Republic of Buryatia and Zabaykalsky Krai, which are "multi-municipal" subjects[5] that are difficult from the socio-economic perspective. In the article, we recalculate statistical data in retrospective analysis and include the "new", expanded composition of the regions – Far Eastern entities.

An adequate assessment of the features of the reform of the LSG in terms of the dynamics of the territorial structure, the formation of the powers of municipalities, revenues and expenditures of municipal budgets is possible in the process of comparative analysis with national trends related to the reform.

National trends in the implementation of the local self-government reform

Let us consider national trends in the course of the LSG reform in terms of its structural and quantitative results, as well as the degree of provision of financial and budgetary resources to the powers of municipalities.

The structural result of the reform. During the years of the reform, the specific composition of municipal formations has changed. If the first edition of Federal Law 131-FZ[6] contained five types of municipalities of two levels, then the modern version of the law speaks about eight types of municipalities of two levels *(Fig. 1)*. We are talking about municipal districts, urban and rural settlements, urban okrugs without inner-city divisions, intra-urban territories (intra-urban municipal formations) of federal cities approved in the first version of the law; as well as the following division introduced in later editions of the law: urban okrugs with inner-city divisions (since 2014),

Figure 1. Modern two-level structure of LSG and types of municipal formations in Russia
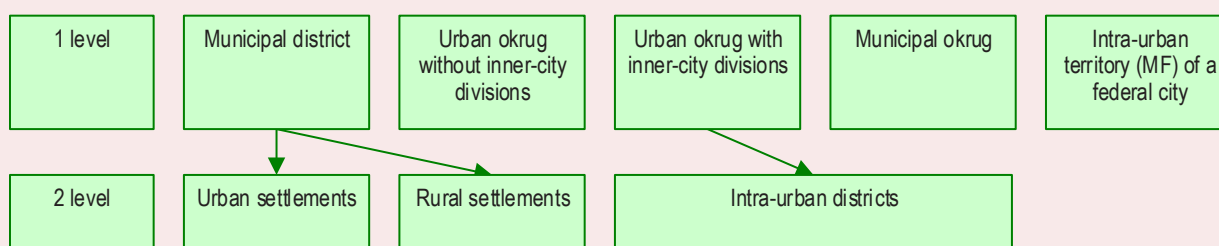
Source: Federal Law 131-FZ.

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[5] In accordance with the Decree of the President of the Russian Federation dated November 3, 2018, no. 632 "On amendments to the list of federal districts approved by the Decree of the President of the Russian Federation dated May 13, 2000, no. 849", the territorial composition of the Far Eastern Federal District was expanded to include two regions that were previously part of the Siberian Federal District: Zabaykalsky Krai and the Republic of Buryatia. In our article, the composition of the Far Eastern Federal District is considered within the boundaries of the said decree and includes 11 RF constituent entities: the republics of Sakha (Yakutia) and Buryatia, Khabarovsk, Primorsky, Kamchatka and Zabaykalsky krais, the Amur, Magadan and Sakhalin oblasts, the Jewish Autonomous Oblast (JAO) and Chukotka Autonomous Okrug (ChAO).

[6] On the general principles of organization of local self-government in the Russian Federation: Federal Law 131-FZ, dated October 6, 2003. *Rossiyskaya gazeta*, 2003, October 8. Available at: https://rg.ru/2003/10/08/zakonsamouprav.html

intra-urban districts (raions) of an urban okrug with inner-city divisions (since 2014), and municipal okrugs (since 2019).

According to Federal Law 131-FZ, the second-level municipal formations are part of the first-level municipal formations (urban and rural settlements are part of composite municipal formations — municipal districts; and intra-urban districts (raions) are part of urban okrugs with inner-city divisions[7]).

Three types of municipalities are classified as single-level municipal entities.

Urban okrugs include one or more settlements united by a common territory that are not municipal formations and in which residents carry out LSG directly or through elected bodies.

Intra-urban territories (municipal formations) of federal cities are included in federal cities in the form of independent municipalities (municipal okrugs or settlements)[8].

In the process of their creation, municipal okrugs that were possible to be established in 2019[9] combine several settlements into a larger municipal formation in terms of the number of inhabitants and area. It is also important that the merged settlements lose their municipal functions, their own authorities and, most importantly, budgets. As a result, the situation with intergovernmental transfers to level budget security is greatly simplified.

We should expect a further increase in the number of municipal okrugs, because according to the Resolution of the Government of the Russian Federation no. 445, dated May 18, 2016[10], by January 1, 2025, urban okrugs where less than two thirds of the population lives in cities or other urban settlements should be transformed into municipal okrugs. Moreover, on the territory of an urban okrug, population density should be five or more times higher than the average population density in the Russian Federation.

The changes, along with the procedure for converting a municipal district into an urban okrug introduced in April 2017[11], show that it is premature to talk about a full-fledged structure of LSG in the Russian Federation. The complexity of the functioning of a two-level system of local self-government is associated with the need to organize significant intergovernmental budgetary flows to bridge the gaps in the budgetary provision of municipalities[12]. The focus on urban and municipal okrugs allows regional authorities to form a single-level system of LSG, which is already functioning in eight RF constituent entities (Moscow, Saint Petersburg, Sevastopol, the Magadan, Sakhalin, Kaliningrad and Moscow oblasts, Stavropol Krai). Two of these regions with a single-level system of LSG (the Magadan and Sakhalin oblasts) have been formed in the Far East.

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[7] Three urban okrugs with inner-city divisions (Makhachkala, Samara and Chelyabinsk) contain a total of 19 intra-urban districts and have obtained their status in 2014–2016. Since then, their number has been unchanged, and new projects for the formation of such MFs are not considered [14, p. 12].

[8] Created in Moscow and Saint Petersburg in 2006, in Sevastopol — in 2014. As of January 1, 2021, the number of intra-urban territories was 146 in Moscow, 111 in Saint Petersburg, and 10 in Sevastopol. At the time of the formation of intra-urban territories of federal cities, existing mainly in the form of municipal districts, the term "municipal district" as an independent municipal entity was not contained in Federal Law 131-FZ.

[9] On amendments to the federal law "On the general principles of organization of local self-government in the Russian Federation: Federal Law no. 87-FZ, dated May 1, 2019.

[10] On approval of the state program of the Russian Federation "Development of federal relations and creation of conditions for effective and responsible management of regional and municipal finances": Resolution of the Government of the Russian Federation no. 445, dated May 18, 2016. Available at: http://base.garant.ru/71405474/

[11] On amendments to the federal law "On the general principles of organization of local self-government in the Russian Federation": Federal Law no. 62-FZ, dated April 3, 2017. Available at: https://rg.ru/2017/04/05/fz62-dok.html

[12] For example, the budget system of Khabarovsk Krai currently includes 233 budgets, including the Krai budget, two budgets of urban okrugs, 17 budgets of municipal districts, 22 budgets of urban settlements and 191 budgets of rural settlements. In the region in 2021, the gap in the provision of own revenue for 232 municipal formations of the Krai (the share of tax and non-tax revenues in the volume of own revenues) was 45 times (from 2.1 to 94.5%). At the same time, almost 60% of the Krai's MFs (137 municipalities out of 232) were provided with own revenues by only 30% [15].

The quantitative result of the reform is related to the dynamics of the number of municipalities in the post-reform period. Adopted in 2003, Federal Law 131-FZ officially entered into force in 2006, after a transitional period. According to Paragraph 3 of Article 85 of Federal Law 131-FZ, the borders of a municipal formation were subject to description and approval in accordance with the requirements of urban planning and land legislation until January 1, 2007. Since that time, Rosstat has been publishing detailed statistics on the state of municipal formations[13].

Previously, the monitoring of the number of municipal formations was carried out by the Ministry of Finance of the Russian Federation. At the start of the reform, the Ministry of Finance of Russia included 5.5 thousand local budgets in the country [16, p. 18].

Trying, albeit formally, to bring LSG closer to the population, the government contributed to a sharp increase in the number of municipalities at the beginning of the reforms. According to the results

of a monitoring conducted by the RF Ministry of Finance, there were 11,733 MFs in Russia in 2005. In 2006, their number increased to 24,210 (by 12,251 MFs)[14]. In 2005−2006, the structure of Russia's MFs by type underwent major changes. The number of urban okrugs decreased threefold (from 1,601 in 2005 to 522 in 2006), while the number of municipal okrugs increased from 902 to 1,802 units, the number of rural settlements — from 8,789 to 19,894, and the number of urban settlements for 2005−2006 increased fourfold (from 443 to 1,756).

In general, over the period from the beginning of the reforms until 2007, the total number of MFs increased in 4.5 times. However, at the same time, it was realized that such a course to increase the number of MFs contradicts the world practice of enlarging municipalities [17], since in modern conditions the term "accessibility" of local self-government for citizens is guided by other criteria besides "pedestrian accessibility". Consolidation of municipalities has virtually begun since 2007, and by 2021 their number has decreased to 20.3 thousand units *(Tab. 1)*.

Table 1. Dynamics of the number of municipal formations by type (as of January 1 of the current year), units

Type of MF		2007	2010	2015	2020	2021	2021/2007, %
TOTAL,	RF	24200	23907	22923	20846	20303	83.9
	FEFD	2129	2118	2056	1961	1895	89.0
including							
municipal districts	RF	1793	1829	1823	1673	1606	89.6
	FEFD	179	177	175	161	151	84.4
urban settlements	RF	1732	1739	1644	1398	1346	77.7
	FEFD	237	233	214	182	173	73.0
rural settlements	RF	19919	19591	18654	16821	16332	82.0
	FEFD	1659	1654	1611	1549	1492	90.0
urban okrugs	RF	520	512	535	632	630	121.2
	FEFD	54	54	56	66	66	122.2
urban okrugs with inner-city divisions	RF	-	-	-	3	3	…
	FEFD	-	-	-	-	-	-
intra-urban districts	RF	-	-	-	19	19	…
	FEFD	-	-	-	-	-	-
intra-urban territories of a federal city	RF	236	236	267	267	267	113.1
	FEFD	-	-	-	-	-	-
municipal okrugs	RF	-	-	-	33	100	…
	FEFD	-	-	-	3	13	…
Compiled with the use of the data from the website of the Federal State Statistics Service. Available at: https://rosstat.gov.ru/folder/11110/document/13263							

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[13] See for example: https://rosstat.gov.ru/folder/11110/document/13263

[14] Calculated according to: Information on the results of the monitoring of local budgets of the Russian Federation as of October 1, 2006 (monitoring period − 9 months of 2006). Available at: https://minfin.gov.ru/common/img/uploaded/library/2007/09/monitoring011006.pdf

The recorded change in the structure of municipalities differed by region. In the Far East, for example, the dynamics were smoother. During the period from 2007 to 2021, the total number of MFs in Russia decreased by 16.1%, while in the Far East the "reduction rate" was one and a half times less (11%), and the number of rural settlements decreased only by 10%, with the national average of 18%. Such specifics have their own reasons, which will be discussed below.

The managerial result of the reform is connected with clarification of the mechanisms for regulating the powers and rights of LSG bodies, and it sets the structure of powers assigned by federal laws to a specific level of government (regional or municipal), predetermining the formation of budget expenditures of this level of government.

By 2003, there emerged a need to resolve the contradiction, which consisted in the duplication of basic powers of municipalities and constituent entities of the Russian Federation, which led to acute conflicts, especially in the relationship of regions with their "capital cities". Federal Law 131-FZ assigned main issues of local importance[15] to LSG bodies, and the line between the "own" and "delegated" powers (expenditure obligations) of local authorities was determined, respectively, between the sources of their financing. It is recognized that delegated powers should be financed only by subventions.

In the future, a number of amendments were made to Federal Law 131-FZ so as to expand the list of issues of local importance for municipal formations. In addition to the powers to address issues of local self-government, Articles 14-1, 15-1 and 16-1 endowed LSG bodies with several rights, that is, they gave MFs the opportunity to participate in matters not directly related to the issues of local significance *(Tab. 2)*.

Table 2. Spatial structure of the powers and rights of local self-government bodies set out in Federal Law 131-FZ and in laws of the federal cities

Type of MF	Contained in Federal Law 131-FZ (number)			
	Powers of MFs			Rights of MFs
	in the original version of the law	in the version of the law as amended on July 1, 2021		
Urban settlement	22	39		15
Rural settlement	22	13 (the remaining 26 issues of local importance are resolved by the local self-government bodies of municipal districts)		15
Municipal district	20	39		14
Urban okrug	27	44		18
Intra-urban district (since 2014)	-	13		6
Municipal okrug (since 2019)	-	44		18
Urban okrug with inner-city divisions (since 2014)	-	44		18
	Powers set out in the laws of federal cities			
Intra-urban territories in federal cities	Moscow – 24; Saint Petersburg – 44; Sevastopol – 12			

Compiled according to: Federal Law 131-FZ; On the organization of local self-government in Moscow: The Law of the City of Moscow, dated November 6, 2002, no. 56. Available at: https://basman.mos.ru/about/normativno-pravovye-akty/zakon-g-moskvy-ob-organizatsii-mestnogo-samoupravleniya-v-g-moskve.php); On the organization of local self-government in Saint Petersburg: The law was adopted by the Legislative Assembly of Saint Petersburg on September 23, 2009. Available at: https://docs.cntd.ru/document/891818221; On local self-government in Sevastopol: The Law of Sevastopol dated December 30, 2014, no. 102-ZS. Available at: https://sevzakon.ru/view/laws/bank/dekabr_20141/o_mestnom_samoupravlenii_v_gorode_sevastopole1/tekst_zakona/

[13] We are talking about electricity, heat, gas and water supply to the population, sanitation, fuel supply to the population, education, healthcare, roads, transport services, primary fire safety measures, creating conditions for providing the population with communication services, catering, trade, consumer services, libraries, protection of local cultural heritage, physical education, sports, work with youth.

The dynamics of expansion of the powers and rights of LSG bodies show that their legislative status has formally increased over the years of the reform; and the emphasis in regulating the activities of LSG bodies is shifting from the principle of "only what is allowed is allowed" toward the principle of "what is not prohibited is allowed"[16].

It is important to understand how this "power status" of local authorities, which is proclaimed to have been increased, actually correlates with the provisions of budget legislation on financing the powers of municipalities, in order to further understand whether Far Eastern municipalities have their own specifics in this matter.

Financial results of the reform. It is implied that there is a need to form stable and manageable financial and budget foundations for local self-government. We should note that at present such an approach in the development of LSG, with certain variations, corresponds to the aspirations of the majority of federal and unitary states [4; 12; 19; 20].

During the years of the reform, Russia did not manage to overcome the problems in the financing of LSG bodies, which were noted at the start of the reform. In 2007, the share of LSG in the consolidated budget revenues was 10.7%, and in expenditures — 13%[17], while at present, due to methodological flaws in the financial component of the reform concept, significant underfunding of LSG in Russia remains the norm. Thus, according to the results of 2016−2018, the shares of revenues and expenditures of municipal budgets in the state consolidated budget of the Russian Federation averaged 11.4 and 12.3%, respectively, which, although it is better than the national indicators for 2007, is significantly lower than the world indicators for federal states *(Tab. 3)*. Moreover, the gap in the level of expenditures and revenues of LSG bodies is especially noticeable when comparing Russian indicators with those of high-income countries.

Even among countries with above-average revenues, including the Russian Federation [22], we observe that the share of Russian LSG bodies in terms of expenditures and revenues in the consolidated budget of the country is 40−60% lower than the world "average group" data. The situation when the balance of the shares of expenditures and revenues of municipal budgets is in favor of expenditures (they exceed the revenues of LSG by 0.9 p.p.) means that the Russian municipal level of government is "overloaded" with obligations when the powers performed are underfunded.

Table 3. Shares of revenues and expenditures of the budgets of LSG bodies in different countries, % of the consolidated budget on average for 2016–2018

Indicator	Russia	Federal countries	Countries with high incomes	Countries with incomes above average
Revenues	11.4	14.5	21.8	18.2
Expenditures	12.3	13.5	20.9	17.3
Compiled according to: [21, p. 25].				

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[16] Recently, according to the participants of the 20th Russian Municipal Forum, the ***rights*** of local self-government bodies to resolve issues not related to issues of local importance are often interpreted as ***duties*** by prosecutors and courts. As a result, local self-government bodies fall into a legal trap: compulsory, court-imposed implementation of the rights of local self-government bodies to resolve issues outside their competence entails additional costs not supported by local budget revenues, and failure to comply with the requirements of the courts may entail the imposition of fines [18, p. 76].

[17] Calculated according to: The formation of local self-government in the Russian Federation 2007. Available at: https://rosstat.gov.ru/compendium/document/13263); Annual information on the execution of the consolidated budget of the Russian Federation. Available at: https://minfin.gov.ru/ru/statistics/conbud/execute/?id_65=93449-yezhegodnaya_informatsiya_ob_ispolnenii_konsolidirovannogo_byudzheta_rossiiskoi_federatsiidannye_s_1_yanvarya_2006_g.

Features of a regional cross-section of the local self-government reform

For an adequate assessment of financial results of the reform in relation to the municipalities of the Far East, it is necessary to understand how the territorial structure of local self-government that developed in the macroregion has changed and what it currently represents; how the powers of municipalities, revenues and expenditures of municipal budgets of Far Eastern constituent entities of Russia are formed against the background of the identified nationwide trends in the implementation of the reform.

Specifics of the territorial organization of Far Eastern municipalities are largely determined by the specifics of Russia's Far Eastern constituent entities, which, in general, stand out markedly in terms of area and population density among Russian regions. Of the ten largest RF constituent entities by area, six are within the Far Eastern Federal District (Yakutia, Khabarovsk Krai, Chukotka Autonomous Okrug, the Magadan Oblast, Kamchatka and Zabaykalsky krais); among the five constituent entities with the minimum population density, there are four regions of the Far East (Chukotka Autonomous Okrug, the Magadan Oblast, Yakutia, and Kamchatka Krai). The "average" Far Eastern MF is 6.6 times larger than the "average" Russian MF in area, and 11.2 times smaller in population density. Besides, the more northerly the MF is, the more clearly this pattern is manifested.

The specifics of municipalities within the Far Eastern Federal District predetermine a need for more budget expenditures per capita, in comparison with the Russian average. Local and regional Far Eastern authorities have no other option, because they need to provide food and heat to remote territories, ensuring a decent level of education and the provision of medical services to the population dispersed over a vast territory.

In the Far Eastern Federal District, the largest number of MFs is registered in the Sakha Republic (455) and Zabaykalsky Krai (392), the smallest —

in the Magadan (9) and Sakhalin (18) oblasts. The average number of municipal formations in the region maintains a long-term downward trend, having decreased from 194 in 2007 to 172 in 2021. In Russia in 2021, the density of municipal formations was almost one and a half times higher (239 units per RF constituent entity).

The dynamics of changes in the number and structure of municipalities of the Far Eastern Federal District by type and level are given in *Table 4.*

During the period under consideration, the number of municipal districts decreased by 28 units, mainly due to the transformation of municipal districts into single-level municipal okrugs[18]. As a result, during the analyzed period, the number of first-level MFs decreased by only three units. The overall reduction in the number of MFs in the Far East was at the expense of second-level municipalities: the number of urban settlements decreased by 64, rural — by 167 units. At the same time, the process of optimizing the number of MFs in specific regions of the Far East is carried out under the influence of various factors.

The prevailing mentality of the local population in regions of the Far North forms a type of closed community, which makes it difficult to make decisions on the consolidation of municipalities[19]. As a result, for example, 455 municipal formations have been preserved in the Republic of Sakha (Yakutia) throughout the entire period under review, although 2/3 of them have fewer than 1 thousand inhabitants and are located in hard-to-reach and remote places [23].

Another trend that has manifested itself in the Far East is the growth in the number of urban and municipal okrugs over the analyzed period and the

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[18] Aleutsky District in Kamchatka, two districts in the Amur Oblast (Belogorsky and Romnensky districts), and five districts in Primorsky Krai (Lazovsky, Oktyabrsky, Terneysky, Khorolsky and Khankaysky districts) were transformed into municipal okrugs in the Far East in the first half of 2020 alone [14].

[19] According to Federal Law 131-FZ, such reorganizations must take into account the opinion of the population.

Table 4. Dynamics of the number and structure of municipal formations of the
Far Eastern Federal District (as of January 1 of the current year)

Type of municipal formation (MF)	Level of MF	Number of MFs, units			Structure of MFs by type (%)	
		2007	2021	(2021–2007)	2007	2021
Municipal district	I	179	151	-28	8.4	8.0
Municipal okrug	I	0	13	13	-	0.7
Urban okrug without inner-city divisions	I	54	66	12	2.5	3.5
Urban settlement	II	237	173	-64	11.2	9.1
Rural settlement	II	1659	1492	-167	77.9	78.7
Total		2129	1895	-234	100	100
Calculated according to the data from the website of the Federal State Statistics Service. Available at: https://rosstat.gov.ru/storage/mediabank/ykmb3eKg/munst.htm						

transition to a single-level system of LSG. The abandonment of the two-level system of LSG in the Russian Federation began in 2017[20], when compactness, walking distance and the predominance of the urban population ceased to be considered as the criteria that an urban okrug should meet. This made it possible to launch the process of transforming territories into urban okrugs, and the appearance of municipal okrugs in 2019 proves that Russia has formalized the abandonment of the two-level system of LSG. Since 2017, the entire territory of the Magadan and Sakhalin oblasts has been distributed between nine and 18 urban okrugs, respectively. At the same time, a two-level system of LSG is maintained in nine Russia's Far Eastern constituent entities.

The specifics of financial support for the development of LSG in the Far East are largely predetermined by the territorial organization of Far Eastern municipalities. By 2020, there were 164 municipal districts and 66 urban okrugs in 11 RF constituent entities in the Far East *(Tab. 5)*.

The analysis of the dynamics of changes in per capita revenues and expenses, the share of own revenues and intergovernmental budget transfers (grants, subsidies and subventions) in the revenues of the budgets of municipal districts and urban okrugs for 2011, 2015 and 2019 allows us to draw a number of conclusions about the features of the budgets of Far Eastern municipalities.

First, the change in the value of real per capita revenues and expenditures of the budgets of MFs for 2011−2019 shows that in the Far East, the volumes of revenues and expenditures of the budgets of municipal districts (MDs) and urban okrugs (UOs) during the analyzed period are in serious stagnation. This conclusion is based on the assessment of real per capita budget revenues and expenditures of municipal districts and urban okrugs for each of the Russia's Far Eastern constituent entities in 2019 prices and the calculation of median real per capita expenditures and revenues of municipalities of the Far East for 2011−2019 *(Tab. 6)*.

Table 5. Number of first-level municipal formations in the Far Eastern entities of the Russian Federation

First-level MFs	2011	2015	2019
Municipal district	176	175	164
Urban okrug	55	56	66
Calculated according to: https://www.gks.ru/dbscripts/munst/			

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[20] Vyzhutovich V. To enlarge so as to form an okrug. *Rossiyskaya gazeta − Federal Issue*, 2019, no. 57(7815). Available at: https://rg.ru/2019/03/14/vyzhutovich-municipalnyj-okrug-eto-ekonomiia-biudzhetnyh-sredstv.html

Table 6. Median revenues and expenditures of municipal districts (MD) and urban okrugs (UO) of Far Eastern constituent entities of the Russian Federation per capita (in 2019 prices), thousand rubles/person

Indicator	2011	2015	2019	2019/2011, %
MD and UO budget revenues per capita	44.7	36.2	42.9	96.0
MD and UO budget expenditures per capita	49.6	36.7	42.2	85.1
Calculated according to: Consolidated budgets of constituent entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Official website of the Federal Treasury. Available at: https://roskazna.gov.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov; http://base.garant.ru/149900/				

The data in Table 6 show that the median real per capita revenues and expenditures of Far Eastern municipalities for 2011–2019 decreased by 4 percentage points in terms of revenue and by 14.9 percentage points in terms of expenditures.

Since per capita expenditures (in 2019 prices) of the entire consolidated budget of the Russian Federation for the same period increased by 11.5 percentage points, we can assume that since 2011, Far Eastern municipal formations have not received additional funds in comparison with budgets of other levels of government and other Russian regions; moreover, the situation with local budgets in the macroregion has worsened in comparison with the average Russian data.

Second, in the Far East, there is a low financial independence of local budgets on the part of urban okrugs and, in particular, municipal districts.

Municipal formations of the Far East receive most of budget funds from RF constituent entities or from the federal budget. Currently, in the Far East, the share of own revenues in the budgets of urban okrugs (that is, the amount of revenue minus subsidies, subventions and grants-in-aid) averages 45–40% with a downward trend. The median share of own revenues in the budgets of municipal districts, although growing, remains at an extremely low level (19.2–24.1%) *(Fig. 2)*. For comparison, we should note that in other federal states, the share of own revenues in the budgets of municipalities is 60% on average [12].

Figure 2. Median share of own revenue in the budgets of municipal districts and urban okrugs of the Far East, %
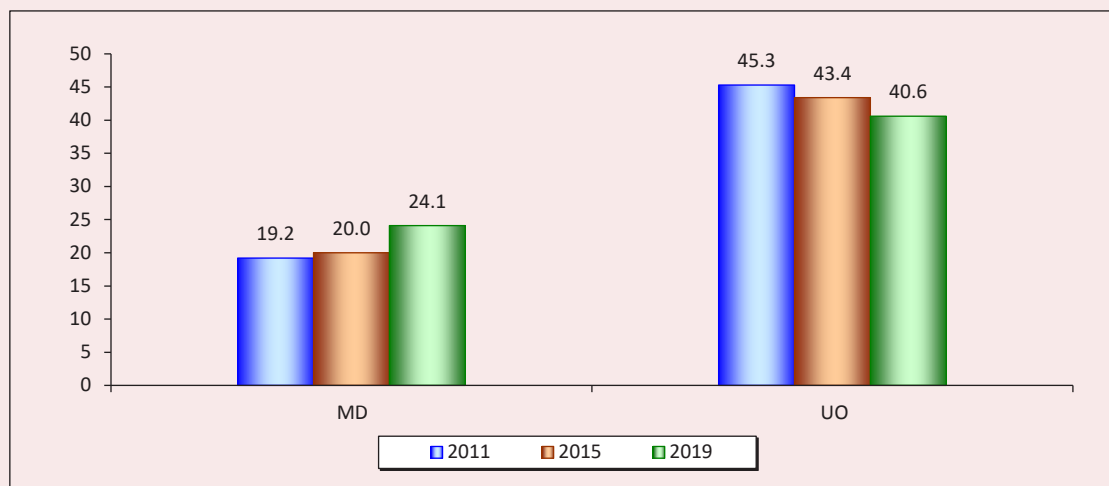
Calculated according to: Consolidated budgets of constituent entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Official website of the Federal Treasury. Available at: https://roskazna.gov.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov

In practice, the present-day situation means that the current financial situation of municipal districts, as well as urban okrugs, in the Far East depends not so much on their own efforts as on the financial capabilities of the RF constituent entity and the amount of intergovernmental transfers. In most cases, subsidies are required by municipal districts, although in recent years, the financial independence of urban okrugs has reduced, as well as the share of their own revenues in the budget.

The third feature of Far Eastern municipal formations is a direct consequence of the decline in financial independence, and it concerns the gradual reduction of the possibility for Far Eastern municipalities to freely dispose of budgetary resources. Subsidies and subventions, which have been increasing in recent years, already account for the majority of all the transfers received by local budgets and are approaching half of the budget revenues of urban okrugs; in municipal districts, they form almost 60% of budget revenues *(Tab. 7)*. The problem is that subsidies and subventions are to be used only for the powers specifically imputed to the municipality.

According to the data in Table 7, the share of subsidies that give the municipality relative freedom to dispose of financial resources[21] decreased by more than 8.6 percentage points for Far Eastern municipal districts during the analyzed period

(from 24.5% in 2011 to 15.9% in 2019), and for urban okrugs it decreased to an inconspicuous 1.8% of all their budget revenues.

As a result, it turns out that the practical ability to freely dispose of the available budgetary resources, which was already low in Far Eastern municipalities, is gradually decreasing even more. This suggests an increasing limitation of the ability of municipalities to meet the needs of the population in municipal services, both in terms of their effectiveness and overall performance results.

In fact, based on the analysis of the situation with the budgets of Far Eastern MFs, we can say that the situation with the budget legislation in terms of LSG over the years of reform in the region is becoming more conservative: "It is allowed to spend budget funds under control and only on what subsidies and subventions are allocated for". As a result, the political "indulgences" declared by Federal Law 131-FZ in terms of expanding the powers and rights of MFs remain unsupported by financial revenues at the regional level, which forms a strong dissonance between pre-reform expectations and reality in terms of reforming local self-government. The main result of the reform is formal inefficiency of the local self-government system. In fact, we can say that in the Russian Federation there is a process of "inflation" of local

Table 7. Structure of intergovernmental transfers as a share of all budget revenues of municipalities of the Far East (median values), %

Median shares of the indicator in budget revenues	2011		2015		2019	
	MD	UO	MD	UO	MD	UO
Transfers, total	81.5	53.0	79.6	57.8	76.0	59
Grants	24.5	6.3	20.2	3.4	15.9	1.8
Subsidies and subventions	43.4	37.2	47.8	48.6	57.0	44.8
Other transfers	6.9	5.8	3.6	1.2	3.9	10.9
Calculated according to: Consolidated budgets of constituent entities of the Russian Federation and budgets of territorial state extra-budgetary funds. Official website of the Federal Treasury. Available at: https://roskazna.gov.ru/ispolnenie-byudzhetov/konsolidirovannye-byudzhety-subektov						

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[21] Subsidies, being an unrelated, non-targeted transfer, actually simply increase the budgetary security of the regional budget, which encourages flexibility in the use of funds, that is, regions can independently direct the funds received to fulfill their spending obligations and solve the most important problems for the region.

self-government as a system of public relations, when the bloated powers of municipalities do not have the appropriate financial coverage for their implementation both in the national and regional context.

Discussion

1. ***The reform of LSG has not been completed***, so we would like to attribute many problems in the formation of local self-government in Russia to "growth problems". However, it seems that practical measures and legislative initiatives implemented under the slogan of improving the effectiveness of LSG functioning, in reality lead to the weakening of this institution and the strengthening of the power vertical[22]. In fact, the institute of LSG has been undergoing "creeping unitarization" over the last decade. In the context of financial problems inherent in the municipalities of the Far East, the transition to a single-level system of local self-government in the Magadan and Sakhalin oblasts can be not only an example of simplification of intergovernmental relations, but also a step toward the integration of local self-government into the vertical of state power [24]. Such an assumption requires further study and substantiation, but it cannot be completely excluded, because in the key amendment of the new version of the Constitution[23] (Article 131) in terms of the territorial foundations of LSG, the priority of the settlement level has disappeared, and the possibility of its complete abolition has appeared. And the fact that now the Constitution contains the provision on the right of public authorities to directly participate in the formation of LSG bodies and to appoint and dismiss LSG officials (Article 131, Paragraph 1.1) undermines the very principle of organizational isolation and independence of LSG bodies, postulated in Article 12 of the Constitution[24].

In September 2021, the draft law "On general principles of organization of public power in constituent entities of the Russian Federation"[25] was introduced to the State Duma by Senator A.A. Klishas and State Duma deputy P.V. Krasheninnikov, and, if adopted, it will promote the unitarization of the Russian Federation. The draft law proposes to consolidate the possibility for governors to be elected to their posts an unlimited number of times. They can be dismissed only if they become objectionable to the President. In practice, this legislative norm, if adopted, will reduce the subjectivity of governors and expand the possibilities of influence of the presidential administration.

An analysis of the progress of the reform of local self-government and legislative initiatives suggests that local self-government in the country as an institution of public authority is gradually mutating into local public administration known since Soviet times, in practice turning into "municipal administration", under which the contours of "public administration within municipal borders" are visible.

2. ***Strengthening the financial and economic foundations of LSG and inter-municipal cooperation.*** The actual results of the reform are very different from the declared goals. The situation with local self-government in the country remains difficult, and in Far Eastern municipal districts and urban okrugs – critical, which is especially clearly observed in the field of finance, where the slogan "There is no money, but you gotta hold on!"

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[22] Petukhov R. What do the amendments to the Constitution change in the fate of local self-government? Available at: https://www.vedomosti.ru/opinion/articles/2020/01/24/821369-popravki-v-konstitutsiyu (accessed: March 30, 2021).

[23] Constitution of the Russian Federation. Official website "Constitution of Russia. All editions". Available at: http://konstitucija.ru/ (accessed: August 30, 2021).

[24] We should note that, although Article 12 of the Constitution of the Russian Federation actually prohibits the subordination of municipal authorities to state bodies, the real practice of their relationship indicates the presence of a strong political and economic influence of the state on local self-government (for more details, see [25]).

[25] Draft law no. 1256381-7 "On general principles of organization of public power in constituent entities of the Russian Federation. Available at: https://sozd.duma.gov.ru/bill/1256381-7 (accessed: September 28, 2021).

becomes relevant. In these conditions, an important issue of the functioning of local government is the search for sources of additional funding for local self-government.

We should note that in the process of formation and development of local self-government, most countries face financial problems [12]. The issue is often solved by improving the tax sphere and actively using inter-municipal cooperation.

The target areas and prospects for strengthening the financial foundations of MFs functioning can be found in improving the tools for developing the revenue base of local budgets (in relation to individual income tax, property-related tax revenues, taxation of small businesses) [5, p. 80]. We are talking about the problem that has been solved by a significant number of foreign countries and that deals with redistribution of individual income tax from the place of work to the place of residence of the taxpayer, after the initial payment of tax at the place of work [26]. It is necessary to pay attention to the proposals made by the scientific community on giving the status of "local" to the entire group of property taxes, since it is LSG bodies that can effectively influence their administration.

As for the institute of inter-municipal inter-action, it has proven to be a tool that helps to satisfy people's needs more effectively, as well as ensure the achievement of postulated economic and social tasks by saving resources of local budgets [27; 28; 29].

For Russia, the study and use of domestic and foreign experience in the application of various forms of inter-municipal interaction is especially important, since it can not only help to find solutions to issues of local importance in ensuring socio-economic interests of the population, but also act as an alternative to a series of separative and unifying processes in the system of municipalities. It can be expected that the expansion of the practice of using various forms of inter-municipal interaction will make it possible to find solutions to issues of

local importance in ensuring the socio-economic interests of the population within the emerging system of municipalities, while maintaining the formal independence of the latter [9, pp. 69–70].

We should noted that at present, inter-municipal cooperation in Russia is largely reduced to formal moments, since out of its three main forms (associative, contractual and organizational-economic), the greatest attention is paid only to associative forms of cooperation[26].

It would be wrong to say that the RF Government is not doing anything to resolve this situation. In September 2020, the Ministry of Economic Development prepared a package of draft laws aimed at legal regulation of development of urban agglomerations and improving the legal mechanisms of inter-municipal cooperation[27] and posted it on the federal portal of draft normative legal acts. The package includes a draft federal law "On urban agglomerations"[28] and two draft laws that adjust related laws and amend the Civil Code of the Russian Federation in connection with the development of inter-municipal cooperation in agglomerations[29]. The draft basic law is aimed at creating legal and economic conditions for the development of urban agglomerations, and the model of management of urban agglomerations provided for in the draft law is based on the creation of mechanisms for inter-municipal cooperation.

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[26] The most significant examples are the Association of Siberian and Far Eastern Cities; the Union of Russian Cities; the Union of Cities in the Center and North-West of Russia, etc.

[27] https://www.economy.gov.ru/material/news/minekonomrazvitiya_razrabotalo_paket_zakonoproektov_o_razvitii_gorodskih_aglomeraciy_i_mezhmunicipalnogo_sotrudnichestva.html

[28] https://regulation.gov.ru/projects#npa=107906

[29] "On amendments to certain legislative acts of the Russian Federation regarding the development of urban agglomerations and inter-municipal cooperation", "On amendments to the Civil Code of the Russian Federation regarding the development of urban agglomerations and inter-municipal cooperation".

Although many of the issues raised in the draft laws require further elaboration and clarification[30], it seems that the discussion and adoption of this package of draft laws can remove a significant number of problems in the development of inter-municipal economic cooperation.

3. ***Detailed monitoring of the progress of the LSG reform.*** In order to achieve the declared goals of the reform, to establish and clarify specific contours of the "regulated diversity" of local self-government models or to use specific forms of inter-municipal interaction, it is necessary to organize extensive monitoring that would record positive achievements of the reform and its shortcomings. A detailed monitoring of the progress of the reform can be a tool that will identify the problems and prevent the dismantling of local self-government as a real institution of public power or embedding it in the system of public administration.

Conclusions

Summarizing, we note that in the Far East, the situation with the financial provision of LSG is determined not so much by local or Far Eastern trends, as by all-Russian trends. Over the years of reforms, the legislative strengthening of the powers and rights of LSG, declared at the federal level, has not found appropriate financial support in the region. In the last decade, the state and conditions for the formation of budgets of municipal districts and urban okrugs in Russia's Far Eastern constituent entities show the presence of serious stagnation of revenues and expenditure of municipal formations.

In addition to the underfunding, centralization of budget-forming taxes at the federal and regional

levels and a steady increase in the share of targeted transfers in the allocation of financial assistance from budgets of other levels have formed a low financial independence of municipal budgets in the Far East. A decrease in the financial autonomy of local self-government means a decrease in the possibility of free disposal of budgetary resources for municipalities of the region; this indicates the possibility of turning the institution of public authority of LSG into "public administration within municipal borders" or, in other words, gradual transformation of modern LSG into the lower level of state power.

Clarifications and amendments to the Constitution of the Russian Federation in 2020 contain certain prerequisites for reducing the role and importance of LSG. Being de jure neutral to local self-government, they will require clarification of federal legislation for their implementation. The de facto result may be an even greater financial and political dependence of LSG on state authorities, which will finally undermine the principles of organizational isolation and independence, still imposed on LSG bodies by the Russian Constitution and Russian legislation.

The results of the study help to identify theoretical aspects of the formation of LSG in the Far Eastern macroregion, reveal urgent problems caused by the course of the reform and identify risks associated with the possible loss of financial and political independence of LSG in the new constitutional environment. The obtained research results allowed us to substantiate proposals for improving approaches to the management of the institute of LSG, among other things, in terms of financial and budgetary relations. The practical significance of the study is due to the possibility of using the aforementioned provision in the work of authorities at all levels in solving problems in the development of LSG in the Far Eastern region of Russia.

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[30] Conclusion on the draft federal law "On amendments to certain legislative acts of the Russian Federation regarding the development of urban agglomerations and inter-municipal cooperation". Available at: https://opcrimea.ru/ekspertiza-zakonoproektov/zaklyuchenie-na-proekt-federalnogo-zakona-o-vnesenii-izmenenij-v-otdelnyezakonodatelnye-akty-rossijskoj-federacii-v-chasti-razvitiya-gorodskih-aglomeracij-i-mezhmunicipalnogo-sotrudnichestva.html

References

1.   Babun R.V. Results of municipal reform and problems of development of local self-government in Russia. *Gorodskoe upravlenie=Urban Management,* 2011, no. 10, pp. 68–74. Available at: http://emsu.ru/extra/pdf5s/um/2011/10/68.pdf (in Russian)

2.   Shugrina E.S. *Doklad o sostoyanii mestnogo samoupravleniya v Rossiiskoi Federatsii* [Report on the State of Local Self-Government in the Russian Federation]. Moscow: Izd-vo "Prospekt", 2015. 240 p.

3.   Leksin V.N., Shvetsov A.N. *Reforma i regiony: Sistemnyi analiz protsessov reformirovaniya regional'noi ekonomiki, stanovleniya federalizma i mestnogo samoupravleniya* [The Reform and Regions: A Comprehensive Analysis of the Processes of Reforming the Regional Economy, Establishing Federalism and Local Self-Government]. Moscow: LENAND, 2012. 1024 p.

4.   Markwart E. The organization of the local government in Germany and adapting the German experience to the Russian reality. *Problemnyi analiz i gosudarstvenno-upravlencheskoe proektirovanie,* 2011, vol. 4, no. 2, pp. 25–36 (in Russian).

5.   Pechenskaya-Polishchuk M.A. Instruments and principles of reallocating budgetary resources in the region. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast*, 2020, vol. 13, no. 2, pp. 71–88. DOI: 10.15838/esc.2020.2.68.5 (in Russian).

6.   Leonov S.N. Structural and financial aspects of local government reform in Russia. 30 years of experience. *Izvestiya Baikal'skogo gosudarstvennogo universiteta=Bulletin of Baikal State University,* 2021, vol. 31, no. 2, pp. 129–139. DOI 10.17150/2500-2759.2021.31(2).129-139 (in Russian).

7.   *Politika regional'nogo razvitiya kak instrument preodoleniya stagnatsii i obespecheniya innovatsionnogo razvitiya ekonomiki. Nauchnyi doklad* [Regional Development Policy as a Tool to Overcome the Stagnation and Support Innovation Economic Development: Scientific Report]. Moscow: IE RAN, 2014. 40 p.

8.   Klimanov V.V., Kazakova S.M., Yagovkina V.A. Tools of interregional cooperation in the public administration system. *Regionologiya=Russian Journal of Regional Studies,* 2021, vol. 29, no. 2, pp. 250–282. DOI: 10.15507/2413-1407.115.029.202102.250-282 (in Russian).

9.   Bukhvald E.M., Valentey S.D., Odintsova A.V. Economic problems of federalism, regional policy and local self-government. *Vestnik Instituta ekonomiki Rossiiskoi akademii nauk=The Bulletin of the Institute of Economics of the Russian Academy of Sciences*, 2020, no. 1, pp. 51–76. DOI: 10.24411/2073-6487-2020-10003 (in Russian).

10.   Temple M. *Regional Economics*. London: St. Martin's Press, 1994. 301 p.

11.   Fujita M., Krugman P., Venables F.J. *The Spatial Economy: Cities, Regions and International Trade*. Cambridge (Mass.), 2000.

12.   *OECD/UCLG (2019) 2019 Report of the World Observatory on Sub-national Government Finance and Investment – Key Findings*. 109 p. Available at: http://www.sng-wofi.org/publications/2019_SNG-WOFI_REPORT_Key_Findings.pdf

13.   Odintsova A.V. Local self-government as a development institution. *Federalizm=Federalism*, 2015, no. 2(78), pp. 87–100 (in Russian).

14.   Lyubimov Yu.S. (Ed.). *Doklad o rezul'tatakh ezhegodnogo monitoringa organizatsii i razvitiya mestnogo samoupravleniya v Rossiiskoi Federatsii (za 2019 god i pervoe polugodie 2020 goda)* [Report on the Results of the Annual Monitoring of the Organization and Development of Local Self-Government in the Russian Federation (for 2019 and the First Half of 2020)]. Moscow, 2020.

15.   Leonov S.N. Problems of equalization the level of budget security of municipalities and ways to solve them. *Regionalistika=Regionalistica,* 2021, vol. 8, no. 4, pp. 5–21. Available at: http://dx.doi. org/10.14530/reg.2021.4.5 (in Russian).

16.   *Problemy i perspektivy munitsipal'noi reformy Rossiiskoi Federatsii. Doklad Instituta ekonomiki RAN i Instituta zakonodatel'stva i sravnitel'nogo pravovedeniya pri Pravitel'stve Rossiiskoi Federatsii* [Problems and Prospects of a Municipal Reform in the Russian Federation: Report of the Institute of Economics of the Russian Academy of Sciences and the Institute of Legislation and Comparative Law under the Government of the Russian Federation]. Moscow, 2008.

17. Bukhvald E.M. *Munitsipal'naya reforma v Rossii: mify i real'nost'* [Municipal Reform in Russia: Myths and Reality]. Available at: http://dom-hors.ru/rus/files/arhiv_zhurnala/pep/2013-1/bukhvald.pdf

18. Shirokov A.N., Yurkova S.N. Problems of development of local self-government at the present stage: The view of a municipal community. *Munitsipal'naya akademiya=Municipal Academy,* 2020, no. 4, pp. 74–79 (in Russian).

19. Pokrovskaia N.V., Belov A.V. Tax revenues of local budgets in unitary states: A case study of Japan. *Journal of Tax Reform*, 2020, no. 6(1), pp. 73–89. DOI: 10.15826/jtr.2020.6.1.07

20. Semeko G.V. Territorial reform 2014–2015 in France. *Federalizm=Federalism,* 2017, no. 3(87), pp. 19–32 (in Russian).

21. Kazantsev K.I., Rumyantseva A.E. *Ot izbraniya k naznacheniyu. Otsenka effekta smeny modeli upravleniya munitsipalitetami v Rossii* [From election to appointment. Assessment of the effect of changing the model of municipal management in Russia]. Moscow: TsPUR. 2020. 67 p.

22. *OECD/UCLG (2019) 2019 Report of the World Observatory on Sub-national Government Finance and Investment – Country Profiles*. 539 p. Available at: http://www.oecd.org/cfe/regionaldevelopment/Observatory-on-SubnationalGovernment-Finance-and-Investment.htm

23. *O khode razrabotki metodiki tipologizatsii naselennykh punktov Respubliki Sakha (Yakutiya) s uchetom chislennosti naseleniya, razvitiya transportnoi seti, razmeshcheniya proizvoditel'nykh sil i sozdaniya novykh rabochikh mest* [On the Development of a Methodology for Classifying Settlements of the Republic of Sakha (Yakutia), Taking into Account the Population, the Development of the Transport Network, the Placement of Productive Forces and the Creation of New Jobs]. Tsentr strategicheskikh issledovanii pri Glave Respubliki Sakha (Yakutiya), 2020. 107 p.

24. Leonov S.N. Structural aspects of local self-government reform in the light of amendments to the Constitution of the Russian Federation. In: Minakir P.A., Sidorenko O.V. (Eds.). *Sotsial'no-ekonomicheskoe razvitie Vostoka Rossii: novye vyzovy i strategicheskie orientiry: Materialy mezhdunarodnoi nauchno-prakticheskoi konferentsii, Khabarovsk, 29–30 aprelya 2021 goda* [Socio-Economic Development of the East of Russia: New Challenges and Strategic Guidelines: Proceedings of the International Scientific and Practical Conference, Khabarovsk, April 29–30, 2021]. Khabarovsk: Izdatel'stvo KhGUEP, 2021. Pp. 50–56. DOI: 10.38161/978-5-7823-0746-2-2021-50–56 (in Russian).

25. Roi O.M. Budgetary insufficiency of local self-government in the conditions of centralization of power. *Munitsipal'naya akademiya=Municipal Academy,* 2014, no. 3, pp. 3–7 (in Russian).

26. Kuznetsova O.V. Inter-budgetary relations: parallels between Russia and Germany. *Kazanskii federalist*, 2006, no. 3, pp. 56–67 (in Russian).

27. Barabash E.S., Leonov S.N. *Mezhmunitsipal'noe vzaimodeistvie: potentsial i mekhanizm realizatsii* [Inter-Municipal Interaction: Potential and Mechanism of Implementation]. Khabarovsk: Khabarovskii gosudarstvennyi universitet ekonomiki i prava, 2013. 188 p.

28. Odintsova A.V. Strengthening the financial base of local self-government: Lessons from foreign experience. *Audit i finansovyi analiz*, 2015, no. 2, pp. 246–251 (in Russian).

29. Armstrong H., Taylor J. *Regional Economics and Policy*. London: Harvester Wheatsheaf, 1993. 397 p.

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ENVIRONMENTAL ECONOMICS

Conflicts in Protected Areas within the European Part of the Russian Arctic: Systematization and a Mechanism for Their Resolution
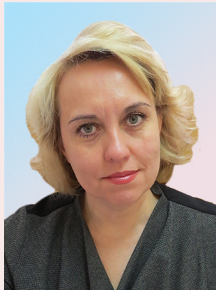
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Abstract. It would be difficult to overestimate the role of protected areas in the conservation of the Arctic nature. Due to their fragility and vulnerability to anthropogenic impacts, Arctic natural complexes need special and stricter protection. The importance of preserving the nature of the Arctic is also due to the fact that maintaining the environment in an undisturbed natural state is one of the main ways to preserve the traditional culture and lifestyle of the indigenous peoples of the North. However, the processes of creation and functioning of protected areas are often accompanied by conflicts; this reduces the efficiency of the entire network of protected areas. The article uses our own algorithm to identify and classify conflicts in protected areas within the regions of the European part of the Russian Arctic. In total, we revealed 138 conflicts in 21.6% of protected areas; 70.3% of the conflicts are in the most acute stage of open confrontation. As a result of the research, we have developed a universal mechanism for

resolving conflict situations in protected areas. The mechanism is of a closed nature and includes the following implementation stages: setting a goal; analyzing conflicts that arise during the creation and functioning of protected areas; identifying stakeholders and their interests; identifying the subject and stage of the conflict; arranging the work of a platform for coordinating the interests of stakeholders; taking into account the priority of sustainable development in the territory; setting specific tasks and choosing conflict resolution tools; monitoring conflict situations in protected areas. We believe that the implementation of the proposed mechanism will ensure a balance of interests of the local population, economic entities, authorities and other interested parties, and will also contribute to sustainable socioi environmental and economic development in protected areas and in adjacent territories as well.

Key words: Russian Arctic, protected areas, conflict.

Introduction

In contemporary Russia, the processes of creation and functioning of protected areas are often of a conflict nature. The main foundation, on which the emergence of almost all conflict situations is based, is two antagonistic positions. According to the first one, the territory of high natural value should be preserved for future generations in its primitive form by turning it into a protected area. Basically, this position is promoted by individual eco-activists, representatives of public environmental organizations and the scientific community. In most cases, they advocate the strict protection regime which provides for the creation of an extensive protected area; it is prohibited to carry out any economic activity within its boundaries. Representatives of the second position, on the contrary, advocate the maximum use of the territory's natural resources, no matter what natural value it may have. For the most part, these are entrepreneurs of different levels who are primarily concerned with maximizing profits, rather than preserving the natural environment. Often they are not only against the creation of new protected areas, but also for the elimination or reduction of the area of the existing ones.

As we can see, these positions reflect the views of different social groups and people about the ecological and economic development of a particular natural area. However, we should remember that the normal functioning and sustainable development of any territory implies pursuance of a balance not only of ecological and economic systems, but also of the social system, in the center of which are local residents. There is often a "failure", which is another major cause of conflicts in protected areas. Without necessary knowledge, the local population is easily misled. On the one hand, when creating a new protected area, residents are often intimidated by prohibitions on conducting habitual economic activities, which constitute an important part of local population's life (ban on harvesting firewood, fishing, hunting, collecting wild plants, etc.). On the other hand, they are "intimidated" by the complete destruction of the natural habitat by enterprises in case of refusal to create protected areas. Meanwhile, it is the local population that acts as a kind of "mediator" of the two antagonistic positions, as, first, the people are interested in preserving the nature of its native territory, and second, they have certain economic requirements and need jobs. Despite this, the position of local residents cannot be considered deliberately "compromise" and base on it in the process of conflict resolution. Due to the lack of specific knowledge, the local population, as we have already noted, may fall under the influence of the most powerful public organizations or business structures, or may simply defend their momentary

interests and habitual way of life without thinking about the strategic prospects for developing the territory. This necessitates a detailed study and classification of conflicts including depending on the parties involved, their positions/motives.

To date, neither in the scientific literature nor in official documents there is no mechanism for resolving conflicts, related to the creation and functioning of protected areas. Moreover, the work itself on the study and description of conflict situations in protected areas is limited and fragmented. Therefore, the purpose of our study is to systematize conflicts, related to the creation and functioning of protected areas in the European part of the Russian Arctic, and to develop a mechanism for resolving such conflicts on its basis. To achieve this purpose, it is necessary to solve the following tasks:

1. To review the modern scientific literature, devoted to studying conflicts in protected areas and mechanisms for their resolution.

2. To form a theoretical and methodological basis for the study of conflicts in protected areas.

3. To collect and analyze information about conflicts in protected areas of the European part of the Russian Arctic, obtained by sending official requests to municipal authorities, conducting in-depth interviews with experts and reviewing publications in the media.

4. To highlight the most important characteristics of conflict situations in the Arctic protected areas: the parties and subjects of conflicts, the positions and actions of the conflicting parties, the stages at which conflicts are currently located.

5. To identify and describe the main structural elements of the mechanism for resolving conflict situations that arise during the creation and functioning of protected areas.

It is important to note that the Arctic macroregion is the research object for a reason, as it is the Arctic nature that is characterized by special vulnerability to anthropogenic impacts and requires immediate response to possible environmental threats until the degradation of ecosystems has become irreversible. In addition, the preservation of nature in the Arctic in an undisturbed natural state is one of the main ways to maintain the vital activity and traditional culture of the indigenous peoples of the North.

The significance of the research is also emphasized by the vector set by the national project "Ecology" to increase the number of protected areas and their area in Russia, the development of ecotourism and the growth of the number of visitors to protected areas. Usually, these processes are accompanied by an increased risk of conflict situations, the need to coordinate divergent interests and take into account the opinions of all participants in a comprehensive manner. This determines the special relevance of the work, carried out by the authors, and creates a substantive request for the development of a mechanism for resolving and preventing conflicts in specially protected natural territories.

Theoretical review

Speaking about environmental conflicts, it is worth noting that this phenomenon has been analyzed in sufficient detail in science. Nevertheless, the vast majority of publications deal with conflicts of nature management in general [1−8], as well as the causes of their occurrence [9; 10] and possible ways of resolution [11].

At the same time, conflicts in protected areas are given much less attention. Among the foreign works of recent years, it is worth noting the works of A.B. Johannesen, A.A. Mbanze, C. Vieira da Silva, N.S. Ribeiro, J.L. Santos, J.V. Campos-Silva, C.A. Peres, J.E. Hawes, T. Haugaasen, C.T. Freitas, R.J. Ladle, P.F.M. Lopes. By modeling the socio-economic consequences of the development of protected areas in Africa, A.B. Johannesen demonstrates the reduction of land suitable for agriculture and hunting, which, in turn, leads to a decrease in the well-being of local communities and the emergence of conflicts [12].

Using the example of a natural reserve in Mozambique, A.A. Mbanze et al. show that the local population living outside the protected areas has less social support, compared to those living inside the protected areas. This generates different conflicts including those emerging when residents of settlements, outside the boundaries of protected areas, are forced to participate more often in the illegal extraction of natural resources in specially protected natural territories [13]. J.V. Campos-Silva and co-authors have made the same conclusions; they have studied the social aspects of the functioning of protected areas in the Amazon basin [14].

In Russia, the most famous and serious scientific research in the field of conflicts in protected areas are the works of Natalia A. Alekseenko [15; 16]. Her extensive work on the identification and typification of conflicts of nature management in individual protected areas of Central Russia formed the basis for the creation of appropriate maps. Despite the high value and depth of the conducted research, the directions of their application are primarily in the field of mapping and design of protected areas, rather than in the field of improving the management of these territories. In addition, the systematic work to identify conflicts under the leadership of N.A. Alekseenko is rather of a pilot nature and has been implemented only in a few protected areas. Similar studies on the detection of conflicts in individual protected areas of the Russian Federation were conducted by M.P. Kuznetsov and S.A. Pegov (Valdaysky National Park) [17], S.K. Kostovskaya, O.G. Chervyakova, and V.O. Stulyshapku (Kaluga Zaseki Nature Reserve) [18].

A.V. Bocharnikova [19] focuses on conflicts between the administration of protected areas and local residents including indigenous peoples, and also considers the possibility of applying a strategy of "co-management" to resolve conflicts. A.S. Krotik analyzes the legal problems of the organization and functioning of protected areas

of federal significance and disputes and conflicts arising on their basis regarding the use and disposal of land, wildlife, forest and other resources[1]. Thus, the works of A.V. Bocharnikova and A.S. Krotik also cannot claim to be comprehensive in considering the whole variety of conflicts in protected areas and have both specific restrictions (in the first case, conflicts of local residents are considered, in the second – legal conflicts), and territorial (the object of analysis by A.V. Bocharnikova is protected areas only of Primorsky Krai) and level (A.S. Krotik pays attention only to federal protected areas).

The presented literature review helps to conclude that the problem of identifying, in-depth analysis and systematization of conflicts in protected areas still remains poorly understood. In addition, there are no attempts to develop a comprehensive mechanism for resolving conflicts, related to the creation and functioning of specially protected natural territories. Our research is aimed at filling this scientific gap.

Theoretical and methodological basis of the research

The conflict theory, the concept of sustainable development, the concept of landscape approach and the stakeholder theory have become the theoretical and methodological basis for the study of conflicts arising during the creation and functioning of protected areas.

The main provisions of *conflict theory*, developed by famous scientists R. Darendorf [20], L. Kozer [21], K. Boulding, G. Simmel [22], make it possible to consider conflicts in protected areas as dynamic systems that have a common pattern of development and are characterized by the processes of origin, formation and resolution. In addition, according to the theory under consideration, conflicts in protected areas are a natural and in some sense even

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[1] Krotik A.S. Legal problems of organization and functioning of specially protected natural territories of federal significance: specialty 12.00.06 "Land law; natural resource law; environmental law; agrarian law": *Candidate of Sciences (Law). Thesis Abstract.* Moscow, 2003. 24 p.

necessary phenomenon, since they are a source of development and improvement of the protected area system itself, as well as the mechanisms of their creation and functioning.

The concept of sustainable development, which has been widely publicized and disseminated throughout the world since the late 1980s and early 1990s, implies the adoption of a model of social development that provides equal opportunities to meet the needs of natural resources of current and future generations. In the traditional sense, the concept of sustainable development has a triune character and assumes a balanced development of three components: economic, social and environmental. However, in some interpretations, a fourth component appears – "institutions", reflecting political, managerial, cultural and technological aspects [23]. The concept of sustainable development does not provide for the abandonment of nature management in general and the cessation of economic growth, but positions the rational use of natural resources and the conservation of biodiversity [24] while recognizing man as the main value and asset of any state. Thus, the consideration of conflicts on the territory of protected areas, as well as the search for ways to de-escalate and resolve them from the perspective of sustainable development presuppose taking into account the need to preserve not only the natural environment, but also to ensure sustainable economic development and maximize public well-being.

One of the ways to achieve the Sustainable Development Goals is the use of an integrated *landscape approach* in the management of natural resources [25]. To date, there is no single universally recognized definition of landscape approach in the scientific literature. In the most general sense, it can be interpreted as a theoretical basis for integrating the interests of various nature users in order to ensure sustainable and equitable use of environmental resources [26; 27]. In relation to conflicts in protected areas, the landscape approach has great potential, since it helps to create a foundation for reaching a compromise between environmental protection and socio-economic development. The latter is achieved by establishing a dialogue between all interested parties, involving all parties to the conflict, primarily representatives of local communities, in joint management and decision-making regarding protected areas.

The creation and widespread dissemination of the *stakeholder theory* is associated with the name of the American Professor R.E. Freeman, who published the monograph *"Strategic Management: A Stakeholders Approach"* in 1984. It defined a "stakeholder", which includes "any individuals, groups or organizations that significantly influence the decisions made by the firm and/or are influenced by these decisions" [28]. The simplified list of stakeholders of a modern firm included owners, consumers, consumer protection groups, competitors, mass media, employees, "Special Interest Groups", environmentalists, suppliers, government agencies, local community organizations. The success and strategic development of any company at the same time directly depends on the interaction with stakeholders. The management of such interaction has been reflected in a new direction of management – "stakeholder management", which has recently been increasingly used not only by private companies, but also by state and municipal institutions, non-profit organizations. In relation to conflicts in protected areas, the stakeholder theory and stakeholder management allows analyzing motives and interests of the parties involved in the conflict situation for a more detailed, as well as developing mechanisms for managing relations between them on the basis obtained.

Data and methods

To systematize conflict situations arising during the creation and functioning of protected areas, we have used the algorithm, developed by the authors,

presented in an earlier article [29]. The algorithm assumes the use of the following methods of scientific research:

— sociological methods are: written survey of employees of municipal authorities, conducting in-depth semi-structured interviews of experts to identify and describe existing conflict situations in protected areas; we have selected and interviewed 10 experts among managers of protected areas, representatives of economic entities, scientific and public environmental organizations in each studied region (the period of information collection: September 2019 — January 2020);

— analysis of information on conflict situations in protected areas, presented in official documents, mass media, as well as received from municipal authorities and experts;

— generalization, classification, analogy, and graphical modeling.

Results and discussion

Based on a detailed analysis and systematization of a large amount of information, received from the media, as well as from municipal authorities and experts, the authors have managed to present it briefly in the form of several tables (*Tab. 1—4*). Each table contains the most important information about all the conflicts in the protected areas of the European part of the Arctic: the parties and the subject of the conflicts, the positions and actions of the conflicting parties, as well as the stage at which the conflicts are at the moment. The dynamics of any conflict situation in a protected area include four stages. At the first stage, the conflict originates, which proceeds at an unconscious level. Awareness of the conflict by its parties arises at the second stage. At the third one, most acute conflict stage, active actions of the conflicting parties begin, aimed at defending their interests. The fourth, final stage, involves the resolution of a conflict situation.

There are 74 protected areas on the territory of the Murmansk Oblast, the total area of which is 191.25 thousand km^2, which corresponds to 13.2% of the region's area. This is significantly lower than the standard, established by the Convention on Biological Diversity ratified in the Russian Federation (hereinafter the Convention) — 17% of the land area. Meanwhile, there are positive changes in this area in the region: over the previous 10 years (from 2011 to 2021), 9 new protected areas have been created in the region, while the area, occupied by protected areas, has grown by more than 30%.

As a result of the conducted research, we have identified 19 conflict situations in 17 protected areas of the Murmansk Oblast (or almost 23% of the protected areas of the region; see Tab. 1). Five conflicts were recorded on the territory of federal protected areas and fourteen on the territory of regional ones. Sixty-three percent of the detected conflicts are in the most acute stage of open conflict (3rd stage); the remaining 27% represent conflict situations in the final stage. At the same time, it is important to note that all conflicts, that are currently ending or have already been completed, have been resolved in favor of protected areas.

Separately, it is necessary to highlight conflicts during which public environmental organizations insist on the elimination of protected areas due to the absence of the object of protection itself. There are quite a lot of such conflict situations in the Murmansk Oblast — 7 (or almost 37% of all identified conflicts). The existence of protected areas with insignificant and unjustified objects of protection makes it difficult to form new protected areas in the region, and also creates an unfavorable image of protected areas as a whole.

In the vast majority of conflict situations, the conflict object is the object of protection of protected areas (73.7%), followed by the territory of protected areas in terms of its use for the construction of infrastructure, travel, exploration and extraction of natural resources (15.8%). Only in 10.5% of cases, water resources were the subject of conflict (Atlantic salmon in the Varzugsky Nature Reserve).

Table 1. Conflicts related to the creation and functioning of protected areas in the Murmansk Oblast

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Khibiny National Park	Mining companies / environmental organizations; institutions of science; travel companies and tourists	Territory of the park in the passage part	Construction of roads on the territory of the park by mining companies for ore transportation. A special working group was set up to resolve the conflict, and several working meetings were held. As a result, the companies abandoned their original plans.	4th stage – the conflict is resolved
Kanozersky Nature Reserve / Murmansky tundrovy (Murmansk tundra) Nature Reserve / Tulomsky Nature Reserve	Ministry of Natural Resources of Russia / environmental organizations	Objects of protection	Environmental organizations declare the absence of objects of protection and advocate the elimination of protected areas, and the Ministry of Natural Resources of Russia – for its preservation.	3rd stage
Natural Monument "Astrophyllite of mount Eveslogchorr"	Entities engaged in illegal mining of minerals / Ministry of Natural Resources of Russia	Objects of protection are astrophyllite crystals	Destruction of the main object of protection – astrophyllite crystals by persons and organizations, engaged in illegal mining of minerals.	3rd stage
Nature Park "Rybachy and Sredny Peninsulas"	A Ministry of Defense of Russia / environmental organizations; institutions of science; Ministry of Natural Resources of the region B Ministry of Natural Resources of the region / environmental organizations; institutions of science	A Territory of the park under construction B Objects of protection	A The Ministry of Defense of Russia claims to use the territory of the nature park for its own purposes. Negotiations between the conflicting parties are underway. B The necessity for additional inclusion in protected areas of valuable objects in need of protection, which were unreasonably excluded during the preparation of the regulations on the park. Ministry of Natural Resources of the region, under pressure from environmental organizations, is preparing amendments to the regulations on the reserve concerning the expansion of its borders.	A 4th stage – end of the conflict B 4th stage – end of the conflict
Seidyavvr Nature Reserve	Federal Agency for Mineral Resources, ore mining and processing enterprises / Ministry of Natural Resources of the region; environmental organizations; institutions of science; travel organizations; local population; Small Indigenous Peoples of the North (Saami)	Territory of the nature reserve for exploration and extraction of minerals	The Federal Agency for Mineral Resources, ore mining and processing enterprises advocate the exclusion of all mineral deposits and ore occurrences from the boundaries of the nature reserve for their subsequent development.	3rd stage
Kolvitsky Nature Reserve / Kutsa Nature Reserve / Kaita Nature Reserve	Ministry of Natural Resources of the region / environmental organizations; institutions of science	Objects of protection	Public environmental and scientific organizations consider inadequate the regime of protection of nature reserves, established by the Ministry of Natural Resources of the region, which contributes to the threat of disappearance of the objects of protection. The Ministry of Natural Resources of the region is working to adjust the regulations on the reserve taking into account the recommendations of scientific organizations.	4th stage – end of the conflict

End of Table 1

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Varzugsky Nature Reserve	A User of fishing grounds / environmental organizations; institutions of science; travel organizations; local population B Poaching communities / environmental organizations; institutions of science; local population; Ministry of Natural Resources of the region; fishing control; user of fishing grounds	A Aquatic biological resources (Atlantic salmon) B Aquatic biological resources (Atlantic salmon)	A The user of the fishing grounds intensively extracts Atlantic salmon, as a result of which the number of this valuable fish breed is greatly reduced. Environmental, scientific organizations and the local population are in favor of tightening the protection regime of the nature reserve. B Illegal salmon fishing by poachers, leading to a reduction in the population of this valuable fish breed.	A, B 3rd stage
Geological-geophysical Polygon "Shuoni-Kuets" Geophysical Station "Lovozero" Glacial boulder near Apatites Biogroup of spruces	Ministry of Natural Resources of the region / environmental organizations; institutions of science	Objects of protection	Environmental organizations declare the absence of objects of protection and advocate the elimination of protected areas, and the Ministry Natural Resources of the region – for its preservation. The Ministry Natural Resources of the region retains protected areas, referring to the fact that there is no single procedure for the liquidation of protected areas.	3rd stage
Fluorites of the Yelokorgsky Pillowcase	Enterprise engaged in the harvesting of minerals / environmental organizations	Objects of protection – fluorite minerals	The company, engaged in the harvesting of minerals, planned to develop a mineral deposit in the protected area, which would lead to the destruction of the natural monument. The Ministry Natural Resources of the region refused to consider the liquidation of the natural monument for the subsequent destruction of the object of protection.	4th stage – the conflict is resolved
Amethysts of the Cape Ship	Entities engaged in illegal mining of minerals / environmental organizations	Objects of protection – amethyst crystals	Individuals and organizations, engaged in illegal mining of amethysts, destroy the main object of protection of the natural monument.	3rd stage

The Nature Reserve Fund of the Republic of Karelia consists of 149 specially protected natural territories with a total area of 10 thousand km², which is only 6% of the Republic's area and almost three times lower than the standard, established by the Convention. From 2011 to 2021, seven new protected areas appeared in the region, which led to an increase in the area of protected areas by almost 2 thousand km².

According to the results of the studies, we have identified conflicts only in 9 protected areas of the Republic of Karelia (see Tab. 2), or 6% of

all protected areas in the region. A total of 11 conflict situations were detected. The most "conflicual" protected areas were the Ladoga Skerries National Park and the Shaidomsky Nature Reserve, where two conflicts were recorded.

We should especially note the fact that the vast majority of conflict situations (almost 73%) are at the final stage, the remaining 27% are in the acute (3rd) stages of open conflict. Of the seven completed conflicts, five were resolved in favor of the protected areas.

Table 2. Conflicts related to the creation and functioning of protected areas in the Republic of Karelia

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Ladoga Skerries National Park	A Representatives of the tourism business / environmental organizations; institutions of science	A Territory of the park	A Representatives of the tourism business opposed the creation of the park and wanted to use the resources of this territory for the further development of their business. They set up local residents against the creation of protected areas, intimidated them with restrictions on agriculture activity. Environmental and scientific organizations have launched active educational and explanatory work among the local population. This helped to form a positive image of the new park.	A 4th stage – the conflict is resolved
	B Loggers / environmental organizations; institutions of science	B Territory of the park (tract "Chaika")	B The site of the forest "Tract "Chaika" was included in the projected protected area due to its high biological value. However, this territory was leased from loggers, and they did not want to give it up. The National Park was created, but the tract "Chaika" was not included in it.	B 4th stage – the conflict is resolved
Valaam Nature Park	Representatives of the monastery, economic entities / directorate of protected area of the region	Territory of the park for construction, hunting and aquatic biological resources	Representatives of the monastery, economic entities violate the protection regime of the natural reserve: they build skeets on the territory of the park, carry out household work, catch fish with nets, and arrange poaching of moose. The administration of the monastery, as a rule, does not respond to the legitimate demands of the park staff and agrees to communicate only with representatives of the Ministry of Natural Resources of the region resolving disputes mainly through pressure "from above". A few years ago, the department for the protection of the natural park was liquidated, and employees were laid off.	3rd stage
Shaidomsky Nature Reserve	A Loggers / environmental organizations; institutions of science	A Forest resources, valuable objects of flora and fauna	A Loggers conducted continuous logging on the territory of the nature reserve, which negatively affected the biological value of protected areas. The conflict was resolved through negotiations and amendments to the forestry regulations. Now only selective logging is carried out in the nature reserve.	A 4th stage – the conflict is resolved
	B Directorate of protected area of the region / environmental organizations; institutions of science	B Forest resources	B The Directorate of the protected areas of the region does not make changes to the protection regime of the nature reserve, which allows for selective logging. Environmental and scientific organizations are in favor of tightening the regime due to the high natural value of this territory. As a result of the negotiations, loggers plan to introduce a moratorium on logging within the boundaries of the nature reserve.	B 3rd stage
Lake Kovshozero Nature Reserve	Loggers / local population	Territory of the nature reserve in terms of passage and cattle grazing	Logging companies that carry out cutting and export of wood in the vicinity of Kovshozero, break up roads, sections of hay fields and pastures, pollute the lake with gasoline and diesel fuel. In addition, residents are concerned that the logging takes place on the very shore of the reservoir. Residents appealed to the supervisory authorities. The conflict has not been completed, however, after inspections by the supervisory authorities, entrepreneurs engaged in harvesting and exporting wood restored the road.	3rd stage

End of Table 2

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Chugozero Natural Monument	Representatives of the hunting industry / directorate of protected area of the region, environmental organizations; institutions of science	Territory of protected area	When creating a new protected area, it turned out that hunting grounds are located on the planned territory. The hunting grounds lobbied for the exclusion of its territory from the planned protected area, as a result of which the area of the latter has significantly decreased.	4th stage – the conflict is resolved
Zaonezsky Nature Park	Logger companies / environmental organizations; institutions of science	Forest resources	The planned territory for protected areas is leased from logging companies; they intended to carry out logging. Public environmental and scientific organizations have surveyed this area and established its high natural value. As a result of the negotiations, agreements were reached, according to which loggers announced a voluntary moratorium on logging activities in the territory planned for protected areas.	4th stage – the conflict is resolved
Yangozero Nature Reserve				
Pyalma River Nature Reserve				
Sunsky Bor Nature Monument	Company engaged in the exploration and production of sand and sand-gravel material / local population, institutions of science	Territory of protected area, planned for the extraction of natural resources	The mining company planned to develop a quarry to extract of sand and sand-gravel material. Local population opposed it. At the initiative of the local population, scientists were invited to substantiate the biological value of the forest. Local residents have repeatedly filed lawsuits to protect the Sunsky Bor in court. To date, the environmental prosecutor has issued a warning to the company's director about the inadmissibility of violations of the law when carrying out activities, related to the extraction of sand and sand-gravel material at the Yuzhno-Sunskoye subsurface area.	4th stage – the conflict is resolved

In half of the identified conflict situations, the subject of dispute was the territory of protected areas in terms of its use for the construction of infrastructure facilities, passage, cattle grazing, extraction of natural resources, in another 41.6% of cases, forest resources were the conflict subject.

There are 14 protected areas on the territory of Nenets Autonomous Okrug, the total area of the land part of which is 23.25 thousand km^2. Thus, only 13% of the area of the district has a conservation status with the minimum standard, established by the Convention of 17%. Despite this, it is worth noting a positive trend of increasing the number and area of protected areas in the last decade: since 2011, four new protected areas have been formed in the region, and the square, occupied by protected areas, has almost tripled.

As a result of the study, we have identified conflicts in 78% of the protected areas of the district. Only in three protected areas of the region (Shoinsky, More-Yu and Khaypudyrsky Nature Reserves) there are no conflict situations. Nevertheless, the Khaypudyrsky Nature Reserve is also considered as potentially "conflictual" due to the oil and gas fields, located along its borders (see Tab. 3).

In total, we have recorded 18 conflict situations in the protected areas of Nenets Autonomous Okrug. The most "conflictual" protected areas of the region are the Nenetsky Nature Reserve and the Vaigach Nature Reserve, which account for almost 39% of all identified conflicts.

Currently, most conflict situations (67%) are in the most acute and active third stage, five more conflicts are in the stage of conception and awareness, and only one conflict has reached the fourth final stage.

Table 3. Conflicts related to the creation and functioning of protected areas in Nenets Autonomous Okrug

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Nenets Nature Reserve	A Rosneft / directorate of protected area B Yachtsmen, unorganized tourists, ship-owners / directorate of protected area C Poachers / directorate of protected area D Family and tribal communities / directorate of protected area	A Territory of protected area for the development of minerals B Water area of the reserve and fauna objects (walruses) C Aquatic biological resources of Korovinskaya Bay D Territory for pastures	A Rosneft conducts geological exploration and prepares documents for the development of the Kumzhinsky field within the boundaries of the protected area. The company is in constant negotiations with the directorate of the reserve, but the development of the occurrence has not yet begun. With the work intensification, the conflict may escalate. B Yachtsmen, ship-owners, and tourists violate the regime of the reserve by unauthorized visits to the territory, while causing concern to Atlantic walruses. The directorate of the protected area has organized a temporary observation post. However, due to the seasonality of control and the remoteness of the territory, these measures have low effectiveness. C Poachers illegally extract aquatic biological resources in the Korovinskaya Bay. D Family and tribal communities are interested in grazing deer in adjacent territories and areas of the reserve, which leads to overgrazing of deer, degradation of tundra, littering of protected areas.	A 2nd stage B 3rd stage C 3rd stage D 2nd stage
Nenets Zoological Reserve	A Rosneft / directorate of protected area B Family and tribal communities of Small Indigenous People of the North (SIPN) / directorate of protected area	A Territory of protected area for the development of minerals B Territory for pastures, aquatic biological resources of the reserve	A Rosneft conducts geological exploration and prepares documents for the development of the Korovinskoye field located within the boundaries of the protected areas. The company is in constant negotiations with the directorate of the reserve, but the development of the occurrence has not yet begun. With the work intensification, the conflict may escalate. B The family and tribal communities of the SIPN are interested in grazing deer in adjacent territories and areas of the nature reserve. This leads to overgrazing of deer, non-compliance with pasture turnover, degradation of the tundra, littering of the territory with household waste. SIPN illegally catch aquatic biological resources in protected areas. Currently, the conflict has not acquired an acute form due to negotiations between the conflicting parties.	A 2nd stage B 2nd stage
Vaigach Nature Reserve	A Family and tribal communities "Hebidya Ya", Bask companies / environmental organizations	A Fluff of common eider, king eider and barnacle goose	A The tribal community and entrepreneurs are engaged in collecting fluff for the production of clothing. This scares the birds and negatively affects their population. The resolution of the conflict is difficult due to the lack of a legislative framework regulating this type of activity (fluff harvest).	A 3rd stage

End of Table 3

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
	B Local population, SIPN association/ environmental organizations	B Category (status) of the protected area "Vaigach"	B Environmental organizations advocated changing the category of protected area and creating a national park on the basis of the Vaigach Nature Reserve. The local population opposed the creation of the park fearing eviction and a ban on economic activity, as a result of which the project to create a protected area was frozen. Currently, environmental organizations are actively engaged in ecological and educational work and create a positive image of the park.	B 4th stage – the conflict is resolved

C 3rd stage |
	C Local population, poachers / environmental organizations, Center for Nature Management and Environmental Protection (CNMEP)	C Valuable fauna objects (polar bears and walruses)	C Local population act as guides contributing to the development of illegal tourism on the nature reserve. Tourists visit the walrus rookery, thereby disturbing the animals. Poachers hunt walruses and polar bears for the extraction of fangs or skins.	
Nizhnepechersky Nature Reserve	Poachers / CNMEP	Aquatic biological resources	Poachers are engaged in illegal fishing of biological resources on the territory of protected areas.	3rd stage
Pakhanchevsky Nature Reserve				
Vashutkinsky Nature Reserve				
Nature Monument "Kamenny Gorod" (Stone City)				
Khaypudyrsky Nature Reserve	Subsoil user / CNMEP	Territory for the development of oil and gas fields along the nature reserve borders	The nature reserve was created in order to preserve coastal marching ecosystems (places of concentration of migratory birds). There may be a conflict with subsoil users who have licenses to develop oil and gas fields, located along the boundaries of protected area.	1st stage
Severny Timan Nature Park	A Poachers / CNMEP

B Local population, poachers, reindeer breeders / CNMEP | A Aquatic biological resources
B – Valuable object of fauna (wild deer) | A. Poachers are engaged in illegal fishing of biological resources in protected area.

B Local population and poachers kill wild reindeer for food, and reindeer breeders – because of the removal of domestic females by males from herds. | A 3rd stage
B 3rd stage |
| Natural Monument "Pym-Va-Shor" | Local population, tourists / CNMEP | Territory with a thermal spring | Residents of Haruta Rural Settlement act as guides for tourists who visit the territory of the natural monument uncontrollably. As a result, the territory is littered, buildings are destroyed, and rare plant species are lost (Paeonia anomala). | 3rd stage |
| Nature Monument "Kan'on Bol'shiye Vorota" (Big Gate Canyon) | Poachers, tourists / CNMEP | Aquatic biological resources, valuable object of protection – agates, territory | Poachers are engaged in illegal fishing of biological resources on the territory of the natural monument, and tourists illegally collect semi-precious agate stones, leave garbage. | 3rd stage |

The subject of the emergence of the vast majority of the studied conflicts were the territory of protected areas (to extract natural resources and use them for pastures) and aquatic biological resources (36.4% each). The remaining 27.2% have conflicts over protected areas (wild reindeer, polar bear, walrus, etc.), as well as changes in the status of protected areas (transformation of the Vaigach Nature Reserve into a National Park).

Nature Reserve Fund of the Komi Republic consists of 234 protected areas with a total area of 54 thousand km^2, which corresponds to 13% of the republic's territory and is significantly inferior to the Convention standard. The Komi Republic has become the only region of the European part of the Russian Arctic where the number of protected areas has decreased over the past 10 years: from 239 in 2011 to 234 in 2021. The area, occupied by protected areas, has also decreased: from 56 to 54 thousand km^2, respectively.

As a result of the research, we have identified 32 conflict situations in the protected areas of the Komi Republic (see Tab. 4). Various kinds of conflicts occur in 11.5% of the protected areas of the region.

According to the majority of experts interviewed, violations that can escalate into conflicts exist in almost all protected areas of the Komi Republic. The main violators are the local population and tourists. The local population often does not know about the existence of protected areas or does not perceive this territory as specially protected: they continue hunting, fishing, harvesting berries, mushrooms, and hay. Recently, various snowmobile and all-terrain vehicles have become easily accessible; people use it to get to the most inaccessible protected areas. This leads to an increase in the number of violations of the protected areas regime and an increase in conflict situations.

Table 4. Conflicts related to the creation and functioning of protected areas in the Komi Republic

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Yugyd Va National Park	A Tourists, poachers / park administration	A Biological hunting and water resources, territory of protected area	A Illegal fishing and hunting is carried out on the territory of the protected area. Tourists travel throughout the park on various types of transport. As a result, ecosystems are degraded and the park territory is littered.	A 3rd stage
	B Reindeer breeders / park administration	B Territory of protected area for pastures	B On the territory of the protected area, unauthorized grazing of deer is carried out by reindeer breeders. This leads to the degradation of tundra communities of protected area.	B 3rd stage
	C Gold mining company / park administration	C Territory of protected area for mining	C It was assumed that part of the park's territory would be seized by a gold mining company, which had been fighting for the right to mine gold at the occurrence "Chudnoye" for many years. The Arbitration Court of Komi issued a decision on the liberation of the territory of the protected area by gold miners.	C 4th stage – end of the conflict
Pechora-Ilych Nature Reserve	A Tourists, poachers / nature reserve administration	A Territory of protected area (Manpupuner Plateau), aquatic biological resources	A Illegal fishing is carried out in the protected area, as well as passage through the territory and unauthorized visits by tourist groups to the Manpupuner plateau. The nature reserve administration built a house for inspectors on the plateau and organized a year-round duty.	A 3rd stage
	B Nature reserve administration / institutions of science	B Forest resources	B Employees of the reserve carried out illegal logging of forest plantations as part of their economic activities, which was actively opposed by representatives of scientific institutions of the region.	B 3rd stage

Continuation of Table 4

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Natural Monument "Vodopad na reke Khal'mer''yu" (Waterfall on the Halmeryu River)	Tourists / Center for Protected Areas	Territory of protected area	There is an unregulated tourist flow in the protected areas, unauthorized buildings where tourists and fishermen rest.	3rd stage
Enganepe Nature Reserve Khrebtovyy Nature Reserve	Reindeer breeders / Center for Protected Areas	Forest resources	Periodically, reindeer breeders harvest wood in nature reserves to repair sleds.	3rd stage
Podcheremsky Nature Reserve Ilychsky Nature Reserve Syninsky Nature Reserve	Poachers / Center for Protected Areas	Aquatic biological resources	Illegal fishing is carried out on the territory of nature reserves.	3rd stage
Sebys Nature Reserve	Oil exploration and production organizations / Center for Protected Areas	Territory of protected areas for the development of minerals	Geological organizations advocate geological exploration with the subsequent development of an oil field on the territory of the reserve. Currently, an attempt is being made to organize a referendum on this issue.	3rd stage
Adak Nature Reserve	Poachers / Center for Protected Areas	Aquatic biological resources, territory of protected area	Illegal fishing is carried out on the territory of the nature reserve, as well as cluttering of the territory with household garbage.	3rd stage
Chernorechen-sky Nature Reserve	Mineral exploration and production organizations / institutions of science	Territory of protected area for the development of minerals	When creating a protected area, scientists proposed a different territory. But due to the fact that licensed areas for exploration and extraction of minerals are located on it, the boundaries of the nature reserve being created were moved to a less valuable territory in terms of nature.	4th stage – end of the conflict
Vymsky Nature Reserve	A Poachers / Center for Protected Areas	A Biological aquatic resources	A Illegal fishing is carried out on the territory of the nature reserve.	A 3rd stage
	B Bauxite mining company / institu-tions of science	B Territory of protected area	B In connection with the activities of the bauxite mining company, the forest ecosystems, water and bottom sediments adjacent to the protected areas are polluted.	B 3rd stage
Sindorsky Nature Reserve	Poachers, tourists / Center for Protected Areas, institutions of science	Biological hunting and water resources, territory	Illegal fishing and hunting are carried out on the territory of the nature reserve. The territory is often visited by tourists.	3rd stage
Tybyunyur Nature Reserve Verkhne-Lokchimsky Nature Reserve	Poachers / Center for Protected Areas	Biological hunting resources	Illegal hunting of wild reindeer is carried out on the territory of nature reserves.	3rd stage
Dod-Nyur Nature Reserve	Poachers / Center for Protected Areas	Biological hunting resources	Illegal hunting of flying geese is carried out within the nature reserve.	3rd stage

Name of the protected area	Parties to the conflict	Subject of the conflict	Description of the conflict	Conflict stage
Lunvyvnyur Nature Reserve Tashnyur Nature Reserve	Poachers / Center for Protected Areas	Biological hunting resources, territory of protected areas	Illegal hunting of flying geese is carried out within the nature reserve. During the cranberry harvest, all-terrain vehicles move through the swamp, the swamp is polluted with household waste.	3rd stage
Vazhelyu Nature Reserve	A Poachers / Center for Protected Areas	A Biological hunting resources	A Illegal hunting is carried out on the nature reserve.	A 3rd stage
	B Organizations / Center for Protected Areas	B Territory of protected area	B A lot of unauthorized landfills are recorded in the protected areas.	B 3rd stage
Soivinsky Nature Reserve	Tourists / Center for Protected Areas	Territory of protected area	Tourists litter the banks of the Soiva and Omra Rivers with household garbage.	3rd stage
Uninsky Nature Reserve	Poachers, tourists / Center for Protected Areas	Biological hunting resources, territory of protected area	Illegal fishing and hunting are carried out on the protected areas. Unauthorized bases, huts and other buildings for tourist activities are located in the nature reserve.	3rd stage
Yezhugsky Nature Reserve Pyzhemsky Nature Reserve Udorsky Nature Reserve	Poachers / Center for Protected Areas	Biological hunting and water resources	Illegal fishing and hunting are carried out on the territory of the nature reserve, possibly for wild reindeer.	3rd stage
Belaya Kedva Nature Reserve Sodzimsky Nature Reserve Puchkomsky Nature Reserve	Poachers / Center for Protected Areas	Biological hunting and water resources	Illegal fishing and hunting are carried out on the territory of the nature reserve.	3rd stage

Currently, the vast majority of conflicts (94%) are in the most acute stage. Only two conflict situations have reached the completion stage, while one of the conflicts ended in favor of the protected areas (Yugyd Va National Park), and the other — in favor of economic entities, engaged in exploration and extraction of minerals (Chernorechensky Nature Reserve).

Most often, biological resources (water and hunting) are the conflict subject in the protected areas of the Komi Republic; they account for more than half of the identified conflict situations. Quite often, the subject of dispute is the territory of protected areas for exploration and extraction of minerals, pastures, construction of infrastructure facilities, as well as waste disposal (28.6%). In the remaining 17% of cases, forest resources of protected areas are the conflict subject.

Thus, the studies, conducted in the regions of the European part of the Russian Arctic, allow concluding about the high degree of "conflict" of their protected areas. A threatening situation has developed in Nenets Autonomous Okrug, where conflicts occur in almost 80% of protected areas, while most of them are in the most acute stage (*Tab. 5*).

A rather difficult situation is observed in the Murmansk and Arkhangelsk oblasts [30], in which more than 20% of protected areas are "conflictual". The least problems in this area are typical for the Republic of Karelia, where conflicts are observed only on 6% of specially protected natural territories,

Table 5. Summary data on conflicts in protected areas of the regions of the European part of the Russian Arctic, %

	Arkhangelsk Oblast	Murmansk Oblast	Republic of Karelia	Nenets AO	Komi Republic
Share of protected areas in the region	8	13	6	13	13
Share of "conflictual" protected areas in the total number of protected areas in the region	33	23	6	78	11.5
Share of conflicts in the third stage in the total number of conflict situations in the protected areas of the region	69	63	27	67	94

at the same time, the vast majority of them have already been resolved or are at the final stage.

Conclusions and recommendations

The data, obtained as a result of the conducted research, emphasize the high relevance of the problem of conflicts in protected areas. At the same time, the small share of protected areas in the total square of the regions of the European part of the Russian Arctic requires creating new protected areas, and this process is extremely rare without conflicts. In this regard, the authors have developed a universal mechanism for resolving conflict situations in protected areas (*Fig.*).

As the figure shows, the purpose of the mechanism is to resolve or de-escalate (if for some reason a full resolution cannot be achieved) the conflict in the protected areas. The success of achieving the goal will largely depend on the quality and depth of the analysis of existing conflict situations.

It is a comprehensive analysis of the conflicts that arise during the creation and functioning of protected areas that becomes the foundation for implementing the subsequent stages of the mechanism realization. Next, the stakeholders (parties to the conflict) are determined, as well as their true interests. At the same time, it is important to identify indirect participants who "set up" direct participants in the conflict or provide them with material/informational support. The analysis of the conflict situations in the protected areas of the European part of the Russian Arctic made it possible to identify the most common stakeholders and their immediate interests.

At the next stages, the conflict subject and its stages are revealed. We should remember that if the conflict has already moved into the most active and acute third stage, then its resolution will be significantly difficult and will require large resources. In this regard, the role of constant monitoring of conflict situations in protected areas and their detection at earlier stages increases.

Only after a detailed consideration and structuring of the conflict there is organization of the platform work to coordinate the stakeholders' interests. In our opinion, the best solution, given the wide prevalence and relevance of the problem of conflicts in protected areas, would be the organization of a permanent advisory and consultative authority on protected areas under the regional government or the head of the municipality. This institute is designed to take into account the needs and interests of local population, enterprises of the resource sector, as well as the preservation and protection of the unique natural complexes of the territory. At the same time, the creation of an advisory and consultative body under the head of the municipality sounds more preferable according to the authors. For instance, research studies, conducted in Norway, have shown that decentralization of the management system of protected areas, transfer of certain powers to the local level and the active involvement of local communities in decision-making processes have led to the adaptation of the network of protected areas to local socio-economic conditions and an increase in the level of support for nature protection from the local population [30].

Mechanism of conflict resolution in protected areas

STAKEHOLDERS' INTERESTS

STAKEHOLDERS

Stakeholders:
- Authorities
- Local population
- Economic entities
- Tourists
- Public environmental organizations
- Scientific organizations
- Managers of protected area
- Poachers

Interests:
- Compliance with regulatory legal acts in relation to protected
- Use of protected area resources for various purposes or the preservation of natural complexes
- Use of the resources of protected area and its territory in order
- Use of the resources of protected area and its territory in order
- Conservation of natural complexes
- Conservation of valuable natural objects
- Compliance with the protected area regime
- Use of protected area resources for personal gain

Identification of the conflict subject:
- Territory of protected area
- Forest resources of protected area
- Aquatic biological resources of protected area
- Hunting biological resources of protected area
- Valuable protected area

Determining the conflict stage:
- 1st stage, the origin of the conflict
- 2nd stage, awareness of conflict
- 3rd stage, conflicting actions
- 4th stage, end of the conflict

- Provision of economic interests
- Provision of social interests
- Provision of environmental interests

Process:
- Analysis of conflicts arising during the creation and operation of protected areas
- Identification of stakeholders and their interests
- Identification of the conflict subject
- Determining the conflict stage
- Organization of the platform work to coordinate the stakeholders' interests
- Account the priority of the territory's sustainable development
- Statement of specific tasks to resolve the conflict
- Choosing conflict resolution tools

Conflict resolution tools:
- Financial
- Organizational and economic
- Legal

MONITORING

Purpose: resolution/de-escalation of conflicts in protected areas

The tasks of the advisory and consultative body on protected areas are:

— to organize the discussion of controversial issues, related to the creation and functioning of protected areas in the region;

— to prepare and provide objective and comprehensive information on the activities of protected areas in the region, as well as on planned protected areas;

— to initiate and participate in public discussion of issues, related to the activities of the management (directorate) of protected areas;

— to organize joint events with managers of protected areas, aimed at environmental education and arrangement of the protected areas;

— to consider draft regulatory legal acts and other documents, related to the creation and operation of protected areas in the region;

— to participate in anti-corruption work and evaluation of the effectiveness of the managers of protected areas;

— to interact with the media on the coverage of issues, discussed at meetings of the advisory and consultative body on protected areas.

The advisory and consultative body on protected areas has the right to determine a list of other priority legal acts and the most important issues, related to the creation and functioning of protected areas, which are subject to mandatory consideration at meetings. The advisory and consultative body should include representatives of state and municipal authorities, managers of protected areas, representatives of scientific and public environmental organizations, economic entities and local population.

When developing a consensus, it is imperative to take into account the priority of the territory's sustainable development. If possible, it is necessary to refrain from making such decisions that may harm at least one of the systems of the region: social, environmental or economic, and try to ensure their harmonious development as much as possible.

After the development of a joint solution, the stage of setting tasks begins, the achievement of which will lead to the resolution of the conflict situation, as well as the choice of specific tools for their implementation. At the same time, we can distinguish three main types of tools:

1. Legal instruments. They include regulatory legal acts of the regional and municipal levels, which determine the conditions for the creation and functioning of protected areas in the region. The advisory and consultative body on protected areas has the right to initiate work on the adoption of laws, as well as on amendments to existing regulations that would contribute to the resolution and prevention of conflict situations in protected areas.

2. Organizational and economic instruments are:

— informational and advisory support of local population and economic entities on the creation and functioning of protected areas;

— organization of training (workshops, seminars, study trips, etc.) of local population and managers of protected areas;

— coordination of the actions of the subjects in charge of which the regional protected areas are located.

3. Financial instruments are: tax incentives, subsidies, preferential loans, aimed at the development of entrepreneurial initiatives of the local population taking into account the territory's sustainable development. In addition, in this group of instruments, compensations should be allocated that have a natural or monetary expression and are aimed at resolving the conflict in protected areas.

After the implementation of the selected set of tools, it is necessary to assess their effectiveness: whether the tasks were achieved and whether the actions taken led to the resolution of the conflict. To this end, monitoring is carried out, aimed at identifying and analyzing conflict situations that

arise during the creation and operation of protected areas in the region. Consequently, the conflict resolution mechanism in protected areas acquires a closed character, and the proposed monitoring system becomes both the completion and the beginning of the mechanism.

Conclusion

Thus, we have fully achieved the purpose of the study. On the basis of the algorithm, proposed by the authors earlier, we have revealed and systematized the conflicts, related to the creation and functioning of protected areas in the European part of the Russian Arctic. In total, we have detected 138 conflicts in 22% of protected areas, of which 70.3% are in the most acute stage of open conflict actions. The situation in the Nenets Autonomous Okrug requires special attention, where conflicts occur in almost 80% of all protected areas in the region. A rather difficult situation has developed in the Murmansk and Arkhangelsk Oblasts, in which more than 20% of protected areas are "conflictual". The situation is aggravated by the impact of specific Arctic features, in particular, the great vulnerability and fragility of Arctic natural ecosystems, the dependence of the vital activity of a significant part of the population on the preservation of the Arctic nature in an intact state (especially relevant for indigenous peoples of the North, as well as for local population, engaged in gathering, hunting and fishing). In addition, conflicts in protected areas significantly complicate the full use of employment opportunities for the local population in tourism. In conditions of inaccessibility and peripherality of the Arctic territory, where the possibilities of applying labor are severely limited, this may become almost the only alternative to unemployment.

The high relevance of the problem of conflicts in protected areas forced the authors to pay close attention to its solution. As a result of the conducted research, we have worked out a universal mechanism for resolving conflict situations in protected areas. It has a closed character and includes the following structural elements (implementation stages): goal setting; analysis of conflicts arising during the creation and functioning of protected areas; identification of stakeholders and their interests; identification of the subject and the conflict stage; organization of the platform work for coordinating the stakeholders' interests; taking into account the priority of the territory's sustainable development; setting specific tasks and choosing conflict resolution tools; monitoring conflict situations in protected areas.

According to the authors, the advisory and consultative body on protected areas should act as a platform for coordinating the stakeholders' interests being permanently under the regional government or the head of the municipality. The study clearly defines the composition of such an authority, as well as the main tasks of its work.

The authors will continue their research on the inventory and systematization of conflicts in the protected areas of the Arctic regions of Russia because they believe that this work is the foundation for successful conflict resolution. The authors' team hopes to implement the proposed mechanism for resolving conflict situations in the regions of the Russian Arctic. Its implementation will not only preserve the unique fragile natural complexes of the Arctic and increase the efficiency of the functioning of the network of protected areas of the Arctic regions, but also contribute to the balanced sustainable socio-economic development of their territories.

References

1. Evsjeev A.V., Krasovskaya T.M. Modern conflicts of nature management in the North of Russia. In: *Problemy geokonfliktologii. Tom II* [Problems of Geoconflictology. Volume 2]. Moscow: Press-Solo, 2004. Pp. 276–294 (in Russian).

2. Evsjeev A.V., Krasovskaya T.M. Nature management in the North of Russia. *Teoreticheskaya i prikladnaya ekologiya=Theoretical and Applied Ecology*, 2008, no. 1, pp. 90−96 (in Russian).

3. Evseev A.V., Krasovskaya T.M., Chereshnia O.Yu. Potential conflicts of nature management in the Nenets Autonomous District. In: *InterKarto. InterGIS* [InterCarto. InterGIS]. Moscow: Izdatel'stvo Moskovskogo Universiteta, 2019, vol. 25, no. 1, pp. 81−88. DOI: 10.35595/2414-9179-2019-1-25-81-88 (in Russian).

4. Evseev A.V., Krasovskaya T.M., Belousov S.K. Revealing and mapping of nature management conflicts in the Northern Yakutia advanced development zone of the Russian Arctic. In: *InterKarto. InterGIS* [InterCarto. InterGIS]. Moscow: Izdatel'stvo Moskovskogo Universiteta, 2020, vol. 26, no. 1, pp. 68−79. DOI: 10.35595/2414-9179-2020-1-26-68-79 (in Russian).

5. Shuvaev N.S. et al. Modern nature management: Typization, problems, conflicts. *Geologiya, geografiya i global'naya energiya=Geology, Geography and Global Energy*, 2019, no. 2 (73), pp. 73−90 (in Russian).

6. Shuvaev N.S. et al. Conflicts of nature management: Typification and analysis at the present stage. *Nauchnye vedomosti Belgorodskogo gosudarstvennogo universiteta. Seriya: Estestvennye nauki=Scientific Bulletin of Belgorod State University. Series: Natural Sciences*, 2018, vol. 42, no. 3, pp. 446−458. DOI: 10.18413/2075-4671-2018-42-3-446-458 (in Russian).

7. Vorobjevskaya E.L. et al. Modern natural resource management and geoecological problems in the central part of the Kola Peninsula. *Ekologiya i promyshlennost' Rossii=Ecology and Industry in Russia*, 2017, vol. 21, no. 6, pp. 30−35. DOI: 10.18412/1816-0395-2017-6-30-35 (in Russian).

8. Vorob'evskaya E.L., Kirillov S.N., Sedova N.B. Ecological situation control in central Lake Baikal ecological zone. *Nauchnoe obozrenie=Science Review*, 2016, no. 15, pp. 112−117 (in Russian).

9. Emerson K., Orr P.J., Keyes D.L., Mcknight K.M. Environmental conflict resolution: Evaluating performance outcomes and contributing factors. *Conflict resolution Quarterly,* 2009, vol. 27, no. 1, pp. 27−38. DOI: 10.1002/crq.247

10. Krasnoyarova B.A. et al. Spatial organization and conflict of natural-economic systems development in Western Siberia. *Izvestiya vysshikh uchebnykh zavedenii. Severo-Kavkazskii region. Seriya: Estestvennye nauki=Bulletin of Higher Education Institutes North Caucasus Region. Natural Sciences*, 2018, no. 3 (199), pp. 98−106 (in Russian).

11. Gerber J.-F., Veuthey S., Martínez-Alier J. Linking political ecology with ecological economic in tree plantation conflicts in Cameroon and Ecuador. *Ecological Economics,* 2009, vol. 68, pp. 2885−2889.

12. Johannesen A.B. Protected areas, wildlife conservation, and local welfare. *Ecological economics,* 2009, vol. 1, pp. 126−135.

13. Mbanze A.A., Vieira da Silva C., Ribeiro N.S., Santos J.L. Participation in illegal harvesting of natural resources and the perceived costs and benefits of living within a protected area. *Ecological Economics,* 2021, vol. 179, 106825. DOI: doi.org/10.1016/j.ecolecon.2020.106825

14. Campos-Silva J.V., Peres C.A., Hawes J.E., Haugaasen T., Freitas C.T., Ladle R.J., Lopes P.F.M. Sustainable-use protected areas catalyze enhanced livelihoods in rural Amazonia. *Proceedings of the National Academy of Sciences,* 2021, vol. 118 (40). DOI: 10.1073/pnas.2105480118

15. Alekseenko N.A. Maps of nature management conflicts for the design of nature protection areas of regional and local importance. *Vestnik Moskovskogo universiteta. Seriya 5. Geografiya=Moscow University Bulletin. Series 5, Geography*, 2012, no. 2, pp. 54−58 (in Russian).

16. Alekseenko N.A., Drozdov A.V. Conflicts in nature management and their mapping (the case of NP "Ugra"). *Izvestiya RAN. Seriya geograficheskaya=News of the Russian Academy of Sciences. Geography Series*, 2005, no. 6, pp. 77−85 (in Russian).

17. Kuznetsov M.P., Pegov S.A. Nature management conflicts in the area of the Valdai National Park. *Izvestiya RAN. Seriya geograficheskaya=News of the Russian Academy of Sciences. Geography Series,* 2010, no. 4, pp. 77−85 (in Russian).

18. Kostovskaya S.K., Chervyakova O.G., Stulyshapku V.O. Nature management conflicts in protected areas. *Problemy regional'noi ekologii=Problems of Regional Ecology*, 2010, no. 2, pp. 208−214 (in Russian).

19. Bocharnikova A.V. The role of traditional institutions in strategies of co-administration of protected areas in Primorskiy region of Russia. *Biosfera=Biosphere*, 2017, vol. 9, no. 1, pp. 71−78 (in Russian).

20. Dahrendorf R. *Elemente eines Theorie des sozialen Konflikts*. Gesellschaft und Freiheit. München: R. Piper, 1965. 454 p.

21. Coser L.A. *Funktsii sotsial'nogo konflikta* [The Functions of Social Conflict]. Translated form English by O.A. Nazarova. Moscow: Ideya-Press, Dom intellektual'noi knigi, 2000. 205 p.

22. Solomatina E.N. Formation and development of the sociology of conflict in Russia. *Vestnik Moskovskogo universiteta. Seriya 18. Sotsiologiya i politologiya=Moscow State University Bulletin. Series 18. Sociology and political Science*, 2011, no. 2, pp. 207−221 (in Russian).

23. Lozano R. Envisioning sustainability three-dimensionally. *Journal of Cleaner Production,* 2008, no. 16 (17), pp.1838−1846.

24. Dryzek J.S. *The Politics of the Earth: Environmental Discourses*. 2nd ed. Oxford: Oxford University Press, 2005. 261 p.

25. Bürgi M., Ali P., Chowdhury A., Heinimann A., Hett C., Kienast F., Mondal M.K., Upreti B.R. and Verburg P.H. Integrated landscape approach: Closing the gap between theory and application. *Sustainabilit,* 2017, no. 9 (8). pp. 1371. DOI: 10.3390/su9081371

26. Sayer J., Sunderland T., Ghazoul J., Pfund J.L., Sheil D., Meijaard E., Venter M., Boedhihartono A.K., Day M., Garcia C., Van Oosten C. Ten principles for a landscape approach to reconciling agriculture, conservation, and other competing land uses. *Proceedings of the National Academy of Sciences,* 2013, no. 110 (21), pp. 8349−8356.

27. Arts B., Buizer M., Horlings L., Ingram V., Van Oosten C., Opdam P. Landscape approaches: A state-of-the-art review. *Annual Review of Environment and Resources*, 2017, no. 42, pp. 439−463. DOI: 10.1146/ANNUREV-ENVIRON-102016-060932

28. Freeman R.E. *Stakeholder Management: A Stakeholder Approach*. Marshfield, MA: Pitman Publishing, 1984. 276 p.

29. Smirennikova E.V., Ukhanova A.V., Voronina L.V. Conflicts in protected natural areas of the Arctic region: Identifying, analyzing and finding the solutions. *Ekonomicheskie i sotsial'nye peremeny: fakty, tendentsii, prognoz=Economic and Social Changes: Facts, Trends, Forecast,* 2019, vol. 12, no. 3, pp. 107−123. DOI: 10.15838/esc.2019.3.62.7 (in Russian).

30. Hausner V.H., Engen S., Muñoz L., Fauchald P. Assessing a nationwide policy reform toward community-based conservation of biological diversity and ecosystem services in the Alpine North. *Ecosystem Services,* 2021, vol. 49 (2021), 101289. DOI: 10.1016/j.ecoser.2021.101289

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Assessing the Scale and Prospects of the Impact of Climate-Related Risks on Russia's Socio-Economic Development*

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Abstract. Global climate change is one of the most critical issues of our time. It is of vital importance to Russia, since the functioning of the country's economy to a great extant depends on natural resources, and one of the most dangerous consequences of climate change is the depletion of natural capital. In this regard, one should take an assessment of climate-related risks. The purpose of the work is a comprehensive assessment of the impact of climate-related risks on the socio-economic development of Russia. The article determines external climate-related risks expressed in the external pressure of international treaties and trade policy, pursued by foreign countries, particularly Europe, and internal risks realized through ecosystem disbalance and biodiversity loss, epidemic outbreaks and complication of their course, deterioration of infrastructure and other fundamental structures in a large part of the country. It has been established that Russia has just begun the transition to a low-carbon development, and the feature

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of this process compared to other countries is a comprehensive approach that involves both greenhouse gas reduction and its absorption directly from the atmospheric air. Hydrogen economy plays a key-role in emission reduction; in order to absorb greenhouse gases from the atmosphere, it is planned to form industry for their utilization through building carbon polygons and farms. We have found that measures to reduce the country's carbon footprint are now consistent and do not interfere with the interests of either business or government. However, the main issue, in our opinion, is the low rate of implementation of the measures taken relative to similar efforts of foreign countries, which to some extent gives foreign countries the opportunity, under the pretext of environmental policy, to influence the Russian economy and further hinder the Russian Federation in standing its ground in the international arena.

Key words: climate-related risks, socio-economic development, Russia, low-carbon development, decarbonization.

Introduction

In recent years, the planning of economic development at the global and national levels has been increasingly focused on environmental aspects [1−4]. In particular, this is caused by the increasing frequency of natural emergencies, which affect both the environment and the socio-economic system of individual countries.

According to the American scientist T. Farmer, it is the process of environmental degradation, noticeably increased in recent decades, that becomes the main factor in the emergence of many natural phenomena that produce a devastating effect on the economy [1]. The main danger of natural risks lies in the fact that many of them are realized very slowly and accumulate many phenomena (geological, geophysical, hydrological and meteorological) [2].

In the last decade, special attention has been paid to climate-related risks, which are often the cause of various natural disasters and, as a consequence, significant material damage [4−8].

According to The Global Climate Risk Index 2020, which shows to what extent countries and regions have suffered from the consequences associated with natural risks (storms, floods, heat waves, etc.), Russia in 2018 ranked 79th out of 137. Moreover, in terms of natural disasters per 100,000 people, it fell to 103rd out of 115 possible ranks [3].

The unpredictable and uncontrollable force of nature poses a significant danger to the socio-economic development of Russia. According to RAS academician B.N. Porfir'ev, the main problem of coming natural risks is the complexity of their prediction and assessment, which makes it very difficult to carry out preventive and adaptation measures [4]. This necessitates a comprehensive approach to solving the problem of climate-related risks reduction, implemented through consideration of environmental, social and economic aspects, their reflection in domestic and foreign policy of the country.

The purpose of this work is to conduct a comprehensive assessment of the impact of climate-related risks on the socio-economic development of the Russian Federation.

The novelty of the study consists in a comprehensive assessment of the current state and prospects for the realization of climate-related risks for the socio-economic development of Russia.

Theoretical aspects of the research

With the increasing influence of the concepts of sustainable development and green economy in the world, there is a growing awareness of the need to consider the environmental aspects of socio-economic development. One possible reason for this is the increasing frequency of natural disasters

and emergencies which damage almost all spheres of economic life.

According to the World Meteorological Organization, the number of natural disasters in the period 2010–2019 increased 4.5-fold compared to 1970–1979, and economic losses from them increased almost 8-fold *(Tab. 1)*.

If we consider natural emergencies in Russia, we can see that the situation has changed. For example, in the regions of the Northwestern Federal District, cases of special fire risk have become more frequent since 1998, and since 2001 entire range of adverse phenomena has

been observed. In the constituent entities of the North Caucasian Federal District, as well as in the Northwestern Federal District, cases of special fire risk have become more frequent since 1998, cases of avalanches have become quite regular since 1999, and hail has become more frequent in Stavropol Krai since 2016. In the Far Eastern Federal District, the problem of floods has become more acute since 2013[1].

Some of these emergencies have caused more than 140,000 population displacements and forced migrations *(Fig. 1)*, even though the number of emergencies decreased between 2010 and 2019.

Table 1. The number of natural disasters in the world and the associated economic losses

Indicator	1970–1979	1980–1989	1990–1999	2000–2009	2010–2019
Natural disasters, cases	711	1,410	2,250	3,536	3,165
Economic losses, billion dollars	175.4	289.3	852.3	942.0	1,381.0
Source: The atlas of mortality and economic losses from weather, climate and water extremes (1970–2019). *WMO*. 2021. 19 p.					

Figure 1. Number of displacements as a result of natural disasters in the Russian Federation, cases
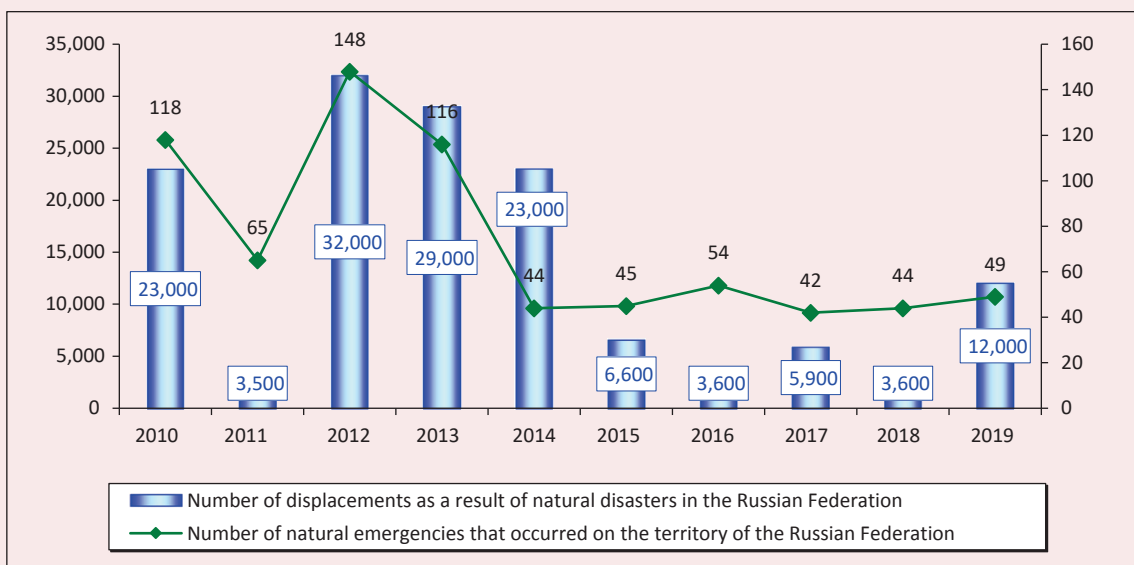
Compiled according to: Internal Displacement Monitoring Centre (IDMC). Russia. 2020. Available at: https://www.internal-displacement.org/countries/russia; Environment. *Rosstat.* Available at: https://rosstat.gov.ru/folder/11194

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[1] Information about dangerous and adverse hydrometeorological phenomena that caused material and social damage on the territory of Russia. Available at: http://meteo.ru/component/docman/doc_download/738-massiv-dannykh-ojdamage-rus?Itemid=

Table 2. Classification of natural risks by genesis, scale and nature of impact

Indicator	Type of risks
Genesis	Cosmogenic
	Atmospheric
	Hydrologic
	Climate
	Geologic
	Biogenic
Scale	Worldwide
	Continental
	National
	Regional
	District and local
Nature of impact	Destructive
	Paralyzing
	Depleting
	Causing technological emergencies
Source: Bedilo M.V. et. al. *Opasnye prirodnye protsessy: ucheb* [Hazardous Natural Processes: Textbook]. 2nd edition revised and supplemented. Moscow: Akademiya GPS MChS Rossii, 2020. 9 p.	

Natural risks are very diverse both in their origin and in the scale and nature of their impact *(Tab. 2)*. However, in recent years, special attention has been paid to climate-related risks which, by definition, will be long-term, and the scale of their consequences may affect all levels of management.

In our study, climate-related risk will be understood as "the time-limited probability of adverse socio-economic, socio-demographic and natural conditions caused by climatic reasons" [2].

The priority of climate-related risks is also due to the fact that they can act as a kind of trigger for other types of natural risks. For example, a long-term increase in temperature can provoke a forest fire, followed by depletion of natural capital and loss of biodiversity, increased morbidity (due to air pollution and smoke poisoning) and nearby population mortality. Another example of the interdependence of natural risks with climate-related ones would be the permafrost thawing, the consequence of which would be ecosystem disbalance, (which, again, leads to the depletion of natural capital and loss of biodiversity) the destruction of infrastructure, resulting in human losses.

At the present stage of development, global climate change primarily means global warming. Its generally recognized cause was an increase in the concentration of greenhouse gases (GHG) in the atmosphere, coming from both natural (e.g. due to volcanic eruptions, marsh gas emissions, etc.) and anthropogenic sources (emissions from industry, transport, landfill, etc.). While society cannot prevent natural emissions, it is possible to reduce anthropogenic emissions, and in some countries, it is claimed that they can be reduced to zero.

Among all greenhouse gases (carbon dioxide, methane, nitrous oxide, hydrochlorofluorocarbons, hydrofluorocarbons, ozone), the proportion of carbon dioxide in the structure of emissions is the largest (79.2%, *Fig. 2*). Despite this, researchers are increasingly drawing attention to the importance of focusing on the effects of the other GHGs because of their higher risk. For example, B.N. Porfir'ev emphasizes that "the greenhouse effect of methane

Figure 2. Total greenhouse gas emissions in Russia in 2019, million tons CO2-eq.

36.5   2.5
84.2   1.4
315.4

- carbon dioxide (CO_2)
- methane (CH_4)
- nitrous oxide (N_2O)
- hydrofluorocarbons (HFC)
- perfluorocarbons (PFC)
- sulfur hexafluoride (SF_6)

1 679.4
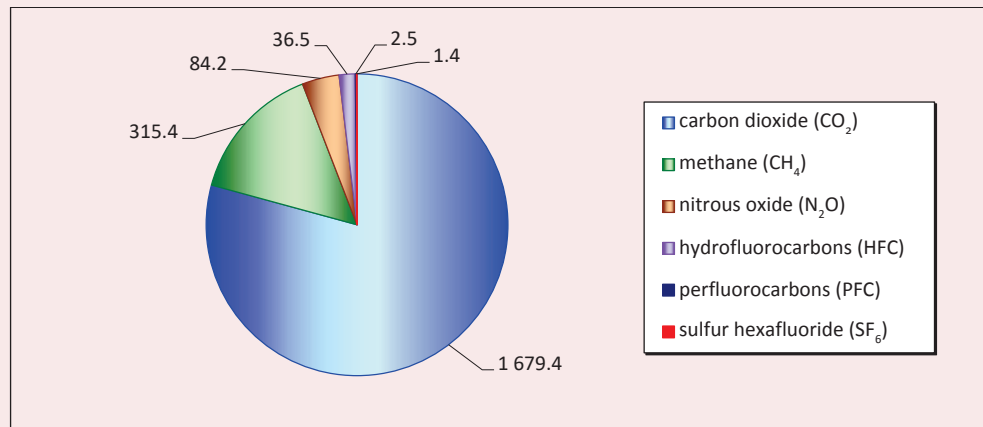
Source: Environmental Protection. *Rosstat*. Available at: https://rosstat.gov.ru/folder/11194

and the associated risks are many times greater than those of CO2, and the environmental and economic efficiency of measures to reduce CH4 emissions is significantly higher" [9].

The negative impact of the consequences of climate change is confirmed by a number of recent studies. Thus, researchers of the Institute of Economic Forecasting of the Russian Academy of Sciences (IEF RAS) (B.N. Porfir'ev, D.O. Eliseev, D.A. Streletskii) predicted possible economic losses due to the destruction of infrastructure caused by climate change until 2050. The results obtained show that the costs of restoring and maintaining the sustainable functioning of regional road infrastructure due to the risk of permafrost thawing and degradation may vary from 14 to 28 billion rubles[2] in annual investments [10].

Another researcher from IEF RAS, Professor B.A. Revich proved the impact of climate warming on the health of the population and the need to implement adaptation measures[3]. In his work

he notes that a feature of climate change in the Russian Arctic is the increased frequency of heat waves, which pose a particular danger to health. "The economic damage from temperature waves is estimated on the basis of calculations of additional mortality of the working-age population, limitations of working capacity, disability due to complications of climate-dependent diseases, such as stroke. In 2018, for example, 133.6 billion potential working hours were lost worldwide, an increase of 45 billion over the 2000 level". [11, p. 395].

Another negative manifestation of climate-related risks in the north of Russia due to thawing permafrost is the destruction of numerous burial grounds, which are major sources of dangerous infections, such as anthrax. Its outbreak in Yamal in 2016 with the hottest summer in the 150-year history of hydrometeorological observation was a confirmation [12].

In addition, it has been proven that greenhouse gas emissions may be a factor contributing to the further development of the COVID-19 pandemic because they affect respiratory health and may exacerbate the epidemiological situation [13].

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[2] At 2018 prices.
[3] Drize Yu. Hot breath of the North. *Poisknews*. Available at: https://poisknews.ru/magazine/zharkoe-dyhanie-severa

Consequently, we can conclude that the problem of climate change is an objective reality that requires a comprehensive approach to addressing it. Assessment of the level and nature of climate-related risks in the Russian Federation has practical relevance, consisting in the possibility of subsequent minimization of economic losses.

Research findings

Climate-related risks affect Russia's socio-economic development both internally through the reduction of natural capital, the deterioration of national socio-demographic and economic indicators, and externally through the pressure of other countries' policies and international agreements.

We first propose to consider the external impact. One of the most recent international climate treaties is the Paris Agreement (2015), under which Russia pledged to reduce greenhouse gas emissions to no more than 70% of 1990 levels by 2030. However, according to the national report on the greenhouse gas inventory, this goal was achieved back in 1995 (65% of the 1990 level, *Fig*. 3).

Figure 3. Dynamics of greenhouse gas emissions in Russia, million tons CO2-eq.
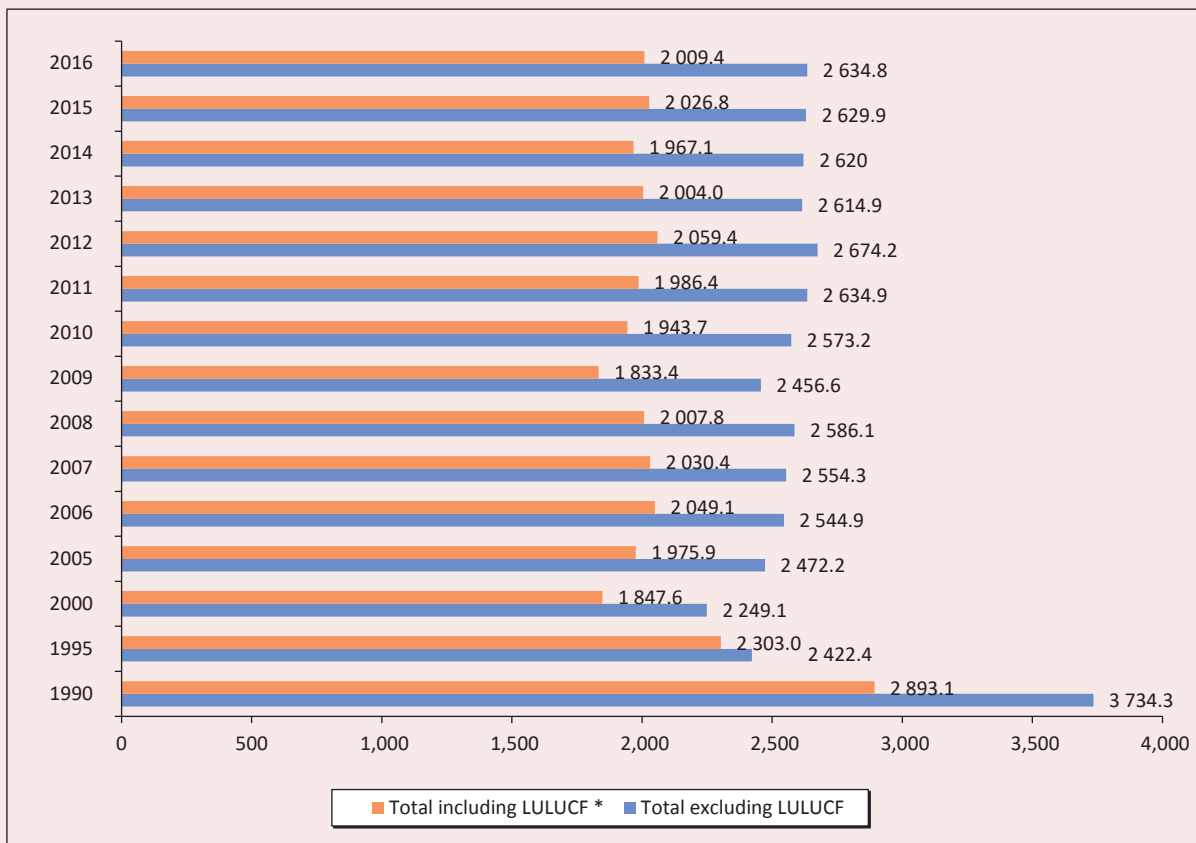
*LULUCF – land use, land-use change, and forestry. A feature of this part of the economy is the ability to absorb greenhouse gases.

Source: Environment. *Rosstat*. Available at: https://rosstat.gov.ru/folder/11194

The reduction of GHG emissions from 1995 to 2005 was substantiated by a reduction in industrial production. Despite the fact that Russia still formally meets the obligations under the Paris Agreement, the level of GHG emissions has been increasing since 2005, which causes a corresponding reaction of the countries that proclaimed the need for total decarbonization and carbon neutrality.

While the Paris Agreement implies voluntary participation, the actions of some of Russia's trading partner countries exert some pressure in the field of carbon regulation, and the country will not be able to avoid this influence.

For example, in 2019 the European Union adopted a strategic document "European Green Deal", which is a plan to achieve zero total greenhouse gas emissions and zero total pollution by switching from fossil to renewable energy sources and raw materials in the EU member states by 2050 [9; 14]. Carbon border tax (CBT) has become one of the tools for the implementation of this plan. In Russia, this tool is most widely discussed. In the EU, its introduction is motivated by incentives for exporters to reduce the carbon intensity of their products. In Russia, for objective reasons, it is seen as an instrument of market protectionism. In the EU is already quite developed market of trade in greenhouse emissions, and also for quite a long time the products of domestic producers are subject to carbon tax, therefore, goods imported from countries with less stringent environmental regulation will be cheaper and more competitive in the European market [15−18].

According to various sources, the size of carbon border tax is estimated from 25 to more than 50 euros per ton of CO_2-equivalent[4]. First of all,

such a tax will affect products of metallurgical, chemical and mining industries[5]. According to the calculations of IEF RAS, the size of its payment from Russia will be about 936 billion rubles[6]. The estimate is preliminary, because the amount of CBT has not yet been approved and, moreover, depends heavily on the exchange rate.

As for internal climate-related risks for socio-economic development of the Russian Federation, the following should be taken into account. Due to the fact that the country has a huge territory located in several climatic zones and rich in different ecosystems, climate-related risks may manifest themselves differently depending on the geographical location of the region and the anthropogenic activities carried out in it. This is evidenced by a study conducted by the Russian Federal Service for Hydrometeorology and Environmental Monitoring (Roshydromet). According to its results, the northern territories of the country, occupying about two-thirds of its area, will be subjected to the greatest degree of negative climate change in the next hundred years. According to the forecast, under the optimistic scenario, the temperature in the North could rise by 5°C until 2099 *(Tab. 3)*.

Since most of the country belongs to the northern territories, climate-related risks are very significant for it, and if they materialize, the consequences will be large-scale. The entire northern border of Russia runs along the shelf of the Arctic Ocean, where some of the most intense climate change processes are recorded.

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[4] Assessment of the economic consequences of the introduction of a carbon border tax. IEF RAS, 2021.

[5] Potaeva K., Mil'kin V. The EU has identified goods for charging a carbon border tax. *Gazeta Vedomosti*. Available at: https://www.vedomosti.ru/economics/articles/2021/07/15/878247-es-opredelil-tovari-dlya-transgranichnogo-naloga

[6] At a tax rate of 25 euros per ton of CO_2-eq. at the exchange rate of 1 euro − 78 rubles.

Table 3. Forecasted changes in temperature at the Earth's surface due to climate change, °C

Territory	Forecasted scenarios of temperature changes at the Earth's surface*								
	RCP Scenario 2.6			RCP Scenario 4.5			RCP Scenario 8.5		
	2011–2031	2041–2060	2080–2099	2011–2031	2041–2060	2080–2099	2011–2031	2041–2060	2080–2099
Far North	1.6–2.7	2.4–4.6	2.3–4.7	1.5–2.7	2.7–5.4	3.6–7.5	1.6–2.9	3.6–6.7	6.2–12.2
Central Russia	1.3–1.5	1.5–2.3	1.7–2.3	1.2–1.4	2.3–2.8	2.9–3.8	1.3–1.6	2.9–3.4	5.5–7
South Russia	1–1.5	1.5–2.4	1.5–2.2	1–1.5	1.8–2.9	2.4–3.8	1.1–1.5	2.8–3.6	4.3–6.9
* RCP scenarios (Representative Concentration Pathways) – scenarios for the evolution of anthropogenic emissions of greenhouse gases into the atmosphere in the future. The scenario index corresponds to the magnitude of the global anthropogenic radiative forcing achieved in 2100, namely 2.6; 4.5 and 8.5. The paper shows three basic scenarios: RCP 8.5, RCP 4.5, RCP 2.6. Compiled according to: Scenario forecasts based on global models. Available at: https://cc.voeikovmgo.ru/ru/klimat/izmenenie-klimata-rossii-v-21-veke									

Nevertheless, it can be noted that active steps to reduce them began to be taken after the influence on the country from the outside. Thus, the introduction of a domestic carbon tax was initially considered as a possible response to the introduction of CBT. The initiators of such regulation saw its advantages in the fact that in this way the "under-taxed" Russian export products will be compensated, but this fee will go to the Russian budget, not out of its borders. However, later researchers from IEF RAS denied the advisability of introducing an internal carbon tax: according to preliminary estimates, the additional tax burden on business will be 1,936 billion rubles, and the total effect on the economy will be negative (-28 billion rubles)[7] [15].

In order to reduce climate-related risks within the country, the following strategic objectives were set in the Address of the President of Russia to the Federal Assembly of April 24, 2021[8]:

1. Adjusting agriculture, industry, the housing and utilities sector and the entire infrastructure to climate change.

2. Creating a carbon utilization sector, bring down emissions.

3. Introducing strict control and monitoring measures.

4. Over the next 30 years, the cumulative emissions in Russia must be smaller than in the EU.

Currently, the greenhouse gas utilization industry is just beginning to take shape. Since the main focus of Russia is not on the prevention of GHG emissions, but on their absorption directly from the atmosphere, it is supposed to consider the maximum possible contribution of Russian ecosystems to the sequestration of GHGs. For this purpose, it is planned to form a network of carbon farms and polygons. In 2021 the Ministry of Science and Higher Education of the Russian Federation launched a pilot project to create carbon polygons on the territory of Russian regions to develop and test carbon control technologies. In the first year of the project, it is planned to create carbon polygons in eight regions: in the Chechen Republic, Krasnodar Krai, the Kaliningrad, Novosibirsk, Sakhalin, Sverdlovsk, Tyumen and Moscow oblasts, and in the long-term — about 50 polygons. At each of them carbon farms will be formed — special areas of ecosystems which most effectively absorb greenhouse gases[9].

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[7] Assessment of the economic impact of the introduction of a carbon border tax. *IEF RAS*, 2021.

[8] Presidential Address to the Federal Assembly. Available at: http://www.kremlin.ru/events/president/transcripts/messages/65418 (accessed: June 25, 2021).

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[9] Carbon polygons. *Ministry of Science and Higher Education of the Russian Federation*. Available at: https://minobrnauki.gov.ru/action/poligony

In some regions, the creation of such farms is an individual initiative, for example, in the Vologda Oblast, the initiator was PhosAgro, which plans to deploy a test site of about 600 hectares[10].

However, another problem arises with respect to carbon farms, namely, ensuring fire protection of forest, as well as their inventory, since the regularity of its implementation is complicated by the large area of forest plantations and the lack of appropriate personnel. In 2021, Russia recorded some of the largest fires in the history of space observation, the smoke from which reached the North Pole [17]. Since forest ecosystems are the second most important carbon sink (after phytoplankton), wildfires can reverse the carbon balance. This is often used by foreign countries when Russia tries to substantiate its contribution to the global GHG sequestration.

At the same time, satellite and sampling data from 1988–2014 indicate a 39% increase in forest biomass, which corresponds to a 47% increase in carbon sequestration [18]. According to V. Guzii and V. Leibin, such an increase could compensate for the lack of carbon sequestration due to deforestation of South American forests [18].

Thus, it is clear that without an effective system of forest use, as well as a system of fire safety measures, Russia will not be able to create a carbon utilization industry and defend its status as a "carbon sink" in the international arena.

As for adapting industries to climate change, to begin with we need to assess how they deal with greenhouse gas emissions.

As shown in *Table 4*, Russia currently tries to take into account the absorptive capacity of its ecosystems, which in the majority of cases remains positive.

In general, both in the world and in Russia, the main source of GHG emissions remains the energy sector (about 80% of all GHG emissions in the country), due to the predominance of traditional generating facilities (operating on fossil fuels, mainly gas and coal). In the case of coal-fired power industry, the solution could be to improve the purification equipment capable of capturing not only particulate matter, but also greenhouse gases, including carbon dioxide.

Table 4. The level of CO2-eq. emissions by economic sector, million tons

Sector	2005	2010	2011	2013	2014	2015	2016	2017	2018	2018 to 2005, %
Energy sector	1 583.7	1 635.1	1 683.1	1 623.3	1 620	1 616.5	1 612.3	1 629.6	1 679.2	106.0
Industrial processes and the use of industrial products	207.4	196.4	199.8	220.2	220.5	218.6	218.3	232.6	243.3	117.3
Agriculture	104.9	103.5	106.2	107.7	107.5	108.6	112.5	113.1	112.8	107.5
Land use, land-use change and forestry (LULUCF)	-530.5	-713.8	-655	-614.6	-670.3	-589	-608.9	-603.3	-586.7	110.6
Waste products	69.5	78.4	81.5	86.5	89.9	92.1	94.1	96.2	98.2	141.3
Total, excluding LULUCF	1 965.4	2 013.4	2 070.5	2 037.8	2 038	2 035.9	2 037.2	2 071.5	2 133.6	108.6
Total, including LULUCF	1 434.9	1 299.7	1 415.5	1 423.2	1 367.6	1 446.9	1 428.3	1 468.2	1 546.9	107.8
Source: Data from the Federal State Statistics Service. *Environment, climate change*. 2021. Available at: https://rosstat.gov.ru/folder/11194										

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[10] PhosAgro plans to launch a carbon farm in the Vologda Oblast. Available at: https://rupec.ru/news/47300/

Table 5. Dynamics of natural gas production and consumption with GHG emissions for 2010–2018

Indicator	2010	2011	2012	2013	2014	2015	2016	2017	2018
Natural gas production, billion m³	657	673	658	675	647	638	644	695	738
Natural gas consumption, billion m³	466	476	471	466	465	445	444	463	499
Emissions, tons of CO_2-eq. per capita	11.08	11.62	11.64	11.32	11.20	10.81	10.61	10.80	11.13
Compiled according to: Enerdata. Global energy trends. 2021; Carbon Dioxide Information Analysis Center, Environmental Sciences Division Dataset, Oak Ridge National Laboratory, Tennessee, United States.									

Rejection of coal is fraught for Russia not only with economic losses, but also with the loss of relations with some countries that import coal for domestic generation. For example, the UK, which declares its desire to decarbonize its economy, purchases Russian coal for power supply in winter[11].

The value of GHG emissions from the gas production sector remains relatively constant *(Tab. 5)*.

Nevertheless, one should note that specific GHG emissions from natural gas production remain quite large. This is due to the nature of its consumption (combustion) and certain losses during extraction and distribution.

Since the gas production industry for Russia remains one of the strategically important, the refusal to use gas is guaranteed to have a negative impact on the socio-economic development of the country.

Given the global low-carbon development trend, as well as the need to maintain the volume of natural gas production and exports, as oil and gas revenues account for about 30–40% of the federal budget, in 2020 the Russian government approved the action plan "Development of hydrogen energy in the Russian Federation through to 2024"[12].

This document provides for the development of hydrogen energy on the basis of the existing capacities of nuclear power plants, the development of technologies for the production of hydrogen from gas, and the launch of rail transport using hydrogen. It is also planned to develop international relations with producers and consumers of hydrogen fuel (Germany, Austria, the Netherlands – the main importers of Russian natural gas). Consequently, in our opinion, the main emphasis in reducing GHG emissions by the gas industry should be placed on the prevention of gas leaks, the greenhouse effect of which is many times greater than that of carbon dioxide.

As for strict carbon regulation in Russia, both the scientific community and the authorities are currently unanimous in this case. As stated earlier, the internal carbon tax is fraught not only with a large tax burden on business, but also with a negative economic effect, so we are currently only talking about carbon reporting for organizations – GHG emitters. For large enterprises such reporting will be mandatory, for small – voluntary. The Ministry of Economic Development of the Russian Federation called this measure the first stage of the formation of carbon regulation without taxes and mandatory payments[13].

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[11] Martsikevich B. Reliable "black diamonds". What is going on in the Russian coal industry. *Zavtra*, 2021, no. 31 (1441). Available at: https://zavtra.ru/blogs/ugol_i_d

[12] Action Plan "Development of hydrogen energy in the Russian Federation through to 2024": Approved by Governmental Decree no. 2634, dated October 12, 2020.

[13] Solov'eva O. Instead of a carbon tax – carbon reporting. *Nezavisimaya gazeta*, no. 34, dated February 18, 2021. Available at: https://www.ng.ru/economics/2021-02-17/4_8085_economics1.html

In our opinion, it is also more appropriate to develop a database on GHG emissions broken down by region, using the system of carbon polygons and farms to assess the contribution of forest ecosystems in the sequestration of carbon. This is exactly what allows creating a system for monitoring GHG emissions and carbon balance of territories of Russia. Since the business takes the initiative and supports projects to create such carbon sequestration industry facilities (including financially), it will be unfair to impose additional tax on them.

Thus, we can make the conclusion that Russia has begun the transition to low-carbon development. Nevertheless, despite all the measures taken, there is a fairly high probability of lagging behind the global rate of decarbonization.

As experience shows, the transition of other countries to a green economy is very rapid. For example, in the USA, a state that withdrew from the Paris Agreement in 2017, climate change was already declared the center of foreign, domestic policy and national security in 2021. With the inauguration of President Biden, the country returned to the Paris Agreement. Moreover, the new president has carried out administrative reform and has established anew the entire conceptual, institutional and legal, organizational and structural framework of the country's climate policy. S.A. Roginko, member of the Workshop on Climate Change at the Presidium of RAS, notes that the pace of changes in the United States, as defined by the climate agenda, is very noticeable and one gets the impression that Washington intends "not just to work, but to fight". To fight against the major opponents – China and Russia, whose economy is based on the use of fossil fuels [20]. Therefore, such changes, both in the U.S.

and Europe, necessitate more extensive and rapid action from Russia, which can be implemented only through the cooperation of government, business, science and society as a whole.

Conclusion

Thus, we can make the conclusion that climate-related risks are quite reasonable for Russia's socio-economic development. They are expressed in the depletion of natural capital, the use of which is the basis of the Russian economy, and, most importantly, in increasing the vulnerability of Russia's position in the world and limiting its ability to defend its national interests. Taking into account global trends of low-carbon development, the goal to be ahead of the EU in reducing net GHG emissions by 2050 becomes clear.

In order to reduce internal climate-related risks, it is necessary to improve the environmental management system, in particular forest use. It is necessary to ensure the complete forest reproduction of felled and dead forest planting, to monitor them, and to carry out fire-fighting measures. In addition, it is advisable, in our opinion, to toughen responsibility in the sphere of forest use regarding unlicensed logging. At present, only this will contribute to the preservation of forest ecosystems and, consequently, to the creation of a carbon sequestration industry.

Regarding external climate-related risks, it is important to ensure cooperation between government, business, science and society as a whole. This is due to the need to implement the planned activities in a short time, and in this regard, it is necessary to support the low-carbon initiative of business. In our opinion, this will not only help to reduce climate-related risks within the country, but also to defend its national interests in the international arena.

References

1. Thomas F.G., Cook J. *Climate Change Science: A Modern Synthesis. Volume 1 − The Physical Climate.* Dordrecht: Springer, 2013. 592 p.

2. Lukyanets A.S., Bragin A.S. The impact of climate risks on Russia's economic development: Example of the North Caucasian Federal District. *RUDN Journal of Economics,* 2021, no. 29(2), pp. 439−450. DOI: http://dx.doi.org/10.22363/2313-2329-2021-29-2-439-450

3. Eckstein D., Künzel V., Schäfer L., Winges M. *Global Climate Risk Index 2020. Who Suffers Most From Extreme Weather Events? Weather-Related Loss Events in 2018 and 1999 to 2018.* Germanwatch e.V., 2018. 44 p.

4. Porfir'ev B.N. The economy of natural disasters. *Ekonomicheskaya politika=The World of New Economy*, 2015, no. 4, pp 21−40 (in Russian).

5. Stern N. The structure of economic modeling of the potential impacts of climate change: Grafting gross underestimation of risk onto already narrow science models. *Journal of Economic Literature,* 2013, no. 51, pp. 838−859. DOI: 10.1257/jel.51.3.838

6. Fan Q., Fisher-Vanden K., Klaiber H.A. Climate change, migration, and regional economic impacts in the US. *Journal of the Association of Environmental and Resource Economists*, 2018, no. 5, pp. 643−671. DOI: https://doi.org/10.1086/697168

7. Dawson J., Holloway J., Debortol N., Gilmore E. Treatment of international economic trade in Intergovernmental Panel on Climate Change (IPCC) reports. *Current Climate Change Reports*, vol. 6, no. 4, pp. 155−165. DOI 10.1007/s40641-020-00163-x

8. Allison E.H., et. al. Vulnerability of national economies to the impacts of climate change on fisheries. *Fish and Fisheries,* 2009, vol. 10, no. 2, pp. 173−196. DOI: 10.1111/j.1467-2979.2008.00310.x

9. Porfir'ev B.N. "Green agenda": Asymmetrical response. *Ekspert=Expert,* 2021, no. 18−19, pp. 18−21 (in Russian).

10. Porfir'ev B.N., Eliseev D.O., Streletskii D.A. Economic assessment of the impact of permafrost degradation induced by climate change the road infrastructure resilience in the Russian Arctic. *Vestnik Rossijskoj Akademii Nauk,* 2019, vol. 89, no. 12, pp. 1228−1239. DOI: 10.31857/S0869-587389121228-1239 (in Russian).

11. Revich B.A. Climate change impact on public health in the Russian Arctic. *Nauchnye trudy: Institut narodnokhozyaistvennogo prognozirovaniya RAN=Scientific Articles − Institute of Economic Forecasting Russian Academy of Sciences,* 2020, no. 18, pp. 395−408. DOI: 10.47711/2076-318-2020-395-408 (in Russian).

12. Revich B.A. et. al. Creating zones in administrative districts located in the Russian arctic region specific as per threats of cattle burials decay due to permafrost degradation. *Analiz riska zdorov'yu=Health Risk Analysis,* 2021, no. 1, pp. 115−125. DOI: 10.21668/health.risk/2021.1.12 (in Russian).

13. Revich B.A., Shaposhnikov D.A. The COVID-19 pandemic: New knowledge on the impact of air quality on the spread of coronavirus infection in cities. *Problemy prognozirovaniya=Studies on Russian Economic Development,* 2021, no. 4(187), pp. 28−37. DOI 10.47711/0868-6351-187-28-37 (in Russian).

14. Bonoli A., Zanni S., Serrano-Bernardo F. Sustainability in building and construction within the framework of circular cities and European New Green Deal. The contribution of concrete recycling. *Sustainability*, 2021, vol. 13, no. 4, 2139. DOI: 10.3390/su13042139

15. Porfir'ev B., Shirov A., Kolpakov A. How to pass carbon border adjustment. *Ekspert=Expert,* 2021, no. 4, pp. 66−69 (in Russian).

16. Carattini S., Carvalho M., Fankhauser S. Overcoming public resistance to carbon taxes. *Wiley Interdisciplinary Reviews: Climate Change,* 2018, vol. 9, no. 5. DOI: 10.1002/wcc.531

17. Sumner J., Bird L., Dobos H. Carbon taxes: A review of experience and policy design considerations. *Climate Policy,* 2011, vol. 11, no. 2, pp. 922−943. DOI: 10.3763/cpol.2010.0093

18. Guzii V., Leibin V. Planet-scale risks of Russian fires. *Ekspert=Expert,* 2021, no. 38, pp. 54−58 (in Russian).

19. Schepaschenko D. et. al. Russian forest sequesters substantially more carbon than previously reported. *Scientific Reports*, 2021, no. 11, 12825. DOI: 10.1038/s41598-021-92152-9

20. Roginko S.A. America's climate turn: Ends and means. *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World,* 2021, no. 2, pp. 53–65 (in Russian).

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SOCIAL AND ECONOMIC DEVELOPMENT

Smart Competencies as a Tool for the Development of the Information Culture of Society*

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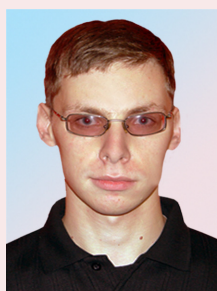
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Abstract. The article considers the process of formation of smart competencies, which have a synergistic nature, as a tool for creating samples of the information society culture. The purpose of the study is to assess the effectiveness of smart competencies formation in a managed (institutionalized) and unmanaged (non-institutionalized) environment. The paper presents a conceptual understanding of smart competencies as the integration of modern basic and flexible skills in the educational profile of a student. We provide the results of a modeling experiment conducted in 2020–2021. The experiment consisted of the identifying, forming, and resulting stage. Seventy-six schoolchildren from Vologda and Staraya Russa participated in each stage. The participants were divided into a control group and experimental groups. In the framework of the experiment, in accordance with the principles proposed in the study, two measurements of smart competencies (initial and control level) were carried out. In the interval between the measurements, a stable level of smart competencies was maintained in the participants. The results of the experiment have revealed considerable opportunities for the formation of smart competencies in a controlled environment in conventional educational conditions. It was in this case that the strategic level of competence development was preserved during the experiment (which was not observed in other groups). In conclusion, we determine which types of information culture are created by smart education. The novelty of the project consists in the proposed original model for the study of smart competencies, which defines the structure and features of this phenomenon. Within the framework of the study, we propose a methodological approach to organizing the process of development of modern competencies in the smart environment, which can be used by educational organizations in Russian regions.

Key words: smart competencies, information culture, modeling experiment, diagnostic test, cultural patterns.

Introduction

In the modern world, technical skills become obsolete every year, and there is an ever growing demand for specialists with a balance of "soft" and "hard" competencies; this is facilitated by the specifics of the information society, which forms qualitatively new cultural patterns and practices [1].

At the modern stage of civilization development, the dominant role belongs to information and knowledge as a driving force of social progress and to the construction of an information society as a "universal ideology in the context of globalization" [2]. The scientific community has now formulated quite a large number of definitions of this phenomenon and a number of conceptual approaches to its study. The classification of information society concepts is considered in detail in the works of several authors [2–5]. In general, we can say that the idea of an information society originated among sociologists, philosophers and futurologists. Japanese scientists T. Umesao (*Information Industry Theory,* 1963) and Yu. Hayashi (*Informatized Society: from Industrial society to Intellectual Society*, 1969) are among those who introduced the term "information society" into scientific circulation. Among the pioneering works on this topic, we can also note *The Coming of Post-Industrial Society* by D. Bell [6], where he argues that scientific and technological progress contributes to the dominance of information processing activities. In the monograph *The Information Society as a Post-Industrial Society*, Y. Masuda outlined the difference between the future information society and the existing industrial one and showed that "the production of an information product, rather than a material product, will be the driving force of education and development of society" [7, p. 49]. E. Toffler designated the third wave of the social revolution as the transition to

an information society [8]. P. Levy proposed the idea of a "collective mind", considering it to be the global network Internet [9]. The concept of the information society in the domestic scientific environment was recognized a little later thanks to the works of A.I. Anchishkin, N.N. Moiseev, A.D. Ursul, etc.

Foreign and Russian scientists consider the term "information society" in the framework of the idea of increasing the role of reliable information and the value of theoretical knowledge against the background of the widespread introduction of information and communication technologies. Under these conditions, the impact of ICT on all spheres of human activity: politics, economics, generally accepted norms and rules of behavior, i.e. on society as a whole, becomes obvious [10]. The corresponding processes generate a new culture of society − information culture, which is the information basis for the development of society [11]. Information culture "reflects and expresses the complex processes taking place in society in connection with the informatization of its various spheres, transformations in economic, socio-political and spiritual life" [12, p. 80].

The concept and content of information culture are currently being considered both in the Russian and foreign scientific community from the point of view of various approaches. For example, A. Curry and C. Moore, using the designated concept, speak of a culture "in which the value and usefulness of information for achieving operational and strategic success is recognized, where information forms the basis of organizational decision-making, and information technology is easily used as a tool for effective information systems" [13, p. 94].

We adhere to the opinion of Russian researchers (A.A. Gorodnova and others) and will consider information culture as "a new type of commu-nication and thinking, formed as a result of the liberation of an individual from routine information and intellectual work, among the features of which the orientation to self-development and self-

learning is clearly manifested" [14, p. 85]. The role of human potential is obvious in the development of information culture, since the importance and role of the individual in this process increases significantly. "Such an individual is required to have a sense of the new, a prognostic orientation for the future, they have other personal and professional competencies, a different system of values, a different culture, a type of consciousness, worldview, the role of which increases both in a crisis and a transitional state of society" [15, p. 6]. This means that for each subject of information culture separately, it is necessary to form such competencies that will be used for successful socialization and for the creation of socially useful goods. In the opinion of the authors, these competencies can be found in smart competencies.

In modern conditions, it is smart competencies (S − self-directed, M −motivated, A − adaptive, R − resource-enriched, T − technological) that are a reliable tool for forming the culture of the information society at the early stages of personal and professional development (high school age). The process of developing smart competencies in an individual is itself synchronized with the pace of development of the information society. In other words, they are usually formed in the process of gaining experience of interaction of an individual with modern culture, society and economy. The more developed the information society becomes, the more samples of everyday life it offers, the more different competencies an individual receives. However, the culture of the information society creates both positive and negative patterns. The former include demassification and personalization of culture, maximizing opportunities for the disclosure of the potential of an individual in the field of economics and creativity; the latter − Internet addiction, retreatism, electronic aggression and identity crisis [16, p. 1362].

In this regard, questions arise as to how to determine the minimum conditions sufficient to

maintain and broadcast positive samples of information culture to the younger generation; which institution should take over the functions of selecting and cultivating verified samples of information society culture, as well as their corresponding modern competencies? Should it be the family? Education? The media? Civil society? Authorities?

Within the framework of the study, we confirmed the working hypothesis: positive samples of information culture are formed more effectively within the framework of a purposeful process of forming smart competencies (i.e. in controlled conditions of the educational smart environment). In the course of free development (outside the educational environment, in the process of acquiring and enriching life experience, in the process of communication), such an effect is not achieved.

The purpose of our research is to assess the opportunities for the formation of smart competencies in different educational conditions (free and controlled) as a driver of the development of information society and information culture. To achieve this goal, we developed a theoretical model of smart competencies as a set of basic knowledge and flexible skills necessary for the adaptation of the younger generation to the information society; we present an algorithm for evaluating these competencies in the process of their formation; we conducted an experiment in small groups of subjects; the results of the experiment helped us to evaluate the possibility of productive formation of smart competencies in different educational conditions. As part of the research, we tried to introduce an experimental model of purposeful formation of smart competencies into the educational process.

Theoretical framework of the study

Living in the "information society" implies daily work with a huge flow of information. Our success and survival depend on our ability to skillfully and appropriately find, analyze and use information. Problem solving, decision-making, critical thinking, information gathering and comprehension are abilities associated with a special kind of literacy and culture. New competencies prepare an individual to meet the special requirements of the information age.

M.I. Orlov believes that in modern conditions, the paradigm of civilizational development can be based on the idea of building a knowledge society as a social structure that constantly produces and consumes knowledge (a special form of information). The author emphasizes that the concepts of the information society and the knowledge society have a common feature, which consists in "their fundamental agreement on the essence of the processes taking place in modern society — intensification of social and economic processes and an increasing importance of intangible factors in the process of changing human life" [17].

It is also pointed out that there exists a possibility of developing a modern information technology paradigm in the direction of taking into account the needs of society in continuous learning, the implementation of which is associated with overcoming the main contradiction between the rapid growth of information in the world and the natural limitations of the possibilities of its assimilation by an individual. This contradiction encourages educational structures to form qualitatively new skills in people, including the ability to learn, find information, critically evaluate it and creatively comprehend it. In the future, these competencies can provide people with the opportunity to successfully live and work in the information society [18]. G. Halász considers new educational competencies as a direct response to the challenges facing modern Europe (preservation of an open society, multilingualism, multiculturalism, development of complex organizations, dynamic changes in the economy, etc.) [19].

To the information society, competence is more than just knowledge, skills and abilities, since it

includes the ability to meet complex requirements by attracting and mobilizing psychosocial resources (including skills and relationships) in a specific context [20]. Changes in society and culture based on the use of new technologies, and their rapid development affect the choice of certain competencies. Living in the information space requires a modern individual to possess competencies that open up great opportunities for interaction in professional network communities, contribute to effective socialization and further self-realization. Against this background, new literacy and flexible skills become the most important competencies for a person's full participation in the information society.

From our point of view, the paradigm of information society development at the present stage could be supplemented by the concept of the formation of smart competencies as a basis for the adaptation of the population to the conditions of modern society, the labor market and technological environment. These competencies reflect the principles of setting life tasks in the modern world: ability to respond immediately to changes in the external environment; adaptation to transforming conditions; independent development and self-control; effective achievement of results. Such competencies are based on knowledge management in the real and virtual world [21]. We understand smart competencies as a system of "new" knowledge and flexible skills that a person requires in order to adapt to the modern world and the new information culture. Such competencies are formed from an early age. In an ideal situation, a person will have a combination of skills, the nature of which is likely to change over the course of life in response to changing circumstances and context [22].

By their nature, smart competencies are fundamentally different from the subject knowledge developed within the framework of federal state educational standards and programs, and perform an additional role in relation to them. Smart competencies are fundamentally important not for the general culture of a person, but for the activities of a new type of workers, "knowledge workers", to adapt to the rapidly changing information and communication technologies that constantly appear in our world and affect all areas of personal and professional life. New knowledge makes it possible to use the Internet and other technologies in order to find and synthesize information, critically evaluate its usefulness, answer questions, and then communicate the answers to others. Smart competencies largely underlie effective participation in key areas of life and work. In today's high-tech environment, they are the basis for full participation in the life of society and, as such, should develop and improve over time and in accordance with the personal and professional circumstances of individuals. Due to their specifics, smart competencies broadly affect the interpersonal area related to teamwork and cooperation (including communication skills, cooperation, ability to work in a team); the intrapersonal area related to intellectual openness, positive self-esteem (flexibility, initiative and meta-awareness); the cognitive area related to cognitive processes, knowledge and creativity (including critical thinking skills, information and financial literacy, argumentation, as well as creativity).

We propose to consider smart competencies as a complex phenomenon, consisting of a series of structures:

a) the competencies of the "new" knowledge that are highly relevant to the information society and "professions of the future"; this includes digital literacy (DL) as the ability to work with modern software and tools of the Internet; financial literacy (FL) as a combination of knowledge, skills and attitudes in the field of financial behavior; project literacy (PL) as the ability to work with data sets of scientific information, to carry out exploratory analysis;

b) soft skills – cross-functional skills that are required in the modern world regardless of employment and profession; these are

communicative literacy (ability to communicate with people, ComL), organizational skills and teamwork skills (TWS), as well as network culture (value-ethical attitude toward Internet technologies, NC). The rationale for the composition of these competencies was presented in our previous publications [22; 23].

Within the framework of the research idea, we believe that the process of forming and updating smart competencies in the modern world is continuous, which is associated with the specifics of the information society and information culture. However, at present it is poorly institutionalized and develops mainly in an uncontrolled environment (in other words, it is associated with the acquisition of life experience, the development of personality and professional in the information society).

We believe that each of the smart competencies manifests itself at several levels: strategic (the level of proficiency is sufficient for independent decision-making taking into account long-term consequences); autonomous (the level of proficiency is sufficient for independent performance of professional and educational tasks); basic (the level of proficiency is sufficient for work and training, but at the same time the individual has difficulties in performing various tasks) [23].

To identify the levels of development of smart competencies, we used O.Yu. Svergun's approach that proposes to describe the manifestations of competencies in behavioral terms. The criterion for the selection of levels is the object to which the potential of accumulated competencies is directed (internal or external environment). Thus, within the framework of the proposed typology, the competence carrier either strives to show the necessary skill in life (basic level), or uses it for personal development (autonomous level), or not only uses the skill, but also creates opportunities for the development of competencies in other people: classmates, relatives, colleagues (strategic level). Such patterns of behavior characterize the application of smart competencies in practice [24].

With regard to digital literacy, the strategic level of competence development means that the student knows all computer programs, knows how to use them, etc.; the average level indicates that the student has this knowledge only in general terms; the basic level indicates that the student does not possess such information at all [23].

In order to have a strategic level of financial literacy, the student must be well aware of the use of funds, personal budget and its planning, financial security, credit transactions, investment and the work of the stock market; manage personal and family budgets, plan expenses, be aware of the need to live within his/her means, etc. The autonomous level is formed when awareness of financial literacy is partial; and a complete lack of knowledge indicates the basic level. In addition, the basic level of financial literacy development is characterized by a lack of conviction in the need for savings, unwillingness to save, the desire to make spontaneous purchases and the confidence that outsiders can be informed of bank account details or part of them [23].

The strategic level of project literacy indicates a constant conscious interest of the subject in research activities (several hours a week are systematically spent on research work); the autonomous level indicates episodic interest (less than one day a week); the basic level indicates a complete lack of interest in such activities [23].

The strategic level of communicative literacy and the ability to work in a team determines a high level of communicative abilities (according to the KOS test of V.V. Sinyavsky and V.A. Fedoroshin); sociability, friendliness, ease of communication; the autonomous level — an average level of communication skills, closeness, lack of flexibility and integrity; the basic level — a low level of communication skills, passivity in the team and self-sufficiency [23].

The strategic level of network culture means that the subject has no conflicts with parents and other people about the content and time spent on the

Internet; does not hide from parents the amount of time spent online; rechecks information from the Internet using alternative sources; tries not to open messages coming to e-mail from strangers; does not communicate with people insulting on the Internet, immediately puts them on the "blacklist" of contacts; believes that rules of politeness are required for communication on the network; does not use nicknames and fake accounts to insult people. The basic level of network culture means that the subject considers life without the Internet boring, empty and joyless; often neglects communication with parents, household chores because of the Internet; finds ready-made works on the Internet and passes them off as his/her own; has boundless confidence in information on the Internet and online interlocutors; believes that personal data can be safely posted on the Internet; in conflict situations arising online, squabbles with others publicly on the forum (website) [23].

Thus, we consider the formation of smart competencies as a process of gradual transition of "new" knowledge and flexible skills from the basic to the strategic level of development. We assume that such an effect can be achieved in both managed and unmanaged environments, but with different results. In order to substantiate this effectiveness, we experimentally reproduced the elements of the formation of smart competencies in a small experimental group.

Research methodology

Assessment of the level of competencies development as a result of educational activity is one of the most discussed, controversial and still unresolved problems in connection with the continuously changing requirements of society to the education system. The choice of methods and techniques for studying the level of competencies development is of the greatest difficulty, which is explained by the complexity of the structure of competencies itself [25, p. 103].

As part of the assessment of general and professional competencies in science, two methodo-

logical approaches are usually used. The first one is a *traditional approach* focused on the evaluation of academic results based on measurement by pedagogical measuring materials that are created on the basis of the experience, and their quality is evaluated intuitively. The second one is a *technological approach* involving the use of modern evaluation tools that are created on the basis of technology (rather than experience), their reliability and validity are assessed on the basis of empirical data. Diagnostics and assessment of the level of competence development in this case occurs as a result of the implementation of the competence development itself, which implies giving the student the opportunity to act as a competence carrier and evaluator themselves. The tool used in the framework of the traditional approach is usually a test, which is used during control and evaluation procedures; in the framework of the technological approach, the following tools are used: a questionnaire, diagnostic questionnaire, portfolio, which are used in the framework of observation, case study, questionnaire, interview and experiment. The advantage of the traditional approach is the apparent simplicity of data interpretation; the disadvantage lies in the fact that this approach identifies the level of awareness of this competence rather than the competencies as such. The technological approach provides much richer material for reflection (the nature and personal features of the competence carrier, motives and inclinations), but at the same time provides the researcher mainly with a set of subjective results [23].

In our study, as part of the approbation of the authors' approach to smart competencies, a method of modeling experiment is proposed, which is a system of observations of short-term changes in an individual's personal development (psychological or educational). This observation is carried out in the process of exerting an active influence of the researcher on the subject.

The modeling experiment is built in accordance with the principles of the technological approach to the assessment of competencies. We chose this

method because it is not limited to the registration of individual facts about the development of personality, but, through the creation of special situations, it reveals patterns and allows us to evaluate the effectiveness of the process of personal development in dynamics, which corresponds to the purpose of our research [26].

The experiment was conducted within the framework of RFBR scientific project "Smart education as a vector of human potential development of the younger generation". As an object of the modeling experiment, the level of development of smart competencies in children studying in high school grades 9–10 is considered. The task was to create conditions conducive to the optimal formation of smart competencies in a managed environment, as well as to compare the level of competence development in a managed and unmanaged environment [23].

In accordance with the recommendations of experts, the experiment consisted of three stages: 1) ascertaining (within the framework of which the initial level of development of smart competencies was clarified); 2) forming (implementation of the impact that forms smart competencies); 3) control (during which the effectiveness and performance results of the work on the formation of smart competencies was assessed by comparison with the initial level) [26]. Thus, the project team had the opportunity to draw conclusions about the conditions under which the competencies under consideration are formed, while preserving the important natural conditions of the life of the object of study.

The modeling experiment was conducted during the 2020/2021 academic year. At all stages of the experiment, the composition of the subjects remained constant − 76 people. The subjects were arranged into three groups: a) control group (CG) − students of Vologda Secondary School no. 13 (28 people); b) experimental group 1 (EG1) − students of the academic class of VolRC RAS Research and Education Center (27 people); c) experimental

group 2 (EG2) − students of schools of the town of Staraya Russa, who participated in the project "VolRC RAS Internet School". Thus, the groups were created based on the principles of having similar conditions for personal and educational development [23].

The subjects included in the CG formed smart competencies in a free (uncontrolled) environment, during the experiment they were not affected at all. The subjects from the experimental groups within the framework of the work of VolRC RAS Research and Education Center (hereinafter − REC VolRC RAS) were purposefully influenced by the formation of smart competencies (formative influence).

In the study, we proceeded from the understanding that the subjects already had a certain initial level of development of smart competencies before the experiment, and this level may be different. The education system cannot yet offer conditions for the purposeful formation of relevant competencies. This means that they are not formed in children purposefully or in an educational environment, but, rather, in a free mode, during the acquisition and enrichment of life experience.

Research results

As part of the experiment, we tried to propose an action program for the purposeful formation of smart competencies in the experimental groups. The algorithm of the experiment included a sequence of several stages.

The first stage is ascertaining (September 2020). Within its framework, an initial measurement of the available level of competencies of all subjects was carried out (before the formative influence was exerted). The assessment tool was a diagnostic test which helped the subjects to assess whether they had the signs of smart competencies. For the formation of the test, we used our own developments and well-known methods of psychological diagnostics.

During the ascertaining stage of the experiment, it was determined that representatives of two groups (CG and EG1) had an initial level of smart competencies at the lower limit of the strategic

level (0.71). However, the level of development of smart competencies of EG2 representatives has not reached strategic values. At the same time, there was a lag in the development of communication skills and the ability to work in a team in all groups of subjects. For example, in EG2 representatives, communicative literacy was developed only at a basic level.

At the second stage (October 2020 – May 2021), the subjects from the experimental groups experienced a formative influence aimed at the development of individual smart competencies. The formative effect was to maintain the strategic level of smart competence development in a managed environment and strengthen communication literacy and the ability to work in a team. The events were held on the basis of REC VolRC RAS (for EG1 in offline format) and VolRC RAS Internet School (for EG2 in online format), in particular, elective courses (financial literacy, economic mathematics, fundamentals of research), master classes "Artificial intelligence. How to make friends with the computer mind", "How to protect data on your gadgets?", Science and Entrepreneurship Week, Financial Literacy Week, discussion club (where the topics "Difficulties of professional choice", "The art of public speaking", "How to build an individual trajectory of professional development" were discussed).

The formative impact was exerted when teachers used digital technologies and online services in the educational process to create interactive exercises to test knowledge (LearningApps, Etreniki, Quizizz, Baamboozle, Gamilab, Worldwall, Educandy). Active and interactive technologies and teaching methods based on students' own activity, interactive communication, teamwork, group and individual reflection were used: critical thinking development technology, communicative learning technology; discussion, game technologies, case technologies, presentations, brainstorming, lessons using audio and video materials, online tests, workshops, trainings, interactive voting, surveys, organization of research activities, distance learning technologies, "blended learning" technologies, including "flipped learning", mobile learning, etc. We also used our teachers' own online courses at REC VolRC RAS.

At the third stage (May – June 2021), a control measurement of the level of smart competencies was carried out using a diagnostic test. The test fully corresponded to what was used at the ascertaining stage.

After the formation of databases of two waves of measurements, we conducted a diagnosis of the sincerity (conscientiousness) of the subjects based on the use of the sociological technique of survey multiplication. As a result, 22.4% of tests that did not meet the criteria of conscientiousness were rejected in the database of the first wave of measurements as part of the analysis; 10.5% – in the database of the second wave.

As part of the reflection on the experimental data, we tested the following scheme of actions to compare the short-term results of purposeful and non-purposeful formation of smart competencies in the subjects. First, the responses were processed according to a single scheme, each response was assigned a value from 0 to 1, depending on the level at which the relevant competence was developed (strategic level – 1; autonomous – 0.5; basic – 0). Thus, we obtained two arrays of values. Then, by averaging the corresponding values, sub-indices were found. After that, the final smart competence index (I_{sk}) was formed by finding the arithmetic mean of the values of the sub-indices. Next, smart competence development indices were compared over two measurement periods, on the basis of which the trend of changes was determined *(Tab. 1)*. At the next stage, index values were correlated with the level of smart competence development according to the following scheme: strategic level – from 0.7 to 1; autonomous level – from 0.5 to 0.69; base level – index less than 0.5 *(Tab. 2)*. The threshold values of the indicators were determined by clustering the entire array of experimental data using the k-means method.

Table 1. Dynamics of smart competence formation indices in the subjects

	DL			FL			PL			ComL			TWS			NC			SK on the whole		
	Period		Trend	Period		Trend	Period		Trend	Period		Trend	Period		Trend	Period		Trend	Period		Trend
	2020	2021		2020	2021		2020	2021		2020	2021		2020	2021		2020	2021		2020	2021	
On the whole	0.71	0.72	←	0.73	0.73	○	0.82	0.78	←	0.57	0.58	←	0.63	0.60	→	0.80	0.70	→	0.71	0.69	→
By groups of subjects																					
CG	0.72	0.70	→	0.73	0.72	→	0.84	0.80	→	0.58	0.54	→	0.63	0.55	→	0.83	0.68	→	0.72	0.66	→
EG1	0.70	0.73	←	0.73	0.76	←	0.82	0.83	←	0.66	0.63	→	0.63	0.63	○	0.78	0.73	→	0.72	0.72	○
EG2	0.72	0.72	○	0.73	0.73	○	0.81	0.73	→	0.46	0.57	←	0.61	0.62	←	0.77	0.69	→	0.68	0.68	○

Note: ↑ – upward trend ↓ – downward trend; ○ – neutral trend.
Source: own calculation.

Table 2. Changes in the level of development of smart competencies in the subjects during the measurement period

	DL		FL		PL		ComL		TWS		NC		SK on the whole	
	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021	2020	2021
On the whole	S	S	S	S	S	S	A	A	A	A	S	A	S	A
By groups of subjects														
CG	S	S	S	S	S	S	A	A	A	A	S	A	S	A
EG1	S	S	S	S	S	S	A	A	A	A	S	S	S	S
EG2	S	S	S	S	S	S	B	A	A	A	S	A	A	A

Note: S – strategic level; A – autonomous level; B – basic level.
Source: own calculation.

Table 3. Proportion of subjects with different levels of development of smart competencies at different stages of the experiment, %

Level	CG		EG1		EG2	
	2020	2021	2020	2021	2020	2021
Strategic	65.0	45.8	60.9	62.5	56.3	40.0
Autonomous	30.0	41.7	39.1	33.3	37.5	50.0
Basic	5.0	12.5	0.0	4.2	6.3	10.0
Total	100	100	100	100	100	100
Source: own calculation.						

The measurements have shown that during the experiment, the effectiveness of the development of competencies in the subjects as a whole decreased slightly, but this decrease occurred due to the group that was not exposed to formative influence. The results of the control measurement indicate that in the control group of subjects, the overall level of smart competencies decreased (from strategic to autonomous). Moreover, during the experiment, the reduction affected the values of sub-indices for all individual competencies (from digital literacy to network culture). In general, the main reason for this transition was the decline in the level of network culture, which was transformed from strategic to autonomous.

The experimental group, which was exposed to formative influence in the traditional classroom format (EG1), managed to maintain the strategic level of development of smart competencies. The values of the sub-indices of basic knowledge (digital, financial and project literacy) even increased in these subjects (in this case, there was a reduction in the control group). EG1 was the only group that managed to maintain the strategic level of development of network culture during the experiment.

The final level of development of smart competencies among the EG2 subjects could not be raised to the strategic level, mainly due to a sharp decrease in the level of development of network culture (as in CG). At the same time, there are also positive results of the formative effect for EG2. During the experiment, the communicative literacy of its representatives has developed from the basic to the autonomous level. In the other groups, there were no similar dynamics in relation to communicative literacy.

Thus, during the period of the experiment without providing a formative influence, the proportion of subjects with the strategic level of smart competences development in the control group sharply decreased (from 65 to 46%). The subjects shifted to the group with both autonomous and basic levels of development *(Tab. 3)*.

Something similar happened in EG2, whose representatives were exposed to formative influence online. However, in this case we see mainly the transition from the strategic to the autonomous level (and then mostly due to the network culture).

Qualitatively different trends are typical of EG1, whose representatives received formative influence in traditional classes. The proportion of subjects who have reached the strategic level of smart competencies has slightly increased (from 61 to 63%). This is the best result among all groups. Only 4% of the subjects remained at the basic level (in CG – 13%; in EG2 – 10%).

An important limitation of the experiment was the low effectiveness of the development of the ability to work in a team. In all groups, these skills have not reached the strategic level during the measurements, although positive changes in this direction are noticeable in EG2. Perhaps this is due to the need to plan a longer period of formative influence and a more detailed account of the psychological characteristics of the subjects.

Conclusion

A very important result of the experiment is the proof that the level of smart competencies, which are a tool for the formation of information culture, can decrease over time. The ability to maintain the strategic level of smart competencies is provided only by a controlled formative impact in the form of classical (classroom) studies. Unfortunately, such an effect is still difficult to achieve within the framework of distance learning technologies, since in this case direct contact and personal communication with the subject are important. The Internet environment itself can negatively affect the network culture (as one of the smart competencies), since it often carries ambiguous cultural patterns (Internet bullying, network imprinting, floating consumerism) [16].

This is another advantage of the smart competencies formation process. It usually does not require the use of advanced technologies, but requires taking into account the potential of existing forms and tools.

The decline in the smart competencies becomes especially noticeable in an unmanaged (non-educational) environment, since it is not stable and its influence is formed under the influence of popular culture. Network culture in an unmanaged environment is much more exposed to negative transformations, which poses the risks of formation of ambiguous cultural patterns in young people (among which one can note a tendency toward Internet bullying).

How do smart competencies create patterns of information society culture (cultural patterns)?

Evolution of information culture patterns within the framework of smart competencies development

	Basic level	Autonomous level	Strategic level
Digital literacy	Digital immaturity	Digital maturity	Digital awareness
Financial literacy	Financial immaturity (a model of anti-savings behavior and the behavior of an active borrower)	Financial maturity (model of savings behavior and the behavior of a rational borrower)	Financial security
Project literacy	Anti-scientism	Striving for scientism	Scientism
Communicative literacy	Refusal to communicate	Indirect communication	High level of communication and mutual understanding
Teamwork skills	Low level of social capital	Sociability, friendliness	Team flexibility
Network culture	Retreatism, propensity for Internet bullying	Screen culture	Digital etiquette

Source: own compilation.

Depending on the level of competence, these samples will be different *(Figure)*.

We believe that the strategic level of smart competencies, which can become stable only in a managed environment, is the basis for the formation of digital and financial maturity, digital etiquette, scientism (perception of scientific knowledge as the highest cultural value), a high level of communication and mutual understanding, as well as team flexibility and acceptance of pluralism of opinions among the younger generation of Russian society, i.e. the formation of everything that is required from life and work in the modern information society.

The experimental study as a whole allows us to talk about the possibility of taking into account the model of smart competencies in school educational programs. The approbation, however, did not show that the model is effective in relation to all competencies, which is explained by a very short period of formative influence. Education should become a base platform for the development of smart competencies. The development of competencies should take place in the entire range of educational contexts: from formal institutions, such as schools, colleges and universities, to informal learning, as well as various forms of independent and informal learning.

The prospects for the development of the idea of forming smart competencies in the information technology paradigm and the paradigm of the knowledge society are primarily related to the elaboration of the concept of smart competencies as a basis for human potential development. This concept should determine that smart competencies arise in the context of smart education as a system that includes smart agents (smart students, smart teachers, smart administration and smart parents), smart environment (which is based on the use of smart devices, techniques and methods of project activity in education) and smart principles (meta-subject, interactivity, continuity, equality, awareness, activity) [22]. The solution of this task should become part of the development strategy of the country and the global community. In the future, it will qualitatively transform the entire education system and the requirements for workers in economic sectors.

Approaches to the selection of smart competencies should be dynamic and regularly reviewed in connection with the emergence of new technologies. Efforts should be made to study the conceptualization of the required smart competencies and then include them in educational standards. The process of forming smart competencies benefits from the involvement of resources and experience of both the public and private sectors, especially from the participation of actors with in-depth knowledge of skills needed today and relevant in the future.

As part of the study, we tried to propose a methodological scheme for the formation of smart competencies in an educational (managed) environment, as well as an approach to the experimental diagnosis of this process. Based on the results of the experiment, a methodological publication will be prepared with detailed instructions on the use of our own model in educational institutions.

References

1. Zenkov A.R., Udovenko I.P. Human capital in the conditions of a new technological order: The trajectory of formation and development *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World,* 2021, no. 4, pp. 7−19 (in Russian).

2. Litvak N. On the classification of concepts of the information society *Sotsis=Sociological Studies*, 2010, no. 8, pp. 3−11 (in Russian).

3. Webster F. *Theories of the Information Society*. Routledge, 2006. 323 p.

4. Dutton W.H. *Social Transformation in an Information Society: Rethinking Access to You and the World*. UNESCO. 2004.

5. Nath H.K. The Information Society. *SIBCOLTEJO − A Journal of the SCTU*, 2009, vol. 4, pp. 19−29.

6. Bell D. *The Coming of Post-Industrial Society: A Venture in Social Forecasting. Revised Edition*. New York: Free Press, 1973.

7. Yoneji M. *The Information Society as Post-Industrial Society*. Washington, 1983. P. 49.

8. Toffler A. *The Third Wave*. New York: Bantam Books, 1980.

9. *Collective Intelligence: Mankind's Emerging World in Cyberspace*. Perseus, 1999.

10. Schmidt E., Cohen J. *Novyi tsifrovoi mir: kak tekhnologii menyayut zhizn' lyudei, modeli biznesa i ponyatie gosudarstva* [The New Digital Age: Reshaping the Future of People, Nations and Business]. Moscow: Mann, Ivanov i Ferber, 2013. Pp. 18−19.

11. Levin I., Mamlok D. Culture and society in the Digital Age. *Information*, 2021, no. 12, p. 68. Available at: https://doi.org/10.3390/info12020068

12. Zhuravleva I.A. *Informatsionnoe obshchestvo* [Information Society]. Irkutsk: Izd-vo Irkut. gos. un-ta, 2013. 141 p.

13. Curry A., Moore C. Assessing information culture: An exploratory model. *International Journal of Information Management*, 2003, no. 23(2), pp. 91−110.

14. Gorodnov A.A. *Informatsionnaya kul'tura i informatsionnoe obshchestvo* [Information Culture and Information Society]. Nizhny Novgorod: Izd-vo Volgo-Vyatskoi akademii gossluzhby, 2010. 174 p.

15. Stegniy V.N. (Ed.). *Lichnost' v informatsionno-innovatsionnom obshchestve* [Personality in the Information and Innovation Society]. Perm: Izd-vo Perm. nats. issled. politekhn. un-ta, 2015. 448 p.

16. Golovchin M.A. Influence of internet activity on life in the epoch of digitalization of the society and economy: By the data of regional research. *Aktual'nye problemy ekonomiki i prava=Russian Journal of Economics and Law,* 2019, vol. 13, no. 3, pp. 1356−1369. DOI: http://dx.doi.org/10.21202/1993-047X.13.2019.3.1356-1369 (in Russian).

17. Orlov M.I. From an information society to a society of knowledge: Conceptualization a new paradigm of civilization developments. *Vestnik Saratovskogo gosudarstvennogo tekhnicheskogo universiteta= Vestnik of Saratov State Technical University*, 2011, no. 2 (55), pp. 237−245 (in Russian).

18. Pavlyuk R.A. "Informational competence" term's genesis in the context of life-long education. *Gumanitarnye nauchnye issledovaniya=Humanities Scientific Researches,* 2014, no. 1. Available at: https://human.snauka.ru/2014/01/5529 (accessed: September 15, 2021; in Russian).

19. Halász G., Michel A.P. Key competencies in Europe: Interpretation, policy formulation and implementation. *European Journal of Education,* 2011, no. 46, pp. 289-306.

20. *The OECD Program Definition and Selection of Competencies (2005). The definition and selection of key competencies. Executive summary. June 30, 2005.* Available at: http://www.oecd.org/dataoecd/47/61/35070367.pdf

21. Tabachuk N.P. Informational, digital and smart competencies of personality: Transformation of views. *Ped.Rev.,* 2019, no. 4 (26), pp. 133−141 (in Russian).

22. Babich L.V., Golovchin M.A., Mironenko E.S. The model of smart competencies as a basis for the formation of human capital. *Ekonomika obrazovaniya,* 2021, no. 1 (122), pp. 4−17 (in Russian).

23. Golovchin M.A., Rossoshanskii A.I. Measurement of smart competencies in the framework of a formative experiment: Verification of the evaluation model. *Pedagogicheskie izmereniya,* 2021, no. 1, pp. 80−89 (in Russian).

24. Svergun O. et al. *HR-praktika. Upravlenie personalom: Kak eto est' na samom dele* [HR Practice. Personnel Management as It Really Is]. Saint Petersburg: Piter, 2005. 320 p.

25. Petrenko E.A. Modern approaches to the assessment of general competencies and the main problems of their diagnosis. *Pedagogika i psikhologiya obrazovaniya,* 2014, no. 4, pp. 102−109 (in Russian).

26. Egorov D.V. The use of a formative experiment in the educational process at a university. *Vestnik TIUiE=Vestnik of Taganrog Management and Economics Institute*, 2010, no. 1, pp. 81−83 (in Russian).

27. Ardasheva A.L. Forming experiment as one of the basic methods of pedagogical psychology. *Ekonomika i sotsium*, 2017, no. 11 (42), pp. 94−97 (in Russian).

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Social Forecasting in the Strategic Management of the Development of Higher Education in Russia*

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Abstract. Social forecasting is directly related to the management of changes in the economy and social sphere, including higher education. The relevance of the study is associated with the analysis of the problem of forecasting indicators of higher education through the prism of the targets of national projects implemented in the context of a prolonged COVID-19 pandemic. The global epidemic aggravates the socio-economic situation in the world community, makes it highly instable and uncertain, thereby increasing the demand for social development forecasts. The purpose of our research is to study the potential of social forecasting in the state strategic management of the development of higher education in Russia. A special task revealing its scientific novelty is to diagnose the problem of measurement and

profiling the methodology of reproduction of the "strategic intelligentsia" (elite) as a "transformative" subjectivity. In the study, we rely on the theory of the socio-cultural management model put forward by Professor A.V. Tikhonov, as well as on the authors socioprognostic approach to management, which acts as a special methodological means of scientific search, integrating ideas and theoretical constructs in the field of social sciences and humanities, while substantiating the solutions to promising problems with the use of modern project-based technologies. With the help of these tools, we profile the multivariate levels of scientific foresight and strategic management, analyze the forecasting and regulatory actions of the Ministry of Science and Higher Education of the Russian Federation as a macroregulator of the functioning and development of higher education, and identify key components in reformatting and optimizing social forecasting in the state strategic management of higher education development. The work is based on the perspective practice of research of manageability of regional development and social group formation, which is in demand by the academic community, acquired by scientists of the Center for Sociology of Management and Social Technologies of the Institute Sociology – Branch of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences in 2015–2020, including that achieved in the study of higher education as a resource for managing the socio-cultural modernization of regions. The materials of the article have theoretical and practical significance; they are intended for specialists in the field of state, regional and municipal management, as well as experts in social forecasting and strategic management of the development of higher education in Russia.

Key words: socio-economic forecasting, development management, strategic forecast and management, socio-cultural modernization, higher education, social group formation, intelligentsia.

In memory of Aleksandr Vasilyevich Tikhonov,
the Scientist, the Educator and
an Outstanding Person (1939–2021)

Introduction

In the practice of socio-economic forecasting of the Soviet and post-Soviet development periods, discourses often changed determining the potential forecasting possibilities in general and social forecasting in particular, its expediency, place and role in public administration, the need to combine it with planning.

The beginning of a turning point in the views on this type of forecasting was the 1960s: it began to link the preparation of a Comprehensive program of scientific and technological progress (STP) and its socio-economic consequences, as well as a number of targeted programs. Among the significant forecasts of that time, which determined the ways of possible development of social processes in the

USSR, there are probable scenarios of the future state of life and the situation with the workforce in the areas of developed territories and when creating new industries; forecasting life of small peoples of the North and the Far East and likely ways to change it (the "trajectory of social movements"); proposals for the intellectualization of social work, reform of the public education system, and a number of others.

In the next two decades, the practice of making forecasts that preceded the work on the implementation of state plans for socio-economic development acquired the character of a mass campaign. This served as an experience in preparing a long-term perspective plan for 15 years and a Comprehensive program STP at the level of industries, regions, individual large enterprises, based on an automated calculation system that provides for the inclusion of forecast models in the planning system.

The scientific and methodological development "Forecasting the development and monitoring of the state of higher and secondary vocational education (theory, methodology, practice)", awarded in 1998 the prize of the President of the Russian Federation, was of particular interest for the field of education. It presented models for forecasting the development of higher and secondary vocational education, the demand for specialists of various categories and the expected results of the forecast; scientific substantiation of monitoring as a tool for developing and implementing a strategy for the development of higher education was given [1].

The authors of the monograph *Forecasting the Future: A New Paradigm* V.M. Bondarenko and G.G. Fetisov believe that socio-economic forecasting in the USSR played a positive role. It was useful for ensuring the quality of planning and management decisions for the short and medium term, contributed to the transformation of forecasting into a system-planning activity of a national scale. In particular, the organizational and technological structure of the annual and five-year planning provided for the strict implementation of sequential and parallel operations: variable target forecasting; key areas of economic and social development; draft state plans with additions in terms of programs for solving economic and social problems. At the same time, such an application of forecasts in planning management included many miscalculations regarding forecasting, low methodological tuning and weak organization of forecast estimates for changes in the internal and external situation [2].

The disadvantages of socio-economic forecasting of the Soviet period of the country's development are organically inherent in forecasting by its internal nature, therefore they migrated to the economy and social sphere of the post-industrial, informational stage of Russia's development. But scientific foresight, the ways of its implementation and application have a high sensitivity to the types of economic and social systems. In this regard, along with the study of experience, the substantiation of general methodological problems and methodological means of social forecasting become relevant in modern economic conditions; methodological analysis and evaluation of scientific forecasting methods, determination of the possibilities and limitations of each of them; search for reliable methods of experimental verification of the proposed forecasts and verification of the means, proposed for their implementation. To the extent that social forecasting performs the functions of regulating and adjusting the economy and political processes to achieve the desired result, its main objects are phenomena, events and actions that are largely manageable through various incentives and methods. Forecasts themselves are developed as signals-indicators of the inadmissibility of managerial decisions that generate undesirable consequences.

In relation to forecasting the development of higher education in Russia, sociological monitoring of the state of higher education is strategically important, especially in the field of training highly qualified personnel as a resource for developing Russian economy and the implementation of national projects.

Methodology and methods

The theoretical and methodological basis of the research is the *paradigm of scientific foresight*, developed in the 1950s by A.M. Gendin, I.V. Bestu-zhev-Lada and a number of other scientists, and later adapted by P.V. Agapov, T.M. Dridze, A.I. Selivanov, B.S. Sivirinov, V.N. Stegniy, J.T. Toschenko, and O.A. Urzha to sociology and social management.

According to the new paradigm of forecasting the future, forecasts of controlled (projective) processes that precede the adoption of planning and management decisions form a scientific prediction of the results and consequences of management, thereby predicting which management decisions

are rational in a given situation. In this sense, such forecasts are often called *active*, since they are a means of developing an active impact on the objects of forecasting, their transformation and translation into the necessary state. They are used in planning, in the development of projects and programs, in making planned decisions as a means of justifying the rationality and reliability of planned actions and evaluating their effectiveness [2].

By *social forecasting* we mean the field of sociological research, related to the prospects of social processes and phenomena covering the entire thematic field of sociological science. Social forecasts are not just aimed at predicting the future; they identify emerging problems and highlight possible ways to solve them.

Our work uses a scientific approach, creatively and consistently developed by the research team under the leadership of Doctor of Sciences (Sociology), Professor A.V. Tikhonov, the founder of the theory of controllability of spontaneous social processes. In accordance with this approach, the controllability of regional development and social group formation is associated with the *spatial-territorial panorama* of modernization processes (*different development levels)* and the humanistic basis of modernization, which is a complex of social and cultural transformations (*socio-cultural modernization*). The controllability of modernization ensures a balanced interaction between its main components: technical and technological, socio-economic, socio-cultural and institutional-regulatory. The role of the latter is played by a set of regulatory institutions, one of which is *higher education* [3].

The theoretical and empirical concept of the study is the concept of *"intelligentsia"*. This is a problematic (in comprehension and understanding) term characterized and endowed by humanitarians with special features: "philosophical dreams", "global concern", "a complex system of compas-sion and sacrifice", "the cult of natio-

nality and the national principle" and, finally, "faith in the spiritual principle". In our opinion, the intelligentsia is a *social group of people who are consciously responsible for the formation of a development strategy and an urgent political agenda, constructive approaches to the organization and self-organization of society*. Overcoming by this group the framework of its own limited "class" worldview, its involvement in power-management networks and, as a result, the actualization of the movement from the construction of abstractions to the analysis of a specific situation allow talking about the need to clarify and supplement the term "intelligentsia" based on the development of parametric features of strategic "transformative" subjectivity (*"strategic intelligentsia" concept)*.

The purpose of the research is to study the potential of social forecasting in the state strategic management of the development of higher education in Russia; a *special task* revealing the scientific novelty of the study is to diagnose the problem of measurement and profiling the methodology of reproduction of the "strategic intelligentsia" (elite) as a "transformative" subjectivity.

The *information base* is the results of studying the controllability of regional development and social group formation, achieved by scientists of the Center for the Sociology of Management and Social Technology of the Institute of Sociology of the Federal Center of Theoretical and Applied Sociology of the Russian Academy of Sciences in 2015–2020 including in the study of higher education as a resource for managing socio-cultural modernization of regions.

The article uses the materials of the dissertation work, performed at the State University of Management at the Department of Sociology and Psychology of Management in 2014–2016[1].

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[1] Len'kov R.V. *Socioprognostic Approach to Social Management of Higher Education in Russia*. Available at: https://www.elibrary.ru/download/elibrary_30717330_39519936.pdf (accessed: January 18, 2022).

The research has applied the general provisions of the scientific foresight theory, methods of *retrospection* (in the analysis of the Soviet experience of socio-economic forecasting), *systematization and generalization of information*, as well as the results of the work of Russian and foreign scientists in the field of social philosophy, management sociology, sociology of education and strategic forecasting.

Discussion

The modern problem of the preservation degree of planned principles in the economy and social sphere of the Russian Federation in their relationship with forecasting, methods and structures, methods of implementing projects and plans arose due to the destruction of the established Soviet system of state socio-economic planning and forecasting. However, the thesis about "abandoning the compilation of socio-economic forecasts in favor of switching to planning and design methods" [4], from our point of view, is insufficiently substantiated. The role of forecasting is increasing today in relation to such forms of state planning as orders for the production of products necessary for national purposes, plans of federal, regional and local budgets, taxes and fees, targeted programs and priority national projects. Targeted forecasts are necessary to anticipate changes in demand, identify new market opportunities, structural and functional failures, risks of innovation, competition, current natural threats and transformation of general development trends [5].

Forecasting is used as a tool for the primary analysis of options for planning and management decisions. But the forecasting goals are not limited to its connection with the state planning, they are broader and more diverse. Taking this into account, E.Yu. Bikmetov and A.V. Lukyanov argumentatively point out that in social forecasting, not only the search component is important, but also the normative component of the forecast, that is, the assessment of the consequences of decisions taken in social design. The normativity of this type of forecasting acts as a truly managerial vision of the future, the processes of goal-setting and goal-achievement [6].

Forecasting models and estimates should be used by authorities and management as a means of indicative planning allowing the state and society to exert an indirect regulatory influence on the development of a planning strategy by organizations of the public, private and mixed sectors of the economy, so that the specified strategy corresponds to a unified state strategy. On the one hand, *indicative state plans* should act as forward-looking ones, representing *non-directive* planning tasks with a set of indicators-indicators of development, the achievement of which is focused on the social policy of the state. On the other hand, they should be based on the results of macroeconomic normative-target forecasting, calculations and forecast models. These are recommendation-oriented plans in the sense that they provide an opportunity and motivate economic entities to follow the guidelines of the state forecast plan, so that their economic and social activities are organically integrated into a single state strategy and receive support, for example, by prioritizing the provision of state orders (tasks) for the provision of services (performance of works). The need for such plans-orders arises from federal and regional authorities and management, in particular, when implementing federal targeted programs and national projects.

Currently, the government of Russia tries to revive the system of state strategic management and its individual components strategic forecasting, planning and programming, which are already included in the regulatory framework. For instance, Federal Law no. 172-FZ, dated June 28, 2014, "On strategic planning in the Russian Federation" strengthens the prognostic orientation of strategic planning documents, constitutionally establishes the need to create a scientific base (a system of forecasts and plans, state and municipal programs) for decision-making and strategizing

scientific and technological, socio-economic and spatial-territorial development of the country. This law provides for an assessment of the current situation and conditions of economic and social development in the medium and long term including demographic development, the state of the environment and natural resources. In federal legislation, *forecasting* is defined as "the activity of participants in strategic planning to develop scientifically sound ideas about the risks of socio-economic development, threats to national security, as well as about the directions, results and indicators of socio-economic development of the country, its subjects and municipalities"[2].

In view of the above, we share the position of A.I. Selivanov which consists in the fact that the *strategic forecasting* acts as a purposeful applied managerial forecasting and a component of the state strategic management system. In this system, it is significantly associated with goal-setting and national goals [7].

The strategic forecast assumes active involvement of goal-setting and design elements, provided that the goal is a constantly adjusted project. Creating a new one as a result of its implementation is one of the most important processes of strategic forecasting, as it allows managing the trajectories of the future reducing their level of uncertainty. The future becomes a combination of the unmanageable and the manageable, which implies the interaction of the forecast and the goal, a consistent movement from the forecast to the goal and from the goal to the forecast during the implementation of forecast and project activities.

At the same time, socio-economic forecasts, developed by state executive authorities, are not fully indicative. The projected indicators do not serve as indicators of the directions of the desired forward movement, but act as volumetric measures of the expected level of economic and social development. They can perform the functions of indicative planning with the successful selection of the required type of criteria and motivation of subjects in achieving the intended targets. There is a managerial problem of optimizing the achievement of goals within the framework of strategies that determine the mechanisms of federal, regional and sectoral development.

A clear illustration of the above is the criteria-indicators, used by the Ministry of Science and Higher Education of the Russian Federation (hereinafter – the Ministry of Education and Science of Russia) for a multi-stage campaign to classify educational institutions of higher education and their branches as a group of universities with signs of ineffective[3] (hereinafter – Monitoring). They are developed on the basis of recommendations of the Russian Union of Rectors, the Association of Federal Universities, National Research Universities, Moscow and Saint Petersburg State Universities on monitoring the effectiveness of universities and their branches including those with a special focus of activity (military and law enforcement, medical, agricultural, creative, sports and transport).

The logic and characteristics of the indicators meet a number of tasks: getting Russian universities into the world university rankings, the development of university science, raising teachers' salaries, ensuring optimal conditions for higher education, training with the involvement of modern educational and laboratory equipment and computer equipment.

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[2] On strategic planning in the Russian Federation: Federal Law no. 172-FZ, dated June 28, 2014. Available at: https://fzrf.su/zakon/o-strategicheskom-planirovanii-172-fz/st-1.php (accessed: October 20, 2021).

[3] Information and analytical materials on the results of monitoring the effectiveness of the activities of educational institutions of higher education. Available at: http://indicators.miccedu.ru/monitoring/?m=vpo (accessed: October 20, 2021).

Critical (threshold) values of *predictive indicators of attribution of educational institutions to a group of universities with inefficiency features*:

— *in educational activities* — the average score of the Unified State Exam of applicants accepted to study at the university in full-time implementation of the basic educational bachelor's degree programs at the expense of the relevant budgets of the budgetary system of the country, with payment of the cost of tuition by individuals or legal entities (60 points);

— *in research activities* — the amount of R&D, carried out at the university, per one scientific and pedagogical worker (50 thousand rubles);

— *in international activity* — the proportion of the number of foreign university students, enrolled in bachelor's degree programs in the total number of students in the given contingent (0.7%, for metropolitan universities — at least 3%);

— *in financial and economic activity* — the income of the university per one scientific and pedagogical worker (1,100 thousand rubles);

— *by infrastructure* (excluded in 2015) — the total area of educational and laboratory buildings, owned by the university and assigned to it by the right of operational management, per student (at least 5 sq. m. m, in the capital's universities — at least 13 square meters);

— *according to the graduates' employment* — the proportion of the number of graduates who studied at the university full-time, who did not apply to employment services for employment assistance during the first year after graduation, in the total number of graduates (99.342%);

— *according to the average salary of the teaching staff* — the salary level of teachers from the average salary of employees in the region (150%);

— *according to the quality of the teaching staff* — the number of teachers with an academic degree per 100 students.

The activity of an educational organization (university) or branch is considered effective when the thresholds for four or more indicators are reached.

Since 2018, the official portal for the Monitoring of the effectiveness of the activities of educational institutions of higher education provides general results characterizing the campaign. For instance, 731 universities and 583 branches took part in the 2018 Monitoring (according to data for 2017) including 939 state and municipal, 375 private, the contingent of students amounted to 4267.8 thousand people, 90.3%[4] study in state and municipal organizations. In the 2019 Monitoring (according to data for 2018), 709 universities and 555 branches took part including state and municipal — 920, private — 344, the contingent of students amounted to 4174.9 thousand people, 91.3%[5] study in state and municipal organizations. In the 2020 Monitoring (according to data for 2019), 689 universities and 529 branches including state and municipal 908, private — 310, the contingent of students amounted to 4090.9 thousand people, 92.1%[6] study in state and municipal organizations.

Analysis of the main indicators for educational institutions of higher education and scientific organizations in 2013/2014 and 2019/2020. (*Tab.*) shows a decrease in the number of organizations (26.8%), number of students (27.9%) and teaching staff (28.2%). Thus, issues concerning not only the quality of higher education, but also the number of trained graduates are relevant. In the prognostic context, questions about the structure and number of teaching staff become important. We should note that these issues have been remained of acute importance over the previous 10 years [8].

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[4] Information and analytical materials on the results of monitoring the effectiveness of the activities of educational institutions of higher education. Monitoring 2018. Available at: https://monitoring.miccedu.ru/?m=vpo&year=2018 (accessed: October 20, 2021).

[5] *Ibidem*. Monitoring 2019. Available at: https://monitoring.miccedu.ru/?m=vpo&year=2019 (accessed: October 20, 2021).

[6] *Ibidem*. Monitoring 2020. Available at: https://monitoring.miccedu.ru/?m=vpo&year=2020 (accessed: October 20, 2021).

The main indicators for educational organizations of higher education and scientific organizations
carrying out educational activities under bachelor's, specialist's and master's degree
programs in 2013/2014 and 2019/2020[1] (at the beginning of the academic year)

The name of the indicator	2013/2014	2019/2020
Number of organizations[2]	969	709
Number of students in bachelor's, specialist's and master's degree programs, thousand people	5 646.7	4 068.3
Number of students in research and higher doctorate degree, thousand people[3]	136,6	85.2
The number of students of educational organizations of higher education per 10,000 people, people	393	277
Admission to bachelor's, specialist's and master's degree programs, thousand people[4]	1 246.5	1 129.4
Graduates of bachelor's, specialist's and master's degree, thousand people[4]	1 291.0	908.6
Bachelors, specialists, masters graduated per 10,000 people employed, people	181	126
Number of higher-education teaching personnel[5], thousand people	319.3	229.3

[1] According to the data of Ministry of Education and Science of Russia.
[2] Until 2016/2017 – the number of educational organizations of higher education.
[3] Correspondingly at the end of 2013 and 2019.
[4] For the corresponding year.
[5] Without professors-at-large.

Source: compiled according to: The social situation and standard of living of the Russian population. 2019: Stat. Coll. *Rosstat,* Moscow, 2019, pp. 277, 284–285; Russia in figures. 2020: Stat. Coll. *Rosstat*, Moscow, 2020, pp. 146, 150, 154.

Findings

The question concerning the correctness of the implemented criteria-indicators of the effectiveness of educational organizations has been widely discussed in the scientific literature and mass media. In particular, E.V. Balatsky and N.A. Ekimova revealed that almost all indicators are resource-based and have no connection with the quality of education. Moreover, according to the said experts, many of them diagnose the situation with efficiency exactly the opposite [9].

The fact of artificiality of the created "acceleration" of higher education development efficiency attracts attention: forecast estimates, developed in 2014 by V.I. Savinkov and G.A. Klyucharev, stated the reduction by 2018/2019 of the number of students to 4364.7 thousand people and the number of organizations to 859 [10]. As we can see, in this situation, the forecast of the growth of the student contingent to 4867.6 thousand people and organizations to 924 people by 2025/2026 seems in general to be insufficiently substantiated.

We should note that today many problems in the development of the country's higher education, associated with the competitiveness of higher education and real improvement of the quality of education, strengthening its links with science and practice, increasing the salaries of the teaching staff, remain unresolved. Measures taken by the Russian Ministry of Education and Science often deepen the crisis in which higher education is, threatening the loss of a significant part of the intellectual potential and reducing the opportunities for social mobility of highly qualified personnel.

We believe that in order to change the current situation, it is necessary to provide feedback between the indicators of educational development goals achievement and real mechanisms of strategic management, implemented in the form of specific actions of macro-regulator and university management. It is necessary to have an open public discussion about the methodology of evaluating the effectiveness of educational organizations and their branches, its differentiation by types of universities and a clear division of criteria that depend on the activities of the executive authorities and the organizations themselves. It is necessary to develop a specific algorithm of actions in relation

to inefficient universities with a priority on their recovery, rather than elimination, the creation of the practice of merging only after a serious and transparent assessment of this need with the elaboration of organizational procedures that take into account the interests of labor collectives and the needs of students.

From our point of view, there is a need for public discussion with the participation of regional leaders, independent experts, teachers, scientists and the public about the goals and ways of reforming higher education. It should result in the adjustment of a number of fundamental normative and legal acts in the field of education: Government Resolution no. 722-r, dated April 30, 2014 "Changes in the social sphere aimed at improving the efficiency of education and science ("road map")", as well as Government Resolution no. 583, dated August 5, 2008 "On the introduction of new wages systems of employees of federal budget institutions and federal state bodies". The transition from the arithmetic average to the median indicator is required in assessing the level of faculty salaries, as well as taking into account not only the "gross" amount of salary, but also its ratio to the real volume of teaching load of university professors. The problem of "the need to reduce the teaching load, especially the classroom hours, to the limit (normal) its size in a third of the annual fund of working time (520 hours) at the limit of 180 classroom hours" should be promptly solved [11].

The experience of the development of applied socioprognostic research records that strategic forecasting has a responsibility to public administration and society. This type of forecasting requires a combination of theoretical-applied research and expert-analytical evaluations. With regard to society, the fundamental analysis is provided by philosophy and the social sciences and humanities (sociology, political science, cultural studies, economics, etc.), which reveal the causal complexes of interactions and the system of determination of processes in

objects of different nature. This knowledge is basic in forecasting, and its introduction into practice is an integral component of applied interdisciplinary strategic forecasting. But at the same time, there are questions that require reflection: *which of the social communities can act as a strategic, "transformative" subjectivity, what is the methodology of its reproduction?*

Apparently, such a community should *become a "strategic intelligentsia" (elite), and the methodological means* of its reproduction should be *a socio-prognostic approach*, "integrating ideas and theoretical constructs in the field of sociohumanitarian knowledge with the substantiation of solutions of promising problems based on modern project technologies" [12].

It is known that the notion of "intelligentsia" does not imply clear institutional boundaries. It only denotes a social group distinguished by education, erudition, and the ability to think in general categories. But it is believed that a high level of education is that special quality of consciousness of an individual, which allows a person going beyond their own class position, to analyze social problems objectively and impartially. This specificity of perception of social reality induces intelligentsia to empathic attitude toward other social groups, so it, having the necessary socio-cultural resources to carry out the diagnosis of social problems, can take on the role of "arbitrator" in the contradictions between different social classes [13] or "mediator" in social and cultural relations [14].

Certainly, it is not unreasonable to argue that as society transitions to a post-industrial stage of development and authoritarian forms of governance are replaced by democratic ones, the importance of intelligentsia declines, giving way to *intellectuals* in social groups with a high level of individualization, whose function is to "problematize" reality, offering society different images of the present and the future. However, intellectuals organized in small groups hold different, sometimes opposing positions

and are reluctant to offer concrete solutions to the problems they themselves emphasize [15]. Currently, intellectual "think tanks" predict a rapid increase in global warming, a rapid decline in fertility as a result of increasing urbanization and pandemic attacks, a drop in productivity due to social unrest and upheaval, the continuation and deepening of poverty among the world's two billion poorest citizens [16].

V.E. Lepskii rightly states that the Russian intelligentsia, having a powerful intellectual potential, is able to perceive and analyze holistically any combination of the most complex social processes and phenomena. It played a huge role in the pre-revolutionary period, which allowed competing spiritually, morally and culturally with Western Europe. The Soviet intelligentsia was able to assume the role of public leader in the crisis situation of 1991 and prevent another bloody civil war. Unfortunately, at present our intelligentsia has lost and cannot find a united and constructive position due to the division into patriots and globalists, great-powered and market-oriented. It does not fulfill the key function of a navigator of multipurpose processes of social development of the country. The answer to the question of why intellectuals are not at the forefront of social transformation in Russian society can be found by analyzing the most common points of view on their role in modernity, interpreted as "translator of Western templates", mouthpiece of the "enemy image", constant opposition to power, "judge and prophet", "social diagnostician" [17].

Perhaps, in the context of the problems under consideration, taking into account the fragmentation and disconnection of the intelligentsia, it is more correct to talk about elites, which could become strategic subjects and determine the basis of the movement to form a "transformative" subjectivity. The success of "strategic intelligentsia" in fulfilling the mission of "awakening the reflection of public consciousness" depends not only on the awareness of its importance, but also on the acceptance of this mission. Success also depends fundamentally on the understanding of the role of the intelligentsia by the country's top leadership, on the organization of concrete steps aimed at creating adequate managerial and socio-cultural mechanisms, including mechanisms to neutralize the opposition of those who are not interested in consolidating civil society and the state.

From our point of view, the transition to the design of intelligentsia reproduction is possible on the basis of the integration of national-state, socio-economic, research and educational goals. For the rational implementation of such integrative practices it is necessary to develop and test new mechanisms of manageability of regional development and social group formation. This can be realized on the basis of the theory and methodology of sociology of management and organization through rational-communication procedures and introduction of methods of social diagnostics [18; 19], forecasting and designing poly-subject (reflexive-active) environments on the basis of digital and sociotechnical transformations [20].

Conclusion

Below we present *practical conclusions* regarding bringing state strategic management in line with modern requirements (considering the role of higher education in the implementation of the strategic approach to the management of socio-cultural modernization of regions).

I.   The current situation due to the turbulent state generates a civilizational challenge for all countries [4]. It is possible to assert that the world academic community accepts the specified challenge. From the point of view of foreign experts, the theory and methods of network science, social physics, communications, transport, geography and economics are united before our eyes in order to identify and compare the level of development of different countries, diagnose and assess how

this development affects the adoption of strategic management decisions [21]. Analysis of foreign scientific literature allows stating: first, in modern conditions there is a pluralism of views on the means and tools of social forecasting [22]; second, there is no universal approach to scientific foresight of social change [23]; third, the role of empirical research, creating a valid base for accurate and targeted social forecasts [24; 25], is increasing.

The civilizational challenge that has arisen is addressed primarily to the power national elites, and in order to respond to it, the authorities must have a truly effective system of public administration. In other words, the power elite should determine the model of socio-economic development, capable of providing Russia with a worthy place in the geopolitical space. However, it is necessary to search for alternative approaches to the foresight of the future. We need a new paradigm that involves designing and constructing an image of the future and putting it into practice. At the same time, *professional sociology* must be involved at all stages of the management mechanism, from developing draft decisions and controlling their implementation to monitoring the consequences. Only then the sociological science will be on a par with the factors determining the quality of management, and the sociologist will become an expert in assessing the possible results of management decisions [26].

II. We define *predictive social design, planning, and foresight* as the actual tools of state strategic management.

Forecast social design was developed by T.M. Dridze in 1986. It is a specific social technology of implementation of pre-planning scientific substantiation of managerial decisions. It is characterized by: 1) recognition of "equality" of objective and subjective factors of social reproduction; 2) consideration of design as the final stage in social diagnostic work; 3) emphasis on the feedback between diagnostic and constructive stages of the decision-making process [27].

Planning reached its peak in a hypertrophied form in the USSR. Its varieties continue to be used everywhere as directive (hard) and indicative (soft) plans, focused on setting future values of certain parameters as goals.

Foresight came to Russia about 15 years ago and is a methodological tool for creative forecasting [28]. It is characterized by: 1) the use of a survey of experts aimed at "turning on" their collective intuition (when identifying promising directions of development); 2) the implementation of the consensus principle, when as a result of preliminary negotiations the approval of groups interested in a particular project is achieved: the population, experts, government and business representatives (when approving promising directions).

III. *The transition to the project planning* is partly solved by launching national projects, in the case under consideration — the national project "Education", but, in our view, this is not enough. Russia needs to define its place in the geopolitical system and the global project that the country should implement to ensure a strategically significant geopolitical position. In parallel, a set of specific plans and projects should be formed. Given the realities and traditions in the field of central government and federal administration (power and management vertical structure), documents of federal importance should become binding. But the goals should not be a dogma, which requires using the indicative planning procedure, when the initial plans can be adjusted in response to new circumstances. It is necessary to provide procedures for adjusting documents that would make the change of initial goals a phenomenon that requires substantiation. The arsenal of the system of public administration must include normative documents of strategic importance, in the form of projects and plans for the medium and long term. Their implementation is tantamount to the presence of the country's future. Today, Presidential Decree no. 204, dated May 7, 2018, is an integral part of the

work of the Government of the Russian Federation. "On the national goals and strategic objectives of the development of the Russian Federation through to 2024", which sets goals (challenges) for the implementation of breakthrough scientific and technological and socio-economic development, increasing the population, improving the living standards of citizens, creating comfortable living conditions and opportunities for self-realization and the unlock of everyone's talents[7].

A.V. Tikhonov and A.A. Merzlyakov reasonably highlighted that the way the authorities and civil society cope with the national goals is of great practical interest, since it is not only a question of political intervention by the federal authorities in the processes of socio-economic development of regions based on breakthrough projects, but also a question of the extent to which different categories of the population will respond to them and how the mechanism of their social self-organization will work in this regard. The implementation of the decree will require, above all, changing the work of all parts of the power and management vertical (management apparatus), and not only by creating so-called "smart management", but also by ensuring significant support from the population [29].

IV. The solution to the problem of *implementing the mechanism of plans and projects* requires ensuring the link "report – responsibility". In order to control the implementation of a policy paper, one should set specific and well verifiable criteria-indicators. Responsibility for their achievement should be assigned to a particular agency with personal detailing of officials, for whom rewards and sanctions are provided in advance depending on the degree of success in achieving the goals set. But before adopting a policy paper of the

planning-project type, it is necessary to carry out preliminary actions to analyze the current situation and prospects. For this purpose, from our point of view, it is possible to apply the foresight tool, linking the algorithms of various forecasting methods (Delphi methods, scenario writing, etc.). Only after conducting socio-forecasting studies can we move on to planning activities; otherwise, there is a high probability of "violence" over the future, which can manifest itself in errors and subsequent problems in the implementation of the plan.

We agree with E.V. Balatsky's point of view, which is that we should move to a strategy of dominating quality over quantity. And such a doctrine of quality should clearly prevail over quantitative indicators. Only the growth of the quality of life and everything that man creates can substantiate the quantitative stability of the economy and the social sphere, only the desire for development will release the creative potential of people in new conditions [4].

Conclusions related to the reformatting of Russia's higher education:

1) Higher education is an institutional and regulatory resource to ensure the state strategy of socio-cultural modernization of the regions, and highly qualified, educated population a "soft" power and a centripetal factor in achieving a high level of solidarity of society in addressing national challenges.

2) The fate of the economy, the people and the country depends on the quality of state strategic management, which is known to be in the hands of the ruling elite. Here it is fair to ask how realistic the changes formulated in the system of government are. Our answer is that a social group with higher education is able to influence the growth of civic subjectivity and the level of support for the actions of the power and management vertical. It can launch the mechanism of self-building (*intellectual "assembly"*) and take on the integrating

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[7] "On the national goals and strategic objectives of the development of the Russian Federation through to 2024": Presidential Decree no. 204, dated May 7, 2018. Available at: https://base. garant.ru/71937200/ (accessed: October 20, 2021).

function of developing a strategic vector of socio-cultural modernization. At the same time, the modernization processes taking place in domestic education should encourage the state and civil society to arrange institutional changes.

3) It is imperative to ensure the involvement of civil society in the formation of requests for the results of research activities, as well as to develop network forms of organization of scientific, technical and innovative practices. For "soft" state regulation of the processes of socio-cultural modernization of the country and its regions can be quite effective dual regulation: by federal authorities and administration – from above, regional and local – from below.

It is important to emphasize that, at present, the potential of social forecasting in the state strategic management of the development of

higher education in Russia is clearly underestimated both by the authorities and by science. It is necessary to implement it in a short time, because the passivity in the sphere of political and social activity, as well as the alienation of the people from the power and management leads to a shift of people's attention to personal and family problems to the detriment of social and political ones [30]. Along with the domination of the dependent export-raw model of organization of the Russian economy, the reproduction of archaic technological mode passivity and alienation become the macro-destructive factor that does not allow implementing modernization plans and national projects, actually threatens the equation of Russia with the third world countries, where the conservation of age-long backwardness has become an institutional norm.

References

1. Savel'ev A.Ya. (Ed.) *Prognozirovanie razvitiya i monitoring sostoyaniya vysshego i srednego professional'nogo obrazovaniya (teoriya, metodologiya, praktika)* [Development Forecasting and Monitoring of Higher and Secondary Vocational Education (Theory, Methodology, Practice)]. Moscow: NIIVO, 1999. 192 p.

2. Fetisov G.G., Bondarenko V.M. (Eds.) *Prognozirovanie budushchego: novaya paradigma* [Forecasting the Future: New Paradigm]. Moscow: Ekonomika, 2008. 283 p.

3. Len'kov R.V. The problem of targeting sociocultural modernization of Russian regions: Patterns, regulators, subjectivity. *Nauchnyi rezul'tat. Sotsiologiya i upravlenie=Research Result. Sociology and Management,* 2020, vol. 6, no. 4, pp. 42–54. DOI: 10.18413/2408-9338-2020-6-4-0-3 (in Russian).

4. Balatsky E.V., Ekimova N.A. Public administration tools: Forecasting vs designing. *Upravlenets=The Manager,* 2021, vol. 12, no. 1, pp. 18–31. DOI: 10.29141/2218-5003-2021-12-1-2 (in Russian).

5. Sanders N. *Forecasting Fundamentals*. New York: Business Expert Press, 2016. 122 p.

6. Bikmetov E.Yu., Luk'yanov A.V. Normative component of goal setting and goal achievement in social design. *Vestnik Permskogo natsional'nogo issledovatel'skogo politekhnicheskogo universiteta. Sotsial'no-ekonomicheskie nauki=PNRPU Sociology and Economics Bulletin,* 2021, no. 1, pp. 59–68. DOI: 10.15593/2224-9354/2021.1.5 (in Russian).

7. Selivanov A.I. Methodological platforms and methods of strategic forecasting: World experience and Russian potential. *Vlast'=The Authority,* 2021, vol. 29, no. 1, pp. 280–290 (in Russian).

8. Len'kov R.V. Characteristics of the components of higher education in Russia: Sociological and managerial analysis. *Vestnik Universiteta (GUU),* 2012, no. 20, pp. 122–129 (in Russian).

9. Balatsky E.V., Ekimova N.A. Academic effectiveness of Russian higher economic schools. *Terra Economicus,* 2014, vol. 12, no. 1, pp. 13–27 (in Russian).

10. Savinkov V.I., Klyucharev G.A. *Analiz i prognoz chislennosti studentov i prepodavatel'skogo personala uchrezhdenii professional'nogo obrazovaniya* [Analysis and Forecasting of the Number of Students and Teaching Staff of Vocational Education Institutions]. Moscow: TsSPiM, 2014. 96 p.

11. Ershtein L.B. Excessive workload of university teachers as a factor of destruction of higher education in Russia. *Vestnik Permskogo natsional'nogo issledovatel'skogo politekhnicheskogo universiteta. Sotsial'no-ekonomicheskie nauki=PNRPU Sociology and Economics Bulletin,* 2021, no. 2, pp. 75−87. DOI: 10.15593/2224-9354/2021.2.6 (in Russian).

12. Len'kov R.V. Social project management as a subject of social and management discourse. *Nauchnyi rezul'tat. Sotsiologiya i upravlenie=Research Result. Sociology and Management,* 2018, vol. 4, no. 4, pp. 101−112. DOI: 10.18413/2408-9338-2018-4-4-0-9 (in Russian).

13. Mannheim K. *Izbrannoe: Sotsiologiya kul'tury* [Essays on the Sociology of Culture]. Moscow; Saint Petersburg: Universitetskaya kniga, 2000. 501 p.

14. Davydov A.P. The methodological "middle" as a tool for studying social reality. *Rossiya reformiruyushchayasya =Russia in Reform: Yearbook,* 2020, no. 18, pp. 529−564. DOI: 10.19181/ezheg.2020.23529 (in Russian).

15. Chernysh M.F. The intellectuals and the middle class. In: *Intelligentsiya: Mnogoobrazie stilei i obrazov zhizni: Sb. nauchn. statei* [Intellectuals: Diversity of Styles and Ways of Life: Collection of Scientific Articles.]. Moscow: RSUH, 2020. P. 39−45 (in Russian).

16. Randers J. *2052: A Global Forecast for the Next Forty Years*. Vermont: Chelsea Green Publishing, 2012. 304 p.

17. Lepskii V.E. Becoming strategic entities: Setting the problem. *Refleksivnye protsessy i upravlenie=Reflexive Processes and Control*, 2002, vol. 2, no. 1, pp. 5−23 (in Russian).

18. Tikhonov A.V. Problems of social group formation in Russian regions with different levels of socio-cultural modernization: adequate responses to strategic challenges. *Rossiya reformiruyushchayasya=Russia in Reform: Yearbook,* 2020, no. 18, pp. 160−175. DOI: 10.19181/ezheg.2020.7160 (in Russian).

19. Shcherbina V.V. *Ratsionaliziruyushchie diagnosticheskie upravlencheskie sotsial'nye tekhnologii* [Rationalizing Diagnostic Management Social Technologies]. Moscow: Novyi khronograf, 2018. 416 p.

20. Lepskii V.E. *Obshchestvennoe uchastie v samorazvivayushchikhsya polisub"ektnykh sredakh* [Public Participation in Self-Developing Polysubjective Environments]. Moscow: Kogito-Tsentr, 2019. 141 p.

21. Börner K., Rouse W.B., Trunfio P., Stanley H.E. Forecasting innovations in science, technology and education. *Proceedings of the National Academy of Sciences*, 2018, vol. 115, no. 50, pp. 12573−12581.

22. Bhimani H., Mention A.-L., Barlatier P.-J. Social media and innovation: A systematic literature review and future research directions. *Technological Forecasting & Social Change*. Available at: https://doi.org/10.1016/j.techfore.2018.10.007 (accessed: October 20, 2021).

23. Iden J., Methlie L. B., Christensen G. E. The nature of strategic foresight research: A systematic literature review and future research directions. *Technological Forecasting & Social Change*, 2017, no. 116, pp. 87−97.

24. Petticrew M., Roberts H. How to appraise the studies: an introduction to assessing study quality. In: *Systematic Reviews in the Social Sciences: A Practical Guide*. 2006. Pp. 125−163.

25. Sharma P. *Forecasting: Roles, Steps and Techniques. Management Function*. Available at: https://www.yourarticlelibrary.com/management/forecasting/forecasting-roles-steps-and-techniques-management-function/70032 (accessed: October 20, 2021).

26. Gorshkov M. K. Society − sociology − power: On the question of interaction. *Sotsiologicheskie issledovaniya=Sociological Studies,* 2012, no. 7 (339), pp. 23−28 (in Russian).

27. Dridze T.M. (Ed.) *Prognoznoe sotsial'noe proektirovanie: Teoretiko-metodologicheskie i metodicheskie problem* [Forecasting Social Projection: Theoretical and Methodological Problems]. Moscow: Nauka, 1994. 302 p.

28. Kalyuzhnova N.Ya., Tret'yak V.P. Foresight as a methodological tool for creative forecasting. *Nauka. Innovatsii. Obrazovanie=Science. Innovation. Education,* 2007, no. 51, pp. 15−30 (in Russian).

29. Tikhonov A.V., Merzlyakov A.A. Manageability of social group formation processes in regions with different levels of sociocultural modernization. *Nauchnyi rezul'tat. Sotsiologiya i upravlenie=Research Result. Sociology and management,* 2019, vol. 5, no. 4, pp. 176−183. DOI: 10.18413/2408-9338-2019-5-4-0-15 (in Russian).

30. Patsula A.V., Shchelokov D.V. The specifics of managing institutional transformations in Russia. *Izvestiya Sankt-Peterburgskogo gosudarstvennogo ekonomicheskogo universiteta,* 2019, no. 5−1 (119), pp. 133−138 (in Russian).

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The Diffusion of Volunteering Abroad and in Russia: Cultural Foundations, Assessment of Barriers, Intensification Technologies*

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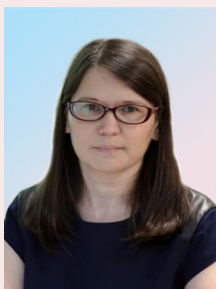
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Abstract. The need to integrate volunteering into national strategies for achieving sustainable development goals, and the importance of its role in curbing the implications of crisis processes caused by the coronavirus pandemic have intensified the scientific search for barriers to civic participation in volunteering and mechanisms for eliminating them. At the same time, researchers focus on identifying barriers of a certain type on the example of one country or group of countries, and, when searching for ways to eliminate those barriers, they underestimate the role of national culture. The purpose of our study is to systematize barriers and promising technologies for intensifying the diffusion of volunteering among the population and to identify major features of national culture in this process. Barriers to the diffusion of volunteer activity

in society are systematized into three groups: barriers on the part of the state, barriers on the part of the non-profit sector, and barriers on the part of the individual. We show national features of their formation, which proceed from the specifics of emergence and evolution of volunteerism in the course of socio-economic development. Using the postulates of institutional economic theory, we identify a system of institutions that intensify the diffusion of volunteering in society, including institutions for the promotion of volunteer practices, institutions for the development of civil society, institutions for the development of horizontal ties through network mechanisms for the diffusion of norms of civic participation, institutions for improving the reputation of volunteering among the population, the institute of volunteer education, institutions for increasing the motivation of participation in volunteering. On the basis of econometric analysis, we have determined that the cultural dimensions highlighted by G. Hofstede, such as the level of individualism, femininity and tolerance, have a significant impact on the extent of development of volunteering in the country. Taking into account the identified cultural features and effective technologies that promote residents' engagement in volunteer activities, we determine directions for intensification of this process in Russia. Development of a comprehensive system of institutions for the diffusion of volunteering in our country will be a promising area for our future research.

Introduction

Currently, the world community, researchers, and civil society representatives become more and more concerned about issues related to the algorithm for achieving the goals of sustainable development, which requires a uniformity of the results of development of national socio-economic systems in economic, social and environmental directions. In this context, attention is focused on identifying the drivers of sustainable development that help to achieve the established target indicators. One such driver, according to the UN, is the extent of integration of volunteering into national strategies for the implementation of the 2030 Agenda[1]. It is for this reason that the governments, when preparing voluntary national reviews of progress towards sustainable development for the period up to 2030, turn to various forms of civil society participation, including volunteerism[2]; besides, the implementation of various UN projects with the participation of volunteers across countries worldwide is highlighted in the aspect of achieving specific sustainable development goals[3].

Awareness of volunteers' considerable contribution to sustainable development is due to their proximity to the targeted solution of various problems of local communities through interaction with major stakeholders – private sector, authorities and population. In this case, citizens become aware of their involvement, interest and personal responsibility in addressing local issues integrated with the achievement of global trends in the sustainable development of society[4].

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[1] For more information, see: Summary report on the Plan of Action to Integrate Volunteering into the 2030 Agenda in the region of the United Nations Economic Commission for Europe. 28 p. Available at: www.unv.org/planofaction

[2] See, for example: Russian Federation: Voluntary National Review of the Implementation of the 2030 Agenda for Sustainable Development. Moscow, 2020; Voluntary National Reviews. Available at: https://www.ohchr.org/EN/Issues/SDGS/Pages/2021VoluntaryNationalReviews.aspx

[3] UN volunteers. Available at: https://www.unv.org/

[4] For more information, see: Summary report on the Plan of Action to Integrate Volunteering into the 2030 Agenda in the region of the United Nations Economic Commission for Europe. 28 p. Available at: www.unv.org/planofaction

In addition, the need to attract volunteers in order to reduce social risks and stabilize destructive social processes became especially acute in 2019 due to the spread of COVID-19 infection [1]. The crisis processes caused by the COVID-19 pandemic have led to a rapid increase in the number of volunteers. For example, in the UK, within 24 hours of a governmental call for citizens to join the National Health Service volunteers, 500,000 people signed up[5]. In Russia, the number of volunteers, according to the portal Добро.ru[6], from 2019 to 2020 increased by almost 70 thousand people. In order to support volunteers who took care of citizens in need of help and care in the context of the COVID-19 pandemic, the Government of the Russian Federation adopted the regulations for special payments for volunteering during the crisis[7]. So, for example, Medical Volunteers – the all-Russian public movement of volunteers in the healthcare sector – in 2020 was allocated more than 242 million rubles from the reserve fund of the RF Government[8].

Despite the acknowledgment of the contribution of volunteerism to the development of national socio-economic systems and solution of socially significant issues, the level of its dissemination worldwide remains low. Thus, according to the 2018 State of the World's Volunteerism Report. The Thread That Binds, the share of volunteers in the total population did not exceed 7% in 2016[9]. The top five countries according to this indicator were Canada (6.98%), New Zealand (6.46%), Luxembourg (6.28%), Sweden (6.14%), Austria (5.99%). Such countries as Pakistan (0.39%), India (0.69%), Korea (0.73%), South Africa (0.85%), and the Russian Federation (0.98%) were outsiders in terms of civic participation in volunteerism[10].

The above has determined a necessity to intensify scientific search for barriers to civic participation in volunteering and mechanisms for their elimination. At the same time, judging by the results of our analysis, researchers, as a rule, focus on identifying barriers of a certain type on the example of one country or group of countries. Thus, researchers consider the involvement of the elderly [2; 3; 4] and youth [5; 6] in public life in the form of volunteering; they analyze gender differences in civic participation [7; 8], investigate the development of volunteerism in the field of environmental protection [9], sports [10], etc. The most comprehensive works include, for example, reports on the situation regarding volunteerism in the European Union member states[11].

The reduction of barriers is considered from the point of view of managing individual preferences in terms of increasing readiness (individual motivation and values), enhancing the opportunities provided and the expected availability of participation in volunteering [4; 11; 12], as well as measures taken by the government to promote public participation in volunteerism[12] [5]. However, only few studies emphasize the formation of culture and promotion of the value of volunteerism in society. In this aspect, volunteering is perceived as a pledge of prosocial behavior, as a factor contributing to the improvement of social justice and social responsibility [13].

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[5] Tierney S., Mahtani K.R. Volunteering during the COVID-19 pandemic: What are the potential benefits to people's well-being? Available at: https://www.cebm.net/covid-19/volunteering-during-the-covid-19-pandemic-what-are-the-potential-benefits-to-peoples-well-being/

[6] https://dobro.ru/analytics

[7] http://government.ru/news/39800/

[8] http://government.ru/docs/39370/

[9] Own calculation based on the 2018 State of the World's Volunteerism Report. The Thread That Binds. Available at: https://www.unv.org/sites/default/files/51692_UNV_SWVR_2018_Russian_WEB_20-11.pdf and the Report on Volunteering in the Russian Federation. Available at: http://nko.economy.gov.ru/Public/NewsPage/Details.html?id=169

[10] The outsider countries are listed in an alternative order from the lowest to the highest indicator.

[11] https://ec.europa.eu/citizenship/about-the-europe-for-citizens-programme/studies/index_en.htm

[12] Laws and Policies Affecting Volunteerism Since 2001. A Research Report. United Nations Volunteers (UNV), 2009. 103 p.; State of the World's Volunteerism Report. Transforming Governance. United Nations Volunteers (UNV), 2015. 132 p.

It is worth mentioning that we have not come across articles that would propose to differentiate the establishment of such conditions taking into account cultural specifics of the country, which predetermine the choice and consolidate the relevant norms of behavior in "collective action". In this case, we are talking about informal institutions with deep historical roots, transmitted through training and imitation from one generation to another, which, as a rule, are internally binding standards of behavior for an individual [14, p. 57]. These rules of social interaction determine the hierarchy of values shared by broad strata of society, people's attitude toward power, mass psychological attitudes, attitudes toward cooperation and confrontation, etc. [15]. Recently, researchers have been paying increasing attention to the importance of the influence of these cultural values and attitudes on the effectiveness and individual parameters of development of national socio-economic systems [16; 17].

Institutional studies emphasize that the cultural attitudes, unlike formal institutions, are changing slowly. "Theorists believe that informal institutions can be stable for up to 1,000 years. But with targeted impact, significant progress can be achieved in 25 years, and the almost complete change — in 40 years"[13]. In this case, it is possible to introduce formal institutions that contradict informal rules; as a result, economic entities may develop resistance to their implementation or manifest various forms of opportunistic behavior. With regard to volunteerism, this means that its intensification imposed by the government will not be effective if the values of volunteerism do not fit into the cultural framework of the country.

We should note that at present some studies focus on the differences in the value of volunteerism depending on the cultural attitudes of population in various countries. Thus, P. Lukka and A. Ellis emphasize that the understanding of volunteering will be determined by differences in the people's social, cultural, historical and political environment [18].

H. Grönlund et al., using the example of cross-national comparisons of 13 countries, proved that the value of volunteering, motives and intensity of participation of bachelor degree students in volunteering have statistically significant differences depending on the country of residence of the students, i.e. they are determined by national culture in general and by the support for the non-profit sector in particular [19].

Developing the results of previous studies, A. Aydinli, M. Bender, A. Chasiotis show that there is a relationship between the diversity of national culture in terms of its individual and collectivist components, which, according to the authors, determine the level of national wealth, trust in strangers, and the prevalence of volunteering as a formal type of assistance to the population. In developed countries where individualism is widespread, people are more often involved in volunteering [20]. However, in the present paper, we do not focus on identifying the relationship between other cultural features and the level of development of volunteerism.

Based on the above, the purpose of our research is to systematize barriers and promising technologies in promoting the diffusion of volunteerism among the population and to identify significant features of national culture in this process.

Let us start by identifying the barriers that hinder the development of volunteering and analyzing effective foreign technologies to eliminate them.

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[13] Auzan A.A., Nikishina E.N. *Sotsiokul'turnaya ekonomika: kak kul'tura vliyaet na ekonomiku, a ekonomika — na kul'turu: kurs lektsii* [Socio-Cultural Economics: How Culture Affects the Economy, and the Economy Affects Culture: A Course of Lectures]. Moscow: Ekonomicheskii fakul'tet MGU imeni M. V. Lomonosova, 2021. P. 20.

Barriers to the development of volunteerism and mechanisms of their elimination: Russian and foreign experience

According to the analysis of scientific literature, we reveal a wide range of barriers that hinder the active development of volunteerism. The barriers can be arranged into three groups: barriers on the part of the state, barriers on the part of the non-profit sector and barriers on the part of the individual *(Tab. 1)*.

We should emphasize that such a division is conditional, since involvement in volunteerism is determined by a system of interrelated factors that one may be only partially aware of. Barriers are often specific, depending on the scope of implementation of volunteer projects. For example, physical characteristics are of great importance for volunteer practices in the field of sports. In addition,

barriers to the diffusion of volunteerism have national features, due to the specifics of emergence and evolution of this phenomenon in the process of socio-economic development of the country, and modern factors determining the trajectory of this phenomenon.

Thus, in the countries in which the share of volunteers in the total population is the greatest, the development of volunteerism was largely determined by strong religious traditions that support the manifestation of altruism, social solidarity and mutual assistance. For example, in Canada, under the influence of the church, institutions were formed to support the poor, the sick, and the disabled (hospitals, homes for the poor and disadvantaged). Volunteering was perceived as an act of goodwill, an indicator of kindness and compassion. Further processes of development

Table 1. Classification of barriers to the diffusion of volunteering in society

Barrier	Manifestation
On the part of the state	
Institutional barriers	Weak institutional support for the non-profit sector as a whole and the lack of mechanisms for involving the population in associate participation (Romania [5], USA [21], Scotland [9], Russia [22]), excessive bureaucratization of volunteering (Germany*).
On the part of the third sector	
Information asymmetry	Uneven dissemination of information about the opportunities, conditions and results of participation in volunteering (UK [23, p. 18], Slovenia, Lithuania, Poland [10], USA [24]).
High organizational risks	Flaws on the part of NGO management in organizing events in the system of involvement and retention of volunteers (USA [4; 25], Slovenia, Lithuania, Poland [10], UK [26]).
Low level of diffusion of volunteering in the environment	Low level of public trust in volunteer practices, high dependence of the level of involvement in volunteering on the channel of information dissemination (invitation by acquaintances). Devaluation of volunteering as a frivolous and insignificant occupation. The barrier is especially pronounced for young people (Spain [27], USA [28], the Netherlands [29], Israel [30], Russia [31]).
Financial risks	High probability of non-fulfillment of obligations in full within the framework of the activities due to restrictions on the financing of individual expenses of volunteers for transport, accommodation, food (USA [25], Slovenia, Lithuania, Poland [10], Ghana [32]).
On the part of the individual	
Limited time resources	Limited involvement in volunteering in connection with employment at the main job, studies, family responsibilities and child care. It is especially relevant among women (UK [23], USA [8; 33; 34], Germany [7], Scotland [9], Australia**, Slovenia, Lithuania, Poland [10]).
Individual project conditions	Conditions of volunteer projects limit participation for certain groups. For minors – due to legal restrictions, for the elderly, difficulties are associated with health problems, for people with disabilities – due to the biased attitude of others who perceive them only as recipients of assistance or as an additional organizational burden (USA [3; 4; 6; 35; 36], New Zealand [37], Slovenia, Lithuania, Poland [10], UK [23], Ireland [38]).
Low motivation to participate in volunteering	The substitution effect in the distribution of free time, when preference is given to other interests not related to volunteering (Mexico [39], USA [6], Romania [5], Australia **).
* National report – Germany. Study on Volunteering in the European Union. 54 p. ** https://www.abs.gov.au/statistics/people/people-and-communities/general-social-survey-summary-results-australia/latest-release Source: own compilation.	

of the socio-economic system (industrialization, urbanization) and external shocks (the Great Depression, world wars) necessitated the emergence of volunteer associations to help socially vulnerable population groups and led to the intensive development of new forms of civic engagement. Despite the active participation of the state in the creation of institutes of healthcare, education, urban planning, etc., volunteering since the 1960s becomes a sign of a strong democratic society, where a whole range of diverse organizations is developing at the local, regional and national levels [2, pp. 153–156].

Religious traditions have had a noticeable impact on the development of volunteerism in European countries, which are also leading in terms of civic participation in volunteer activities [40, p. 69]. In addition, as H.K. Anheier and L.M. Salamon emphasize, the national features in the development of the third sector and volunteerism were largely determined by the specifics of industrialization of socio-economic systems in terms of redistribution of power [41]. In particular, in those countries where, during the period of industrialization, industrialists were able to adjust national policy to suit their economic interests, a "liberal model" of civil society development was formed, which is characterized by a large number of NGOs receiving major funding from private sources (subscriptions, charitable contributions). Such a model became widely used in the UK and Switzerland. In countries where industrialization has led to an increase in the working class and the number of NGOs representing its interests, a model of "welfare partnership" has emerged, which is characterized by significant state participation in financing the social sphere through volunteer organizations, most often religious ones. The model is most pronounced in the states of Northwestern Europe, especially in Germany and the Netherlands. In countries where growth was observed in relation to the working class and farmers, a social democratic model has emerged in which social services are viewed as a "right"

of all citizens rather than a gift from charitable organizations. Services are provided directly by government agencies. In Europe, this model is typical of the Scandinavian countries and Austria, which are leaders in the diffusion of volunteering among the population. In countries where the state plays a dominant role and seeks to carry out rapid modernization with the restriction of personal freedom of citizens, the development of civil society is shifting to the sphere of the informal economy. According to researchers, this "static" model is typical of Russia, Turkey, Spain, Portugal and the countries of Central and Eastern Europe [40, pp. 70–73].

We can highlight active migration processes as modern factors determining the intensity of diffusion of volunteerism. They largely determine the specifics of volunteering in the host countries and also act as a deterrent to the civil participation of migrants. For example, in Canada, Sweden, Austria, New Zealand and Luxembourg, a network of non-profit organizations, whose activities are more supported by local population, has been created in order to engage migrants more effectively. On the contrary, outsider countries in terms of the share of volunteers in the total population (South Africa, Korea, India, Pakistan) are characterized by opposition to the rules established by international organizations [42, pp. 37–39], a negative attitude toward migrants, largely due to the historical past – colonization, racial and ethnic segregation, missionary activities to spread Christianity. In addition, traditional values act as a deterrent; they in many ways contradict the development priorities determined by international organizations that provide grants to volunteer projects [42, p. 93; 43, p. 10]. In general, the third sector in these countries is less institutionalized and is heavily dependent on state power. For example, as Korean scientists note, due to the fact that civic activity is often sanctioned by the state, the attitude of the population toward associated participation is mostly negative [44].

Russia belongs to the countries with the smallest share of volunteers in the total population. Russia's practices of involvement in volunteerism were also determined by the change of cultural and value attitudes in the process of development of society and the transformation of socio-economic systems. Mutual assistance and mutual support typical of Russian culture have made the peasant community one of the most stable institutions [45, p. 16]. In the 19th century, there emerged a form of civic participation such as providing assistance to the needy (for example, "going to the people" by representatives of the intelligentsia, or city guardianship of the poor). During the Soviet period, the culture of volunteering was actively shaped by the state, which "included" an individual in socially useful and socially significant activities. I.A. Kuptsova emphasizes that the formation of such a culture was supported by Soviet cinema and artistic works (a system of informal institutions[14]), demonstrating the huge potential of volunteerism and significant, often somewhat unrealistic, results [46; 47, p. 23]. In the early 1990s, people's engagement in volunteering decreased significantly due to a sharp drop in living standards[15] and a radical change in values, when Soviet principles began to contradict the system of formal institutions that were being introduced at the time [48; 49], and imported approaches to the development of the third sector did not provide a significant restructuring of the system [47, p. 32]. At the same time, in the framework of our research, it is important to emphasize that "many of the former values have not disappeared, but receded into the background and now remain in a latent state" and "can be actualized in a modified way" [50, p. 114] if there is a demand for them in the system of formal institutions. In general, we should note that the current system of state support for volunteering in Russia remains ineffective at all levels of government, and the dominant positions of the state correlate with limited opportunities for the development of the third sector [22, p. 78; 32].

Given the diversity of the identified barriers to the diffusion of volunteerism, it seems obvious that the ways to overcome them should be purposeful and focused on solving specific problems. According to the analysis of foreign studies we systematize the main directions for eliminating the barriers according to various types of institutions that consolidate the norms of volunteer practices, create conditions for their effective development in society, and also contribute to changing the mental structures of individuals through a system of motivations for participation in volunteering *(Tab. 2)*.

Table 2. The system of specialized institutions to intensify the diffusion of volunteerism in society

Institution*	Types of specialized institutions	Countries
Institutions for the promotion of volunteer practices	Building cooperation between authorities, civil society and commercial structures	New Zealand, Luxembourg, Canada, Sweden, Austria, Australia, Peru
	Special departments for the development of volunteering among women	Nepal, India, Bangladesh, Peru, Estonia
	Special laws and programs to encourage youth participation in volunteering, especially in rural areas	Honduras, Mozambique, Togo, Ghana, Kenya
	National programs for the uniform distribution of volunteerism in the regions of the country	China, UK
	Building cooperation with international alliances working in related fields in order to increase the importance of the opinion of local volunteers among national and regional authorities	Chile

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[14] Clarification added.

[15] See more in: Bodrenkova G. National IAVE representative for Russia and chairperson of the Moscow Charity House. Volunteer Center and advisor on the committee of Public and Religious affairs in the State Duma.

End of Table 2

Institution*	Types of specialized institutions	Countries
Institution for the development of civil society (feedback system)	Involvement of the population in legislative activity	Canada, Sweden, Estonia, Iceland, Austria, Luxembourg
Institution for the development of horizontal ties through network mechanisms of diffusion of civic participation norms	Creating and expanding special platforms for joint discussion of community issues ("invited spaces")	Nepal, Kenya, Uganda, Brazil, Peru, New Zealand, Austria
Institutions for improving the reputation of volunteer activity among the population	Establishment of a year of volunteer activity for 17–28-year-old people, during which they work in one of the country's social organizations full-time, receiving a small monthly allowance	Austria
	Giving awards to volunteer organizations; promoting scientific and educational institutions to conduct research on the topic of civic participation	Nepal, Kenya, Uganda, Brazil, Peru, New Zealand, Austria
Institution for volunteer training	Organizing forums to increase women's participation in volunteering through the development of relevant knowledge and skills	Nepal, India, Peru, Bangladesh
Institutions for increasing motivation to participate in volunteering	Creation of a "volunteer passport", which contains information about all volunteer practices in which an individual participated, with a list of skills used in this process	Austria, France, Australia
	Exemption of expenses related to volunteer activities from individual income tax, preservation of unemployment benefits when concluding a contract for volunteering	Macedonia

* Own elaboration based on the provisions of the institutional economic theory.
Compiled according to: Laws and Policies Affecting Volunteerism Since 2001. A Research Report. United Nations Volunteers (UNV), 2009. 103 p.; State of the World's Volunteerism Report. Transforming Governance. United Nations Volunteers (UNV), 2015. 132 p.; Study on Volunteering in the European Union. National Report – Austria. 28 p. Available at: https://www.asi.org.ru/2020/12/16/soczialnye-uslugi-vtoroj-volny/; https://ec.europa.eu/citizenship/pdf/national_report_at_en.pdf; https://www.oecd.org/gov/regulatory-policy/46547003.pdf; https://gr-eat.eu/the-volunteer-passport-france-benevolat/; https://www.wevolunteer.org.au/volunteer-passport; [51; 52; 53].

The data in Table 2 show that the most developed network of specialized institutions aimed at intensifying the diffusion of volunteerism in society is typical of the countries in which the engagement of the population in this form of civic participation is most widespread. We emphasize that in such countries these institutions stabilize the consolidation of volunteer practices in the system of direct, reverse and horizontal links, which forms a favorable environment for a self-sustaining institutional system [54].

In general, as our analysis has shown, technologies for eliminating the barriers to the development of volunteerism are not integrated into the cultural structure of the country. A vivid example is the attempts to involve women in the discussion and solution of social issues in patriarchal societies,

among other things, in the form of volunteering, which contradicts the current system of informal institutions. We think that if cultural features that intensify the development of volunteerism are taken into account, it would improve the effectiveness of the proposed mechanisms, since it would be consistent with the values of the majority of the country's population. The next section of the article is devoted to the identification of these cultural features.

Econometric analysis of the relationship between the intensity of the diffusion of volunteerism and the cultural parameters of the country

According to our hypothesis, national culture should have certain values and behavioral attitudes that promote the dissemination of volunteerism among the population.

The proportion of volunteers in the total population is an effective feature in the model. We believe that in comparison with the absolute value of this indicator in the form of the number of volunteers in the country, it allows us to take into account the extent of the spread of volunteerism in society. We should note that currently only the absolute indicator is presented in government reports on the state of volunteering, so we calculated its relative value on our own[16].

The explanatory variables are the cultural dimensions highlighted by G. Hofstede, the designations of which are presented in *Table 3*. The variables are measured in points from 1 to 100. Secondary empirical data of the HOFSTEDE INSIGHTS[17] project were used, the methodology of which for all six indicators is described in detail in [16]. We emphasize that, despite the different period of data used to build the model, they are comparable, because, as we noted earlier, the characteristics of national culture change very slowly over time.

The analysis was carried out on with the use of the data for 55 countries for which all indicators were available; therefore, the sample is balanced. The calculations were carried out using Gretl software package. The constructed linear regression model (the value of the coefficient of determination $R2 = 0.46$) revealed that 46% of all factors affecting the level of volunteerism in society can be explained by the specifics of national culture, since, as we showed in the previous section, the range of factors is quite diverse. In addition, we have found that such factor variables as "Power Distance", "Uncertainty Avoidance", and "Long Term Orientation" do not have any significant influence on the level of volunteering in the country.

In our opinion, the absence of a significant correlation with the Long Term Orientation dimension is due to the fact that most of the

Table 3. Cultural dimensions of Hofstede's theory

Dimension	Designation	Description
Power Distance	PD	Shows the extent to which members of a society or organization endowed with relatively less power expect and allow an uneven distribution of power
Individualism	Ind	The extent to which people in society are integrated into groups; assumes that everyone will take care of themselves and their closest relatives; on the contrary, collectivism is aimed at integrating people from birth into strong, cohesive groups, often large families (with uncles, aunts, grandparents), which are designed to protect them in exchange for unquestioning loyalty
Masculinity	M	The degree of prevalence of masculine social values in society, accompanied by high competition, differentiation of gender roles in society, orientation toward achievement and success
Uncertainty Avoidance	UA	Shows the extent to which people belonging to the same culture will be afraid of uncertain and unfamiliar situations
Long Term Orientation	LTO	Shows the extent of pragmatism and strategic orientation for the future, in particular perseverance, thrift, in society
Indulgence	I	Shows the extent to which people in society control their desires in satisfying natural and social needs, including those related to the organization of leisure
Compiled according to: Auzan A.A., Nikishina E.N. *Sotsiokul'turnaya ekonomika: kak kul'tura vliyaet na ekonomiku, a ekonomika – na kul'turu: kurs lektsii* [Socio-Cultural Economics: How Culture Affects the Economy, and the Economy Affects Culture: A Course of Lectures]. Moscow: Ekonomicheskii fakul'tet MGU imeni M.V. Lomonosova, 2021. Pp. 39–45; [16].		

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[16] We calculated the share of volunteers in the total population of the country on the basis of the 2018 State of the World's Volunteerism Report. The Thread That Binds. Available at: https://www.unv.org/sites/default/files/51692_UNV_SWVR_2018_Russian_WEB_20-11.pdf and the Report on Volunteering in the Russian Federation. Available at: http://nko.economy.gov.ru/Public/NewsPage/Details.html?id=169

[17] https://www.hofstede-insights.com/country-comparison/

volunteer projects are implemented at the expense of budgetary funds and funds of international assistance in addressing current socially significant issues, the range of which is quite differentiated depending on the level of the country's development. In addition, the funding of volunteer projects by international organizations erases a clear dependence of unresolved socio-economic problems on the national specifics, since sponsoring organizations set the vector of their implementation based on their own ideas and interests [18]. In general, we should note that these projects differ significantly from common investment projects; in our opinion, the difference is expressed in the absence of a significant relationship with the parameters of the time perspective, as well as the uncertainty of the external environment.

The absence of a significant causal relationship between the level of volunteerism and power distance is explained by the specifics of citizens' involvement in volunteering (the initiative can either come from citizens or from the government).

The results of econometric modeling by stepwise regression are presented in *Table 4*.

Table 4. Characteristics of econometric model parameters

Indicator	Coefficient	Standard error
Const	1.832***	0.6629
Ind	0.034***	0.0084
M	-0.022**	0.0087
I	0.026***	0.0089
Schwartz Criterion	199.335	
Coefficient of determination	0.417	
***, ** – significance at the 1 and 5% level, respectively.		

The established factor dependencies confirm our hypothesis, which consists in the fact that only certain values and behavioral attitudes in the national culture affect individuals' preferences concerning the decision-making process about participation in volunteering. Moreover, the significance of their impact on this process, according to the data in Table 4, also differs. The *Figure* confirms the dependencies established by the model for the leading countries and outsider

Distribution of countries by type of culture in G. Hofstede's theory

Compiled with the use of: https://www.hofstede-insights.com/product/compare-countries/
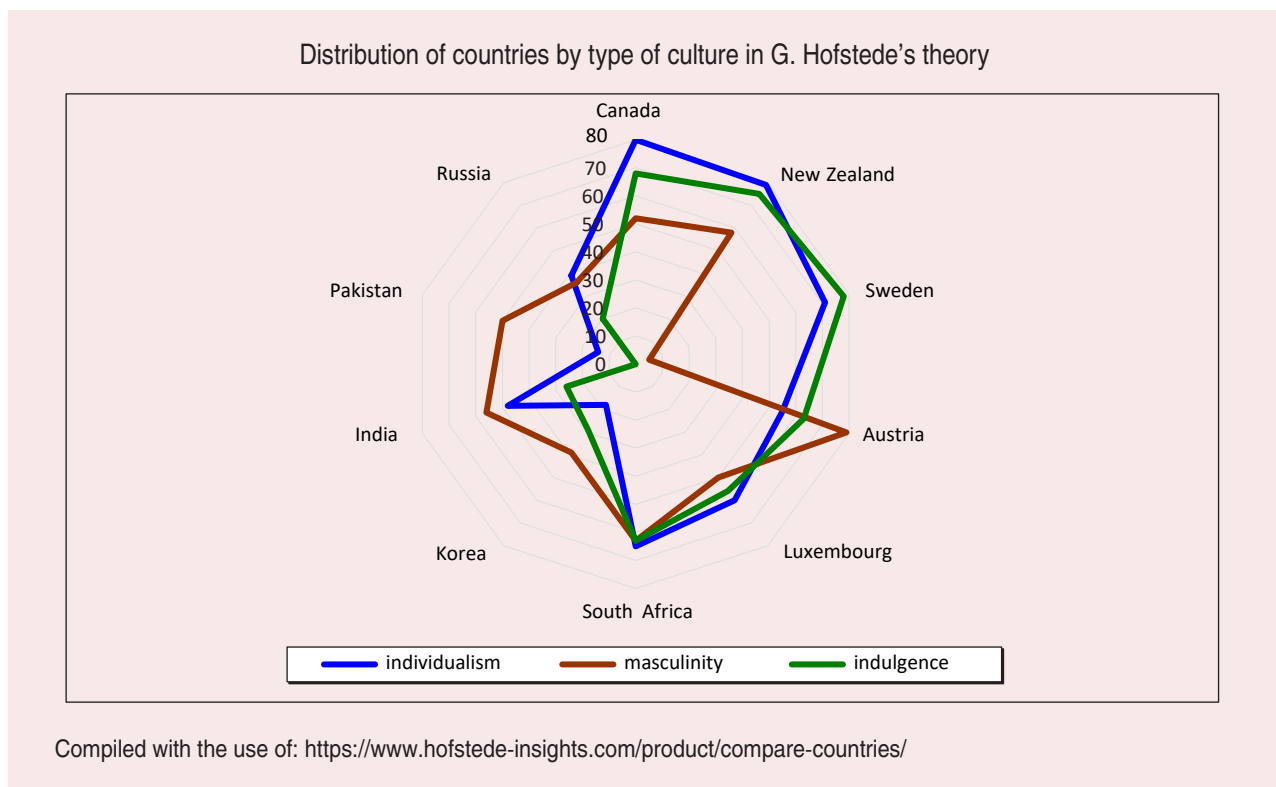
countries by the share of volunteers in the total population. In addition, the significance of the impact of cultural features on the level of volunteerism development is confirmed by the results of studies within individual countries.

First, according to the cultural dimensions highlighted by G. Hofstede, a high level of individualism implies personal responsibility for the achieved standard of living, the desire for self-realization, as well as taking care, first of all, of oneself and loved ones. The emphasis on individual responsibility, active citizenship, and an individual approach to each person create conditions for caring for other members of society in the form of volunteerism. Such value attitudes, as I.A. Kuptsova emphasizes, motivate the involvement of middle-aged people in volunteering [46].

The possibility to increase human capital by obtaining work experience and vocational training, developing new skills, establishing contacts useful for paid work and improving employment prospects is more typical for involving students in volunteer activities [12; 19; 46]. At the same time, according to the results of the study by H. Grönlund et al., these motives can be considered as the initial motive for involving students in volunteering or occasional participation in it [19]. The demand for volunteerism in this case is motivated by the greater loyalty of potential employers to candidates, since they assume that such employees in their professional activities will abandon personal interests in favor of the interests of the organization [19]. It is no coincidence that a high level of empathy is included in the group of so-called soft skills[18], the priority of which in comparison with the accumulation of professional

knowledge and skills (hard skills) is a modern trend of changing employers' requirements to the quality of employees' human capital [55; 56, p. 470]. According to the results of some studies, in countries where utilitarian motives for participating in volunteer activities are the generally accepted norm, volunteering increases the wages of employees from 6% (Canada) to 18% (Austria) [19]. We should note that these countries are among the top five in terms of the share of volunteers in the total population. Nevertheless, it is worth mentioning that utilitarian motives are more typical of occasional volunteering, whereas regular participation in volunteering is mainly determined by value (altruistic) motives [19].

Second, the inverse relationship with the cultural dimension "masculinity" means that the development of volunteerism is more widespread in national cultures of the feminine type, which are characterized by "sympathy for the weak", as G. Hofstede puts it [16]. The values of caring correspond to the figurative constructions of ideas about volunteer activity that dominate in modern society and are among its essential features. We should note that the rootedness of such an idea of volunteering is ensured by the transfer of the experience of helping the needy and poor representatives of the middle class, widespread in the 19th century (see details in [18; 46]). However, at the present stage of society development, according to P. Lukka and A.E. Paine, the idea of volunteering only from the standpoint of helping those in need hampers the engagement of young people in volunteer activities and needs rebranding [18].

Third, the established significant dependence on the level of indulgence, which assumes relatively free satisfaction of basic needs connected with the enjoyment of life and active leisure, on the one hand, confirms that volunteering on the initiative of citizens, as we noted earlier, cannot develop in conditions of consumer survival standards, when

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[18] Recall that these requirements also include competencies related to self-education ability and the ability to learn, the ability to work in a team, motivation toward achievements, a high level of self-awareness and adaptability to the changes, a constructive response to criticism.

people need to focus on solving their own problems. On the other hand, according to the research results, volunteering is considered by many as an active form of leisure organization, which is consistent with the above-mentioned content of this cultural dimension according to G. Hofstede.

We emphasize that freedom of speech and a self-supporting order that does not involve a high concentration of law-enforcement structures is important in societies with a high level of indulgence. These factors act as necessary conditions for the formation of a civil society in which the involvement of people in volunteering is a generally accepted social practice [57].

In the next section we will outline the mechanism for eliminating the barriers that hinder the development of volunteering in Russia. We will proceed from the identified cultural features that contribute to the involvement of the population in volunteering, and the effective technologies we have analyzed.

Ways to intensify the diffusion of volunteering in Russia: Cultural grounds

According to the method of G. Hofstede, Russia is more characterized by the manifestation of collectivist culture (the value of the "Individualism" dimension is 39), feminine traits compared with masculine traits (the value of the "Masculinity" dimension is 36), as well as a high degree of limitation by social norms in the manifestation of one's own needs, including those related to the organization of leisure, a tendency toward pessimism and cynicism (the value of the "Indulgence" dimension is 20)[19]. As for the first two cultural dimensions, the introduction of the principles of market economy into the institutional matrix (in the terms of S.G. Kirdina [58]) in the early 1990s led to a gradual change in their

trajectory. This means that when determining the main directions for intensifying the diffusion of volunteerism in Russia, taking into account its cultural parameters, it is possible to use a synthesis of individual-collectivist measures, and also, along with the principles of the care economy[20], focus on the formation of institutions to increase motivation for participation in volunteering.

First, the state can influence the level of development of volunteerism to a greater extent only through formalized structures (NGOs). Consequently, the main directions to intensify the spread of volunteerism among the population can be identified as an increase in the number of organizations, an expansion of the range of their activities that take into account the specific interests of potential volunteers (customization of volunteer practices), as well as increasing the availability of volunteer practices [59, p. 579]. It seems that for this purpose it is necessary to support the activities of non-profit organizations working with different target audiences so that participants feel belonging to a certain group. This will allow, on the one hand, to involve in public life that part of the population that has sufficient potential for civic participation in the form of volunteer activity, but needs to create special conditions (older people "yearning" for mass socially significant events of the Soviet type, young people seeking to build a network of social ties that can then be used to increase their human capital, etc.). On the other hand, this corresponds to the principles of collectivist culture, when representatives of the group seek to protect each other by providing assistance in various forms. In this case, greater coverage of various social groups is possible with the provision of assistance based on a more individualized approach to the needs of this

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[19] https://www.hofstede-insights.com/country-comparison/russia/

[20] The formation of this system of institutions that ensure an egalitarian type of interaction between men and women in the family is considered in detail in the previous works of the authors. See [54].

group. At the same time, one should bear in mind that the effectiveness of involving the population in volunteering depends on the consistency of its organization. According to the experience of other countries, it is possible to solve this problem if there is a staff of key employees [60, p. 884]. In fact, they are a link between an individual and society; the strength and duration of each person's interest in volunteering depends on their skills and abilities. Relying on the social connections of potential volunteers, the staff of NGOs, taking into account individual motives for involvement, providing effective communication, among other things via online platforms, and providing support in adapting to participation in volunteer practices, ensure the permanent expansion of the network of volunteers [61, p. 7]. Buddy system can become a promising technology for working with a potential volunteer; the system is an analogue of the partner program, when a friend is "assigned" to a person and the couple works together until a certain result is achieved[21] [62, p. 257]. Based on the fact that at present in Russia the state is one of the key grant-givers of the third sector, it is necessary to pay more attention to the issues of financial support to NGOs in terms of increasing civic participation in addressing socially significant issues.

Second, gradual transformation of cultural values in Russia toward individualization and masculinity leads to an increase in orientation toward individual success, activity, ambition, and planning for the future [50, p. 128], which implies the mandatory formation of institutions to increase motivation for participation in volunteering. In this regard, through longitudinal studies, it is necessary to identify a range of factors that motivate civic participation in the form of volunteerism and, on this basis, develop a strategy for the development

of volunteering in Russia, taking into account the identified individual needs, as well as provide access to volunteer practices to all population groups (including disabled people, migrants, etc.)[22].

Third, in order to level out the manifestations of pessimism and cynicism among the population in relation to volunteers in Russia, it is necessary to form a system of institutions for improving the reputation of volunteering among the population in various forms (see Tab. 2). In addition, a strategy for rebranding volunteering should be developed, including a range of specialized activities for employers to raise their interest through awareness of the importance of attracting employees with experience in volunteering for the company. Of course, we should emphasize that the intensification of citizens' involvement in volunteering is possible, as we noted earlier, only against the background of an increase in the standard of living and quality of life in Russia with a wide range of leisure opportunities and the promotion of its forms.

In general, we should point out that the mechanism for overcoming barriers that hinder the development of volunteerism in Russia should be based on the principles of its conscious promotion[23] [64] through the creation of a comprehensive system of institutions (see Tab. 2), defining the conditions for the effective mobilization of volunteers on a systematic basis and supporting people's motivation to participate in volunteer practices. In this section, we have identified only some of the possible directions that are consistent with Russia's cultural structure, since the development of a comprehensive system of institutions for the diffusion of volunteerism in society is an independent study and is not among the tasks we set in the present article.

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[21] In Russia, this technology is implemented, for example, in the educational sphere. Available at: https://privet.urfu.ru/traectories/special/international/buddy/

[22] For more information about these volunteer development practices, see [6; 63, p. 1130].

[23] Laws and Policies Affecting Volunteerism Since 2001. A Research Report. United Nations Volunteers (UNV), 2009. 103 p.

Conclusion

Setting goals for the sustainable development of national socio-economic systems involves the search for new resources to achieve them. One of the potential factors is the strengthening of the role of civil society in this process; this can be done through the integration of volunteerism into national strategies for the implementation of the 2030 Agenda. As the analysis has shown, despite the recognition of the contribution of volunteerism to solving socially significant problems, the level of its worldwide diffusion remains low. Having systematized barriers to the development and technologies for intensifying the diffusion of volunteerism abroad and in Russia, we find out that taking into account cultural values and attitudes of national socio-economic systems is the necessary condition for building the most effective mechanism for increasing the level of civic participation. The conducted research shows the importance of certain characteristics of national cultures in the process of involving the population in volunteering and, in relation to the Russian context, allows us to determine possible directions for its intensification, consistent with the cultural structure of the country. The results obtained are valuable both from a theoretical and practical point of view and can be further elaborated in the development of a comprehensive system of institutions for the diffusion of volunteerism in society.

References

1. Artamonova A.S. Volunteering in the conditions of a pandemic: main trends. In: *Global'nye vyzovy i regional'noe razvitie v zerkale sotsiologicheskikh izmerenii: mat-ly VI mezhdunar. nauch.-prakt. internet-konf. (g. Vologda, 29 marta − 2 aprelya 2021 g.): v 2-kh chastyakh. Ch. 2* [Global Challenges and Regional Development in the Mirror of Sociological Dimensions: Proceedings of the 6th International Research-to-Practice Online Conference (Vologda, March 29 − April 2, 2021): in 2 Parts. Part 2]. Vologda: FGBUN VolNTs RAN, 2021. Pp. 171−175 (in Russian).

2. Arai S.M. Volunteering in the Canadian Context: Identity, Civic Participation and the Politics of Participation in Serious Leisure. In: *Volunteering as leisure/leisure as volunteering. An International Assessment*. Ed. by R.A. Stebbins, M. Graham. 270 p.

3. McNamara T.K., Gonzales E. Volunteer transitions among older adults: The role of human, social, and cultural capital in later life. *Journals of Gerontology Series B: Psychological Sciences & Social Sciences*, 2011, no. 66B, pp. 490−501.

4. Tang F., Morrow-Howell N., Hong S. Inclusion of diverse older population in volunteering. *Nonprofit & Voluntary Sector Quarterly*, 2009, no. 38, pp. 810−827.

5. Pantea M.-C. Understanding non-participation: perceived barriers in cross-border volunteering among Romanian youth. *International Journal of Adolescence and Youth*, 2015, vol. 20, no. 3, pp. 271−283. http://dx.doi.org/10.1080/02673843.2013.793205

6. Roker D., Player K., Coleman J. Challenging the image: The involvement of young people with disabilities in volunteering and campaigning. *Disability & Society*, 1998, no. 13, pp. 725−741.

7. Helms S., McKenzie T. Gender differences in formal and informal volunteering in Germany. *Voluntas: International Journal of Voluntary & Nonprofit Organizations*, 2014, no. 25, pp. 887−904.

8. Taniguchi H. Men's and women's volunteering: Gender differences in the effects of employment and family characteristics. *Nonprofit & Voluntary Sector Quarterly*, 2006, no. 35, pp. 310−319.

9. O'Brien L., Townsend M., Ebden M. *Environmental Volunteering: Motivations, Barriers and Benefits*. Report to the Scottish Forestry Trust and Forestry Commission. 128 p.

10. Krajňáková E., Šimkus A., Pilinkiene V., Grabowska M. Analysis of barriers in sports volunteering. *Journal of International Studies*, 2018, no. 11 (4), pp. 254−269. DOI:10.14254/2071-8330.2018/11-4/18

11. Haski-Leventhal D., Meijs L.C.P.M., Lockstone-Binney L., Holmes K., Oppenheimer M. Measuring volunteerability and the capacity to volunteer among non-volunteers: Implications for social policy. *Social Policy & Administration*, 2017, no. 52 (5), pp. 1139−1167. DOI: 10.1111/spol.12342

12. Lee K.-H., Alexander A.C., Kim D.-Y. Motivational factors affecting volunteer intention in local events in the United States. *Journal of Convention & Event Tourism*, 2013, no. 14 (4), pp. 271−292. DOI: 10.1080/15470148.2013.816646

13. Stukas A.A., Snyder M., Clary E.G. Understanding and encouraging volunteerism and community involvement. *The Journal of Social Psychology*, 2016, no. 156, pp. 243−255.

14. North D. *Instituty, institutsional'nye izmeneniya i funktsionirovanie ekonomiki* [Institutions, Institutional Change and Economic Performance]. Nranslated from English by A.N. Nesterenko. Moscow: Fond ekonomicheskoi knigi "Nachala", 1997. 180 p.

15. Tambovtsev V.L. (Ed.). *Institutsional'nye ogranicheniya ekonomicheskoi dinamiki: monografiya* [Institutional Constraints of Economic Dynamics: Monograph]. Moscow: TEIS, 2009. 524 p.

16. Hofstede G. Dimensionalizing Cultures: The Hofstede Model in Context. *Online Readings in Psychology and Culture*, 2011, no. 2 (1). https://doi.org/10.9707/2307-0919.1014

17. Auzan A.A. et al. Sociocultural factors in economics: Milestones and perspectives. *Voprosy Ekonomiki*, 2020, no. 7, pp. 75−91 (in Russian).

18. Lukka P., Paine A.E. An exclusive construct? Exploring different cultural concepts of volunteering. *Voluntary Action*, 2001, no. 3 (3), pp. 87−109.

19. Grönlund H. et al. Cultural values and volunteering: A cross-cultural comparison of students' motivation to volunteer in 13 countries. *Journal of Academic Ethics*, 2011, no. 9 (2), pp. 87−106.

20. Aydinli A., Bender M., Chasiotis A. Helping and Volunteering across Cultures: Determinants of Prosocial Behavior. *Online Readings in Psychology and Culture*, 2013, no. 5 (3). https://doi.org/10.9707/2307-0919.1118

21. Kolnick L., Mulder J. Strategies to improve recruitment of male volunteers in nonprofit agencies. *American Journal of Hospice & Palliative Medicine*, 2007, no. 24 (2), pp. 98−104.

22. Pevnaya M.V., Kuz'minchuk A.A. Opportunities for and barriers to the development of volunteer management in a Russian region (on the example of the Sverdlovsk Oblast). *Voprosy upravleniya,* 2016, no. 4, pp. 77−85 (in Russian).

23. Southby K., South J. *Volunteering, Inequalities and Barriers to Volunteering: A Rapid Review*. Leeds Beckett University, 2016. 51 p.

24. Bang H. Volunteer age, job satisfaction, and intention to stay. *Leadership & Organization Development Journal*, 2015, no. 36, pp. 161−176.

25. Rovers J., Japs K., Truong E., Shah Y. Motivations, barriers and ethical understanding of healthcare student volunteers on a medical service trip: a mixed method study. *BMC Medical Education*, 2016, 16:94. DOI: 10.1186/s12909-016-0618-0

26. Nichols G., Grix J. 'How sport governance impacted on Olympic legacy: a study of unintended consequences and the "Sport Makers" volunteering programme'. *Managing Sport and Leisure*, 2016, vol. 21, no. 2, pp. 61−74. https://doi.org/10.1080/23750472.2016.1181984

27. Mainar I., Servos C., Gil M. Analysis of volunteering among Spanish children and young people: Approximation to their determinants and parental influence. *Voluntas: International Journal of Voluntary & Nonprofit Organizations*, 2015, no. 26, pp. 1360−1390.

28. Ishizawa H. Civic participation through volunteerism among youth across immigrant generations. *Sociological Perspectives*, 2015, no. 58 (2), pp. 264−285.

29. Van Goethem A.A., van Hoof A., van Aken M.A.G., Orobio de Castro B., Raaijmakers Q.A.W. Socialising adolescent volunteering: How important are parents and friends? Age dependent effects of parents and friends on adolescents' volunteering behaviours. *Journal of Applied Developmental Psychology*, 2014, no. 35, pp. 94–101. https://doi.org/10.1016/j.appdev.2013.12.003

30. Youssim I., Hank K., Litwin H. The role of family social background and inheritance in later life volunteering: Evidence from SHARE-Israel. *Research on Aging*, 2015, no. 37 (1), p. 3.

31. Petrina O.A. Development of voluntary activity in Russia. *Vestnik Universiteta*, 2019, no. 4, pp. 163–167 (in Russian).

32. Dyson S.E., Korsah K.A., Liu L.Q., O'Driscoll M., van den Akker O.B.A. Exploring factors having an impact on attitudes and motivations towards volunteering in the undergraduate nursing student population – A comparative study of the UK and Ghana. *Nurse Education in Practice*, 2021, no. 53: 103050. https://doi.org/10.1016/j.nepr.2021.103050

33. Einolf C.J. Gender differences in the correlates of volunteering and charitable giving. *Nonprofit & Voluntary Sector Quarterly*, 2011, no. 40, pp. 1092–1112.

34. Fyall R., Gazley B. Applying social role theory to gender and volunteering in professional associations. *Voluntas: International Journal of Voluntary & Nonprofit Organizations*, 2015, no. 26, pp. 288–314.

35. Fegan C., Cook S. Experiences of volunteering: a partnership between service users and a mental health service in the UK. *Work*, 2012, no. 43, pp. 13–21.

36. Rotolo T., Wilson J. Social heterogeneity and volunteering in U.S. cities. *Sociological Forum*, 2014, no. 29 (2), pp. 429–452. https://doi.org/10.1111/socf.12091

37. Breheny M., Pond R., Lilburn L.E.R. "What am I going to be like when I'm that age?": How older volunteers anticipate ageing through home visiting. *Journal of Aging Studies*, 2020, no. 53: 100848. https://doi.org/10.1016/j.jaging.2020.100848

38. Connolly S., O'shea E. The perceived benefits of participating in volunteering activities among older people: Do they differ by volunteer characteristics. *Activities, Adaptation & Aging*, 2015, no. 39 (2), pp. 95–108. https://doi.org/10.1080/01924788.2015.1024075

39. Layton M.D., Moreno A. Philanthropy and social capital in Mexico. *International Journal of Nonprofit & Voluntary Sector Marketing*, 2014, no. 19 (3), pp. 209–219. https://doi.org/10.1002/nsvm.1498

40. Enjolras B., Salamon L.M., Sivesind K.H., Zimmer A. *The Third Sector as a Renewable Resource for Europe. Concepts, Impacts, Challenges and Opportunities*. Palgrave Macmillan, 2018. 208 p.

41. Anheier H.K., Salamon L.M. Volunteering in cross-national perspective: Initial comparisons. *Law and Contemporary Problems*, 1999, vol. 62, no. 4, pp. 43–65.

42. *The Palgrave Handbook of Volunteering, Civic Participation, and Nonprofit Associations*. Ed. by D.H. Smith, R.A. Stebbings, J. Grotz. 1505 p.

43. Baqir F. *Evolution of Volunteerism in Pakistan. Strengthening Participatory Organizations (SPO)*. 2012. 27 p. https://www.academia.edu/24357196/Evolution_of_Volunteerism_in_Pakistan

44. Geumchan Hwang, Kyu-soo Chung, 2018. "South Korea," Sports Economics, Management, and Policy. In: Kirstin Hallmann & Sheranne Fairley (ed.), *Sports Volunteers Around the Globe*, 2018. Pp. 225–235.

45. Kudrinskaya L.A. Volunteering: Essence, functions, specifics. Sotsiologicheskie *issledovaniya=Sociological Studies,* 2006, no. 5, pp. 15–22 (in Russian).

46. Kuptsova I.A. Culture of volunteering: Definition of the concept and main characteristics of the phenomenon. *Pedagogika iskusstva*. Available at: http://www.art-education.ru/electronic-journal/kultura-volontyorstva-opredelenie-ponyatiya-i-osnovnye-harakteristiki-fenomena

47. Yakobson L.I., Sanovich S.V. Changing models of the Russian third sector: The phase of import substitution. *Obshchestvennye nauki i sovremennost'=Social Sciences and Contemporary World,* 2009, no. 4, pp. 21–34 (in Russian).

48. Govaart M.M., van Daal H., Munz A., Keesom J. *Volunteering Worldwide*. Netherlands Institute of Care and Welfare, 2001. 257 p.

49. Polterovich V.M. Transplantation of economic institutions. *Ekonomicheskaya nauka sovremennoi Rossii*, 2001, no. 3, pp. 24−50. DOI: https://doi.org/10.1001/jama.285.12.1649 (in Russian).

50. Lebedeva N.M., Tatarko A.N. *Tsennosti kul'tury i razvitie obshchestva* [Values of Culture and Development of Society]. Moscow: Izdatel'skii dom GU VShE, 2007. 528 p.

51. Smith L.G. Mechanisms for public participation at a normative planning level in Canada. *Canadian Public Policy / Analyse de Politiques*, 1982, vol. 8, no. 4, pp. 561−572.

52. Åström J., Hinsberg H., Jonsson M.E., Karlsson M. *Citizen centric e-participation. A trilateral collaboration for democratic innovation. Case studies on e-participation policy: Sweden, Estonia and Iceland*. Tallinn: Praxis Center for Policy Studies, 2013. 47 p.

53. Allhutter D., Aichholzer G. Public Policies on eParticipation in Austria. In: Macintosh A., Tambouris E. (Hrsg.) *Electronic Participation (First International Conference on eParticipation [ePart]*. 2009. DOI: 10.1007/978-3-642-03781-8_3

54. Bazueva E.V. *Sistema institutov gendernoi vlasti v ekonomike Rossii: osnovy teorii i metodologii: monografiya* [The System of Institutions of Gender Power in the Russian Economy: Fundamentals of Theory and Methodology: Monograph]. Perm: Perm. gos. nats. issled. un-t, 2015. 456 p.

55. Khasanzyanova, A. How volunteering helps students to develop soft skills. *Int Rev Educ*, 2017, pp. 363−379. https://doi.org/10.1007/s11159-017-9645-2

56. Bazueva E.V. Features of the formation and use of human capital in the conditions of digitalization of the economy. In: *Kompleksnoe razvitie territorial'nykh* sistem *i povyshenie effektivnosti regional'nogo upravleniya v usloviyakh tsifrovizatsii ekonomiki: mat-ly natsion. (vseross.) nauch.-prakt. konf. (8 noyabrya 2018 g., Orel)* [Comprehensive Development of Territorial Systems and Improving the Efficiency of Regional Management in the Conditions of Digitalization of the Economy: Proceedings of the National (All-Russian) Research-to-Practice Conference (November 8, 2018, Orel)]. Orel: FGBOU VO "OGU imeni I.S. Turgeneva", 2018. Pp. 469−473 (in Russian).

57. Yakobson L.I. (Ed.). *Faktory razvitiya grazhdanskogo obshchestva i mekhanizmy ego vzaimodeistviya s gosudarstvom* [Drivers of Civil Society Development and Mechanisms of Its Interaction with the State]. Moscow: Vershina, 2008. 296 p.

58. Kirdina S.G. *X- i Y-ekonomiki: institutsional'nyi analiz* [X- and Y-Economies: *Institutional* Analysis]. Moscow: Nauka, 2004. 256 p.

59. Narushima M. 'Payback time': community volunteering among older adults as a transformative mechanism. *Ageing and Society*, 2005, no. 25, pp. 567−584. DOI: 10.1017/S0144686X05003661

60. Maas S.A., Meijs L.C.P.M., Brudney J.L. Designing "National Day of Service" Projects to Promote Volunteer Job Satisfaction. *Nonprofit and Voluntary Sector Quarterly*, 2021, no. 50 (4), pp. 866−888. DOI: 10.1177/0899764020982664

61. Shier M.L., Larsen-Halikowski J., Gouthro S. Characteristics of volunteer motivation to mentor youth. *Children and Youth Services Review*, 2020, no. 111: 104885. https://doi.org/10.1016/j.childyouth.2020.104885

62. Jones K.S. Giving and volunteering as distinct forms of civic engagement: The role of community integration and personal resources in formal helping. *Nonprofit and Voluntary Sector Quarterly*, 2006, vol. 35, no. 2, pp. 249−266.

63. Clary E.G., Snyder M., Ridge R.D., Miene P.K., Haugen J.A. Matching messages to motives in persuasion: A functional approach to promoting volunteerism. *Journal of Applied Social Psychology*, 1994, 24, 13, pp. 1129−1149.

64. Young J., Passmore A. What is the occupational therapy role in enabling mental health consumer participation in volunteer work? *Australian Occupational Therapy Journal*, 2007, no. 54, pp. 66−69.

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The Impact of the Pandemic on Demographic Processes in the Russian Arctic*
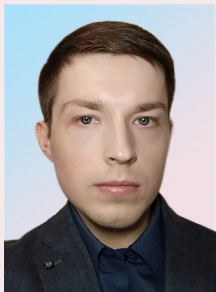
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Abstract. Russia has achieved a high level of Internet connectivity and the use of digital technologies; this helps to accumulate and systematize huge amounts of population data. Modern challenges, such as the COVID-19 pandemic, require a more prompt and detailed analysis of the demographic situation. Understanding the information collected by digital platforms and services can improve the quality of decision-making and be widely used in science and management. The aim of our study is to assess the change in the demographic situation in the Russian Arctic under the influence of the pandemic, with the use of new sources of population data that have emerged as a result of digitalization of the economy and public life. The article proposes an outline for the formation of a demographic knowledge base by combining traditional population statistics with data from digital platforms. We consider advantages and disadvantages of new data sources, features and examples of their application. We provide a detailed description of demographic processes in the Arctic Zone of the Russian Federation in 2020–2021 with the use of municipal statistics, data from Yandex online platforms and international pandemic databases. With the help of the proposed outline, we consider the dynamics of morbidity, mortality and vaccination against coronavirus infection. We study the reaction of the population of the Russian Arctic to the pandemic by analyzing the structure of search queries and the intensity of movement in city streets. We reveal the specifics of the spread of COVID-19 in the Arctic and estimate the impact of the pandemic on the natural

population change and human mobility in the Arctic Zone. We calculate excess mortality at the regional and municipal levels. Based on the vaccination rates, we draw conclusions about the prospects for further development of the pandemic. The results obtained can be used for development of socio-demographic policy measures and construction of demographic forecasts for the Northern and Arctic territories.

Key words: pandemic, digital footprint, vaccination, excess mortality, migration, data sources, Russian Arctic.

Introduction

The COVID-19 pandemic caused by SARS-CoV-2 has significantly affected global demographic changes in 2020–2021. It has claimed millions of lives worldwide, closed borders, reduced migratory movements, and led to economic decline [1]. Arctic societies are particularly vulnerable to epidemics due to the concentration of the population in isolated areas, high migration mobility and the prevalence of a number of chronic diseases [2], so ensuring sanitary and epidemiological safety has become one of the main objectives of the Strategy for Development of the Russian Arctic Zone and Ensuring National Security until 2035 approved in 2020[1].

A large comparative study [3; 4] identified five groups of Arctic countries and regions according to the nature of the pandemic in 2020. In Iceland, northern Norway, Finland, and the Faroe Islands (the "shockwave" group), incidence and mortality rates soared earlier than in other parts of the Arctic, but quickly went down due to extensive quarantine measures. In northern Sweden (the "lingering waves" group), the rises in incidence and mortality were more pronounced and prolonged due to soft policies aimed at building herd immunity in the population. In northern Canada and Greenland (the "isolated outbreaks" group), due to remoteness and preventive measures, no significant spread of the pandemic has been recorded; there were sporadic deaths. Alaska (USA) was part of the group called the "tsunami" because, while the incidence rate

was relatively low at the beginning of the pandemic in November and December, it had the highest incidence rate in the global Arctic; then, after an effective vaccination campaign, it declined.

Russia (the "tidal wave" group) is of particular interest. With the relatively late onset of the pandemic, the Russian Arctic experienced the longest rises in morbidity and mortality. Russia accounts for most of the cases and deaths from coronavirus in the global Arctic[2], and the relative numbers are comparable to Alaska and Sweden. In addition, Russia lags behind other Arctic territories in vaccination rates [4]. In order to understand the reasons for this situation, we will analyze in detail the data on natural and migratory movements of the population in this article.

A key to describing and explaining demographic processes during a pandemic might be the new data sources that have emerged from the digitalization of society [5; 6]. Digital transformation has become a major driver of societal change in the Arctic, as reflected in the State of the Nordic Region Report 2020 [7]. Web-based platforms and information systems collect enormous amounts of population data that can be applied to science and public administration. They have advantages in the speed of information accumulation over traditional statistics, which is especially important in a pandemic.

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[1] On the Strategy for Development of the Russian Arctic Zone and Ensuring National Security until 2035: Presidential Decree no. 645, dated October 26, 2020.

[2] According to the authors of the article cited, Russia accounts for 79% of infections and 91% of deaths. However, they consider the Russian Arctic within broader boundaries, including territories outside the normatively defined Arctic zone of the Russian Federation.

The study aims to analyze the demographic situation in the Russian Arctic under pandemic conditions using both traditional and new sources of population data. In theoretical terms, the originality of the study lies in the systematization of demographic data sources that can be collected or processed using new digital technologies. The resulting demographic knowledge base is highly responsive and detailed. In the spatial dimension, the detalization reaches the municipal and settlement levels, and in the temporal dimension, it reaches weeks and even days. The practical contribution of the work consists in obtaining new knowledge about the demographic development of the Arctic zone of the Russian Federation during the pandemic of coronavirus infection.

The study will answer three questions: (1) What data sources can be used to analyze demographics in the context of digitization of society? (2) How has the demographic situation in the Russian Arctic been changing during the coronavirus pandemic? (3) What are the demographic consequences of the COVID-19 pandemic for the Russian Arctic in 2020? The object of the study is the population of the Arctic zone in the Russian Federation, which includes 75 urban okrugs and municipal districts in 2021[3].

New digital sources of demographic data

Due to the high degree of urbanization [8], the Russian Arctic exceeds the Russian average in terms of Internet connectivity *(Tab. 1)*. The proportion of Internet users there is more than 90%, which is higher not only than the world average (51%), but also than the average level of the developed countries of the world (87%)[4]. More than half of Russian Arctic residents use the Internet to order goods and services, which is especially important for remote and isolated areas. 82% of households have broadband access to the network.

Many everyday practices, such as searching for information, working, studying, and communicating, are increasingly carried out in a networked environment using Internet platforms and services [6]. Due to the development of information technology and the spread of the Internet, there are unprecedented opportunities for data collection on a scale "both enormous and microscopic" [9, p. 131]. Internet platforms collect data about

Table 1. Internet connectivity rates in the Arctic zone of the Russian Federation and Russia as a whole*, %

Indicator	Russian Arctic zone			Russian Federation		
	2016	2018	2020	2016	2018	2020
Proportion of households with:						
- a computer	84.8	83.8	80.1	74.3	72.4	72.1
- Internet access	84.0	86.4	86.6	74.8	76.6	80.0
- Broadband Internet access	73.9	80.1	81.6	70.7	73.2	77.0
Proportion of the population**:						
- Internet users	86.4	91.2	90.6	76.4	83.8	87.2
- active Internet users (use at least once a week)	82.9	88.4	88.6	71.5	79.3	84.1
- using the Internet to order goods and services	38.0	55.9	51.3	23.1	34.7	40.3
* According to a sample federal statistical observation on the use of information technology and information and telecommunications networks by the population. ** To the total population in the age of 15–74; 2016 – for the population in the age 15–72. Source: Statistical information on the socio-economic development of the Arctic zone of the Russian Federation. *Rosstat*. Available at: https://rosstat.gov.ru/storage/mediabank/arc_zona.html						

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[3] "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation": Federal Law no. 193−FZ, dated July 13, 2020.

[4] Statistics. International Telecommunication Union. Available at: https://www.itu.int/en/ITU-D/Statistics/Pages/stat/default.aspx

users by analyzing the digital footprint, that is, their actions on digital devices [10]. The collection and processing of user data is central to modern technology companies. "The developed capitalism of the twenty-first century has gradually built itself around the task of extracting and using a special kind of raw material: data... Just like oil, data is a raw material that is extracted, purified and used in many different ways. The more data one has, the more different are the ways in which one can use it". [11, p. 37].

Let us consider the scheme of formation of the demographic knowledge base *(Fig. 1)*. First of all, it is necessary to separate the real population and the virtual population, that is, the projection of the real population into the digital environment. They vary in both number and composition. The virtual population may or may not include several projections of a single person. In addition, digital technologies are used differently in different age-sex

and social groups. The real population interacts in the digital environment and experiences its opposite influence [12]. For example, the demographic attitudes of the population change with the development of information technology, when new forms of mobility and virtual migration arise [13].

The demographic knowledge base is formed from two types of sources. First, these are traditional demographic data reflecting the characteristics of the real population: official statistics, the results of censuses and sample population surveys. Microdata bases are of particular interest here [14]. These are the results of surveys and censuses broken down by individual or household, which allow studying any distributions of features and constructing arbitrary tables. The number of publicly available microdata records is already measured in billions [15, p. 287]. It has been suggested that extensive demographic microdata collected for research purposes should be considered big data, since the same methods

Figure 1. Creating a demographic knowledge base using new digital data sources
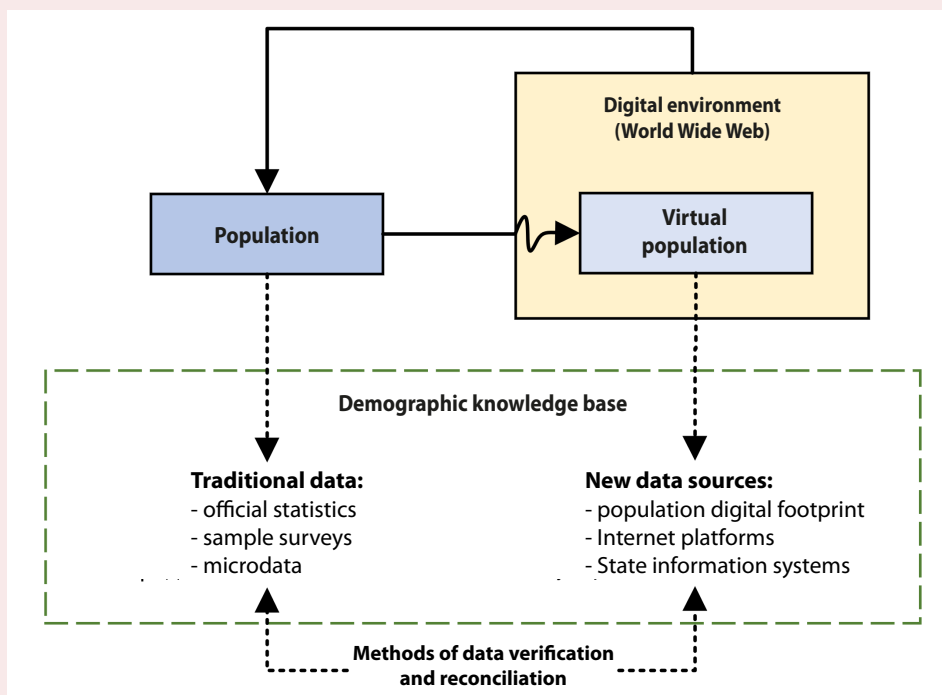
Source: own compilation.

of processing, verification, and analysis often are applicable to them [16]. Thus, Rosstat provides access to microdata of many sample surveys and all post-Soviet censuses.

Publicly available statistical databases are widely used in Arctic research. For example, the Microdata Base of the Russian Census of 2010 was used to assess the human development indicators of the Russian Arctic at the municipal level [17]. Even more often, the Rosstat Municipal Indicators Database is used, which includes more than 500 indicators for 20 thousand municipalities of Russia. Due to its huge volume and high level of detalization, it can also be regarded as a microdata base, with territories and municipalities as its accounting units, rather than individuals. For example, with the help of this database, a ranking of the supporting zones of development in the Russian Arctic has been performed [18], and migration patterns of the Arctic population have been revealed [19].

While traditional demographic data are originally collected for research purposes, new digital data sources are of a different nature. They are generated directly in the digital environment for purposes often unrelated to science. These data are obtained from social media, search engines and other websites, call logs, GPS sensor readings, digitized texts [20; 21]. The intermediate position between the new and traditional data is occupied by online surveys conducted by methods close to traditional, but in a digital environment.

New data sources have also found application in the study of the Arctic. For example, information from the social media VKontakte has been used to analyze return migration in the Russian Arctic [22] and to identify the routes of intermunicipal movements [19]. NASA night satellite images have been used to analyze settlement systems in different parts of the world's Arctic [23]. Big data from Sberbank made it possible to assess the structure and dynamics of population consumption in the

Arctic [24]. Data from the Google Mobility Reports service were used to study changes in the mobility of residents of Arctic countries [3].

The disadvantages of new digital data sources include low representativeness (in most cases), fragmentary nature, vulnerability to changes, possibility of errors in algorithms, false information and spam accounts, low reliability, duplication of information, and limited access to data [9; 25]. Their advantages are huge volume, high production speed, high detalization, internal diversity, exhaustiveness, interconnection with other data, extensibility, scalability [26]. It is noteworthy that new data sources are deprived of one of the main limitations of classical surveys – reactivity. When respondents know they are participating in a study, it can influence their responses [21].

In order to become an effective scientific tool, the demographic knowledge base must meet a number of requirements. First, the data must be linked to territories, ideally at the level of municipalities or even settlements. The higher the detalization, the more conclusions about the nature of demographic processes we can get. Second, data from different sources must not contradict each other. Methods are being developed to verify digital population data and to reconcile them with traditional statistics. These include post-stratification and Bayesian hierarchical modeling [20]. Various methods of machine learning and data mining are also used. Third, the data should be as up-to-date as possible, without a significant time lag, taking into account seasonality and historical dynamics if possible.

The Arctic research centers are now making their first attempts to integrate research databases, scientific publications, and traditional knowledge into unified knowledge bases on socio-economic processes in the Arctic [27, p. 229]. In the future, these initiatives may become the basis for a more systematic explanation of the patterns of functioning of Arctic societies.

Research methodology

The Arctic zone of the Russian Federation will be considered within the boundaries defined by Federal Law no. 193–FZ, dated July 13, 2020, "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation"[5]. According to the Law the territories of 75 urban okrugs and municipal districts in nine northern constituent entities of the Russian Federation *(Fig. 2)* are attributed to the Arctic. Their population at the beginning of 2021 was 2.6 million people (1.8% of Russia's population), contributing about 6% to the gross regional product of the country. The population in the Russian Arctic is rapidly decreasing, since 1989 its number has decreased by about a third, and in Chukotka – by three times [28, p. 122]. Many settlements are completely or almost completely depopulated. The Arctic zone covers about 30% of Russia's territory. There is a very high degree of urbanization, and the spatial distribution of the population is uneven [29]. Almost 80% of the population lives within 100 km of eight major population centers: Arkhangelsk, Murmansk, Apatity, Norilsk, Noyabrsk, Novy Urengoy, Salekhard, and Vorkuta [23].

The study of the demographic situation in the Russian Arctic zone was carried out using a number of methods: general scientific (comparison, generalization, modeling of the subject area), statistical (time-series analysis), demographic (calculation of natural and migration movement indicators, analysis of demographic structures) and economic and geographic (spatial analysis and mapping).

Figure 2. Population settlement in the Arctic zone of the Russian Federation at the beginning of 2021
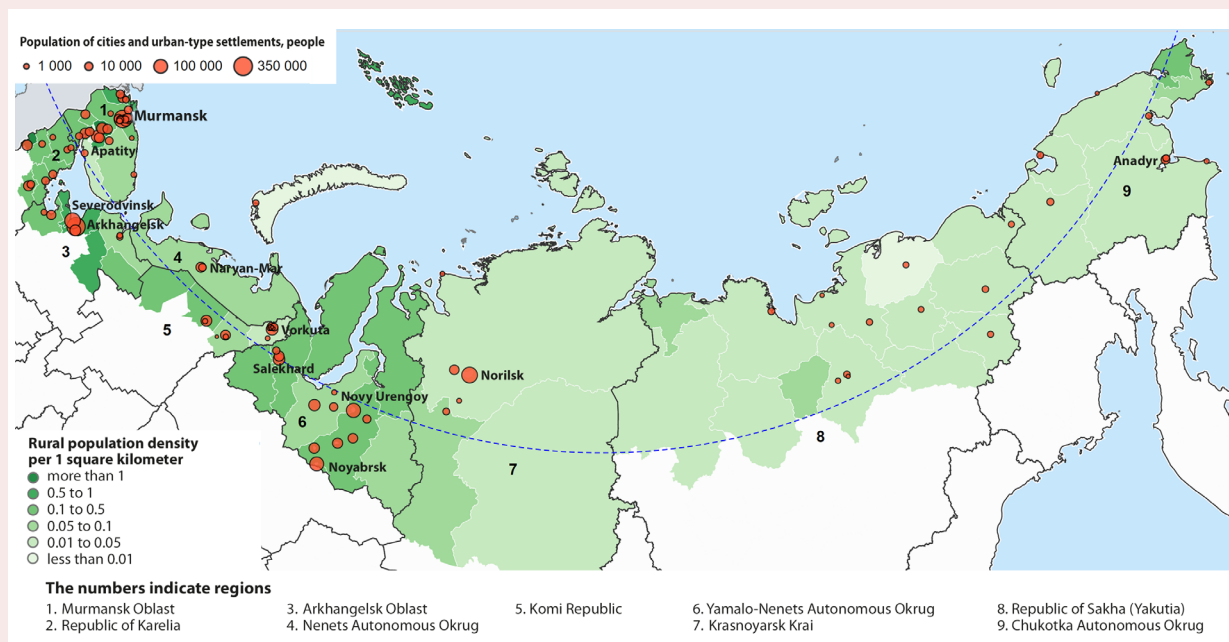
Source: compiled according to the database of indicators of municipalities. Rosstat. Available at: https://www.gks.ru/dbscripts/munst

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[5] "On state support for entrepreneurial activity in the Arctic zone of the Russian Federation": Federal Law no. 193–FZ, dated July 13, 2020.

The study combined traditional vital statistics with population data collected by digital platforms and services. The Rosstat Municipal Indicators Database was used to estimate indicators of natural and migration movement, as well as excess mortality in the Arctic[6]. Excess mortality in 2020 was estimated based on the rate of increase in the total mortality rate to the 2017—2019 average by multiplying the resulting value by the average annual population in 2020. Because of the mosaic nature of the Arctic territories, it is recommended to use indicators with the highest possible level of detalization [30], so excess mortality was calculated for individual urban okrugs and municipal districts.

The data set "Coronavirus statistics and self-isolation index" from the Yandex DataLens[7] service, prepared using data from Johns Hopkins University, the website стопкоронавирус.рф, and Yandex services was used to estimate the morbidity, mortality from coronavirus, population response to the pandemic, and the degree of self-isolation of society. Data from the time of the pandemic beginning in Russia (March 2020) to the middle of September 2021 were unloaded from the service. All indicators of the base have a pronounced weekly cyclicity caused by both the mode of operation of health care facilities and the rhythm of people's lives, so to even out the fluctuations we considered seven-day moving averages of indicators. Since the service data are available in terms of RF constituent entities, only the regions included in the entire Arctic zone of the Russian Federation (Murmansk Oblast, Nenets, Yamalo-Nenets and Chukotka autonomous okrugs) were analyzed, as well as the Arkhangelsk Oblast, the majority of whose population resides in the Arctic. The Arkhangelsk Oblast was considered with a weighting coefficient of 0.612, which corresponds to the proportion of the Arctic population in the total population of the region (excluding Nenets AO).

Four indicators of the pandemic in the Arctic zone and for Russia as a whole are considered in the dynamics: number of cases per day per 1 million people, number of deaths per day per 1 million people, number of search queries about the coronavirus per day per 1 million queries, and the index of self-isolation of cities.

Analysis of search queries was carried out according to 15 keyword phrases (markers) that users often search in conditions of self-isolation or illness: "antibodies", "second wave", "call an ambulance", "home delivery", "how not to get infected", "buy antiseptic", "buy a mask and respirator", "treatment of coronavirus", "loss of smell", "pulse oximeter and saturation", "take a test", "make a CT scan"[8], "symptoms of corona-virus", "what to do at home", "what to do if the ambulance won't come". Taken together, these searches allow assessing the extent of people's interest in coronavirus infection. Increased interest, in turn, can help predict future COVID-19 outbreaks [31].

The index of self-isolation characterizes the change in the activity of users of Yandex services on the streets of cities during the pandemic. The value for the Arctic was calculated as the average for the nine largest cities in the Arctic zone of the Russian Federation: Apatity, Arkhangelsk, Vorkuta, Murmansk, Novy Urengoy, Norilsk, Noyabrsk, Severodvinsk and Severomorsk. The higher the point, the fewer people on the streets. A point of 0 corresponds to the level during the weekday rush hour before the pandemic, 5 points to the value at night[9].

In order to draw conclusions about the prospects for a pandemic, it was also necessary to analyze the

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[6] Database of indicators of municipalities. *Rosstat*. Available at: https://www.gks.ru/dbscripts/munst

[7] Coronavirus: dashboard. *Yandex DataLens*. Available at: https://datalens.yandex/covid19

[8] Computed tomography (CT) is often used to detect lung disease caused by coronavirus infection.

[9] Self-Isolation Index. *Yandex*. Available at: https://yandex.ru/company/researches/2020/podomam

dynamics of vaccination of the population. We took data on the number of vaccinated people in the Arctic regions of the Russian Federation from the aggregator website gogov.ru[10], and for the country as a whole from the global database[11] on COVID-19 vaccination [32].

The considered indicators make up a kind of digital footprint of the pandemic, which captures its impact on people through the actions of Internet users and information posted on official Internet resources by public authorities. Calculation and mapping algorithms are implemented in Julia 1.6 programming language using DataFrames.jl, CSV.jl and VegaLite.jl packages.

Pandemic dynamics in the Russian Arctic

Epidemics, along with wars and famine in bad harvest years, are among the crisis components of population mortality. They have been constant companions of humanity throughout its history. Sometimes, but not always, in Russia, due to the low population density, the damage caused by epidemics was less than in Western Europe [33, p. 84]. In the Russian Arctic, epidemics also have their own specifics. Some features of the Arctic territories increase the damage from epidemics, while others, on the contrary, weaken it.

Because of the great remoteness of Arctic settlements [34], cases of COVID-19 infection in the Russian Arctic were registered later. However, the high concentration of population in cities and urban-type settlements contributes to a more rapid spread of diseases after the first infections. In addition, human mobility is high in most remote areas, and rotation of workers accelerates the spread of the virus [35]. Because of this, outbreaks occurred in a number of northern and arctic locations even in the early stages of the pandemic. Pandemic outbreaks among rotational workers were

recorded in Belokamenka (Murmansk Oblast), at the Chayanda field (Khanty-Mansi Autonomous Okrug), in the Sabetta settlement (Yamalo-Nenets AO), the settlement of the Olimpiada plant (Krasnoyarsk Krai)[12].

In cities, where the majority of the Arctic population lives, the health care infrastructure is relatively well developed, which makes it possible to provide timely assistance to those who fall ill. At the same time, hypertension, diabetes, tuberculosis, hepatitis, cardiovascular and many other diseases are more common in Arctic societies [2], which increase the risks of severe course of the disease and death of coronavirus patients. An even greater, but opposite influence on mortality rates is exerted by the age composition of the population. Comparative studies show that the main contribution to the reduction of life expectancy under the influence of the COVID-19 pandemic is made by the increased mortality of the population over the age of 60 [36]. The proportion of elderly people in the Arctic territories is lower, which reduces the final mortality rate among those infected.

We should also note that the social problems caused by the coronavirus pandemic in the Arctic are not limited to increased mortality. According to sociological studies, "among the main problems faced by the population in the conditions of the pandemic are the threat of restrictions on the activities of mining companies, travel, bans and restrictions on traditional fishing activities for the local population, job loss and reduced income, fear for one's health and the health of loved ones" [37, p. 144].

Let us consider the dynamics of four pandemic indicators in the Russian Arctic zone and Russian Federation as a whole for 2020–2021 by days *(Fig. 3)*. In order to describe epidemiological indicators,

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[10] Coronavirus vaccination statistics. Available at: https://gogov.ru/articles/covid-v-stats

[11] The Our World in Data COVID vaccination data. Available at: https://ourworldindata.org/covid-vaccinations

[12] Why the spread of coronavirus in rotation workers' settlements cannot be stopped. *Vedomosti*. Available at: https://vedomosti.ru/career/articles/2020/05/23/830910-rasprostranenie-koronavirusa-v-vahtovih-poselkah

Figure 3. Coronavirus pandemic statistics, 7-day moving average

a) cases per day per 1 million people

b) deaths per day per 1 million people

c) coronavirus search queries per 1 million queries

d) self-isolation index (activity on city streets)

Arctic regions of Russia   Russian Federation
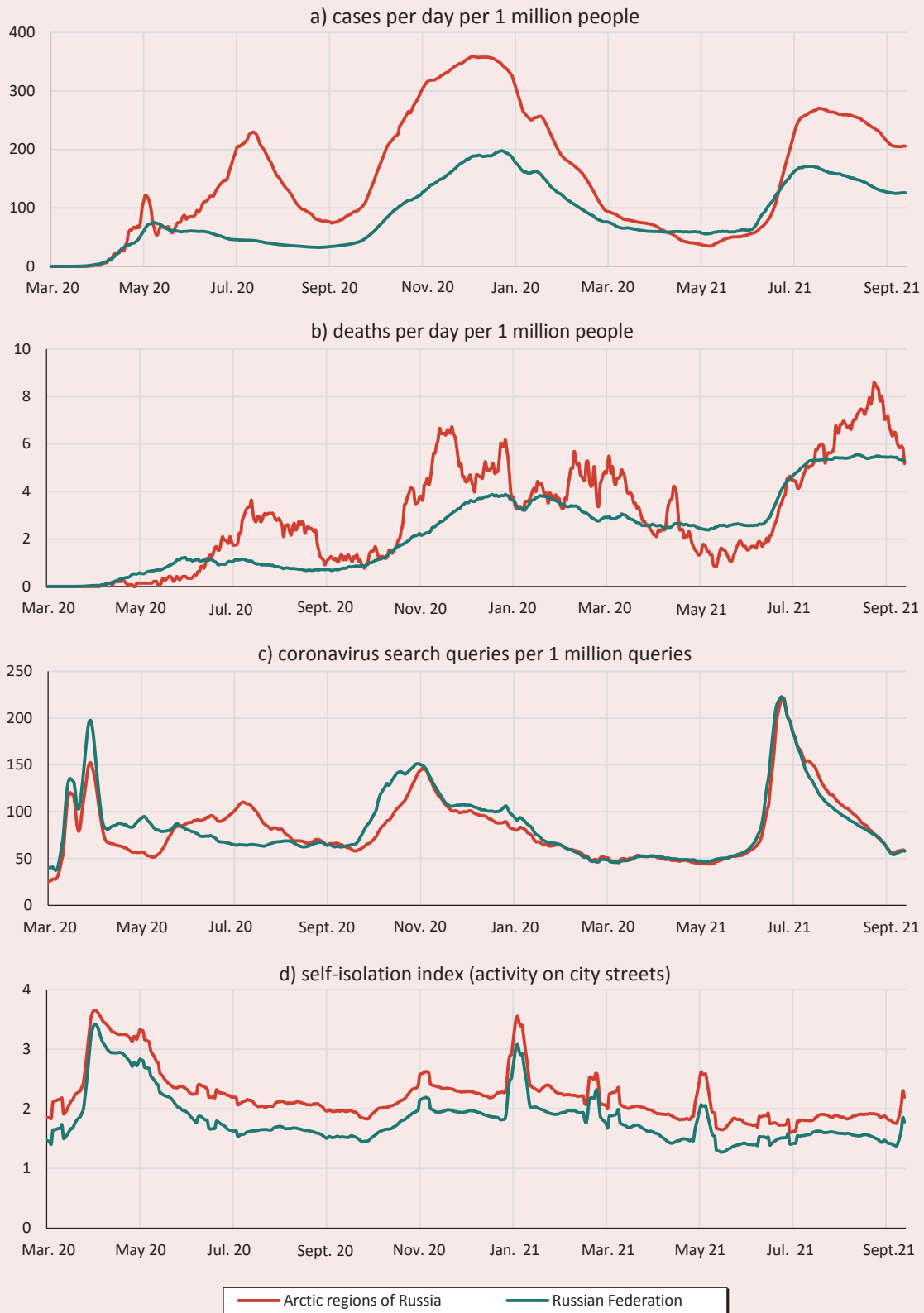
Source: date of Yandex DataLens.

the analogy of "waves" is often used, which are characterized by clearly defined periods of growth and decline, maintained for a certain period of time [4, p. 3]. There are three distinct waves in the presented graphs. The first one lasted from the beginning of the pandemic in March 2020 to the end of August of the same year, the second — from September 2020 to April 2021, and the third — from May 2021.

Throughout most of the period considered, morbidity and mortality rates from coronavirus per 1 million inhabitants in the Arctic zone were higher than in Russia as a whole. The exceptions were the very beginning of the pandemic and April — May 2021 (see Fig. 3a). The higher rates, in addition to the factors mentioned above, may be related to the quality of statistical records in the Arctic regions. In the Arctic, most of the population lives in urban-type settlements, where the recording of diseases and deaths is better than in rural areas, and those who fall ill have more opportunities to visit medical organizations. Problems of comparability of morbidity and mortality data between countries and regions are discussed in scientific publications [38].

While the peak incidence according to official data was in the second wave of the pandemic, the peak mortality was in the third wave (see Fig. 3b). Among the five Arctic regions considered, the highest infection rates were in the Arkhangelsk (233) and Murmansk (174) oblasts, and the lowest were in Chukotka (60) and Nenets (86) autonomous okrugs. In terms of mortality, the situation is similar, only the Murmansk Oblast is in the lead. Yamalo-Nenets Autonomous Okrug takes average positions by all indicators. The leadership of the western Arctic regions can be explained primarily by their older age structure, as well as by the high population density, which contributes to the spread of the infection.

Search query data allow assessing the degree of influence of the pandemic on public sentiment (see Fig. 3c). Among the search queries considered, the most popular among Yandex users were "symptoms

of coronavirus" (280 queries per 1 million queries), "get tested" (227), "antibodies" (206), "treatment for coronavirus" (125), and "loss of smell" (92). The request for loss of smell was more popular in 2020, as strains of coronavirus, which rarely cause loss of smell, became common in 2021. The dynamics of search queries for the Arctic and the country as a whole are almost the same. Search queries related to coronavirus are of greater interest to Internet users in the Murmansk and Arkhangelsk oblasts and the Yamalo-Nenets Autonomous Okrug. In Chukotka Autonomous Okrug information about coronavirus is searched for less frequently. A surge of interest in search queries about coronavirus is observed at the beginning of the infection waves: March 2020, October 2020, and June 2021. The numbers then decrease rapidly, although high incidence rates may be recorded for several more months.

According to Yandex services, the values of the self-isolation index in the Arctic were higher than the Russian average (see Fig. 3g), that is, the residents of Arctic cities have more restricted their movements. The peak of self-isolation indexes was in April—May 2020, which, on the one hand, is connected with the novelty of the threat and high uncertainty, on the other hand, with the implementation of the Presidential Decree No. 239 dated April 2, 2020, which established nonworking days with pay, suspended the activities of certain organizations and established a special procedure for the movement of persons and vehicles[13].

After the end of non-working days, a slight increase in self-isolation rates was recorded during the second wave of coronavirus, but the schedule fluctuations were mostly associated with holidays. Among the Arctic cities, the self-isolation regime, according to Yandex services, was best observed by Severomorsk (2.7 points), Vorkuta, Apatity and

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[13] "On measures to ensure the sanitary and epidemiological safety of the population in connection with the spread of the novel coronavirus infection (COVID-19)": Presidential Decree no. 239, dated April 2, 2020.

Severodvinsk (2.5 points each). The lowest self-isolation index was recorded in Novy Urengoy (1.6) and Arkhangelsk (1.8). In other Arctic cities, it was at the level of 2.0—2.2, while the national average was 1.8 points.

Although the digital footprint provides some insight into the nature of demographic change, the patterns identified need to be confirmed with data from traditional statistics.

Consequences of the pandemic for Arctic demographic development

In 2020, the overall decline in the population of the Russian Arctic has intensified compared to the previous year *(Tab. 2)*. The pandemic had virtually no effect on fertility in 2020, as not enough time had passed since the pandemic began by the end of the year. Quarantine measures may have created problems with hospitalization in maternity wards, but such cases are isolated [39]. At the same time the mortality rate has significantly increased. As a result, natural increase, which had been declining but had maintained positive values over recent years, was replaced for the first time by a natural decrease in population. The negative trends were only partially offset by a decrease in migration losses in the Russian Arctic. The decrease in the absolute value of the negative migration balance was caused by the fact that the intensity of departures decreased more than the intensity of arrivals. As a result, total population growth returned to the level of 2018.

Let us estimate the value of excess mortality in the Arctic territories in 2020 *(Tab. 3)*. The

Table 2. Indicators of population change in the Arctic zone of the Russian Federation, 2017–2020

	People				Ratios per 1,000 people			
	2017	2018	2019	2020	2017	2018	2019	2020
Total increase	**-12,585**	**-12,066**	**-10,222**	**-11,932**	**-4.8**	**-4.6**	**-3.9**	**-4.6**
Natural increase	**5,106**	**3,035**	**1,060**	**-3,575**	**1.9**	**1.2**	**0.4**	**-1.4**
Born	30,913	29,024	26,529	26,083	11.7	11.0	10.1	10.0
Died	25,807	25,989	25,469	29,658	9.7	9.9	9.7	11.4
Positive migration balance	**-17,691**	**-15,101**	**-11,282**	**-8,357**	**-6.7**	**-5.7**	**-4.3**	**-3.2**
Those who arrived	133,910	137,488	126,124	109,446	50.6	52.2	48.1	41.9
Those who left	151,601	152,589	137,406	117,803	57.3	57.9	52.4	45.1
Source: Database of indicators of municipalities. *Rosstat*. Available at: https://www.gks.ru/dbscripts/munst								

Table 3. Dynamics of mortality in the Arctic zone of the Russian Federation
in 2017–2020 and excess mortality in 2020

Territory	Total deaths, people				Total mortality rate per 1,000 population				Excess mortality in 2020 to 2017–2019 levels		
	2017	2018	2019	2020	2017	2018	2019	2020	people	per 1,000 people	%
Russian Arctic zone	**25,807**	**25,989**	**25,469**	**29,658**	**9.7**	**9.9**	**9.7**	**11.4**	**4,226**	**1.6**	**16.2**
Murmansk Oblast	8,371	8,463	8,462	9,951	11.1	11.3	11.4	13.5	1,667	2.3	20.1
Arkhangelsk Oblast excluding AO	8,040	8,121	8,140	9,074	11.9	12.1	12.2	13.6	1,072	1.6	13.4
Yamalo-Nenets AO	2,614	2,547	2,553	3,293	4.9	4.7	4.7	6.0	695	1.3	26.7
Republic of Karelia	1,815	1,913	1,787	2,027	15.5	16.6	15.8	18.1	240	2.1	13.4
Komi Republic	1,694	1,720	1,646	1,815	10.4	10.8	10.6	11.9	192	1.3	11.8
Republic of Sakha (Yakutia)	742	675	634	868	10.9	9.9	9.4	12.8	187	2.8	27.5
Krasnoyarsk Krai	1,686	1,609	1,413	1,659	7.2	6.8	6.0	7.0	80	0.3	5.1
Nenets AO	378	394	380	449	8.6	9.0	8.6	10.1	62	1.4	16.1
Chukotka AO	467	547	454	522	9.4	11.0	9.1	10.5	31	0.6	6.2
For reference: RF (thousand people)	**1,826**	**1,829**	**1,798**	**2,139**	**12.4**	**12.5**	**12.3**	**14.6**	**325**	**2.2**	**17.9**
Source: Database of indicators of municipalities. *Rosstat*. Available at: https://www.gks.ru/dbscripts/munsr											

cumulative excess mortality in the Arctic zone of the Russian Federation was 4,226 people, or 16.2% increase to the 2017–2020 level, which is slightly lower than for the country as a whole (17.9%). The value below the national average can be explained by the low proportion of the population of older age groups at risk of coronavirus. Among the constituent entities of the Federation, the highest excess mortality was recorded in the Sakha Republic (27.5%) and Yamalo-Nenets Autonomous Okrug (26.7%). The lowest excess mortality was recorded in Krasnoyarsk Krai (5.1%) and Chukotka Autonomous Okrug (6.2%).

A more detailed analysis at the level of urban okrugs and municipal districts shows that high excess mortality is mainly observed in resource-producing urban okrugs and districts of Siberia *(Fig. 4)*. Many of them are characterized by rotational settlements and high migration turnover, which may have contributed to the rapid spread of coronavirus infection. Low values of excess

mortality were recorded in some remote isolated cities (Norilsk, Anadyr) and territories with low migration mobility (Ust-Tsilemsky District of the Komi Republic, sparsely populated areas of Chukotka and the Arkhangelsk Oblast). However, analysis of international data shows that morbidity and mortality rates in such territories can quickly catch up with those of areas with earlier infections. "The delayed onset of a pandemic should be used to prepare for the inevitable emergence of the virus in more remote rural areas" [4, p. 9].

Russian Arctic territories have been characterized by high migration mobility in recent years, while the overall population loss in most cities and regions has remained unchanged [19; 40]. The impact of the pandemic on migration flows can be clearly seen in the analysis of the migration mobility of the population, i.e. the sum of those who arrived and those who left per 1,000 inhabitants *(Tab. 4)*. Human mobility of the Russian Arctic has decreased more than that of the Russian Federation

Figure 4. Excess mortality in cities and regions of the Russian Arctic, 2020 to the average level of 2017–2019, %
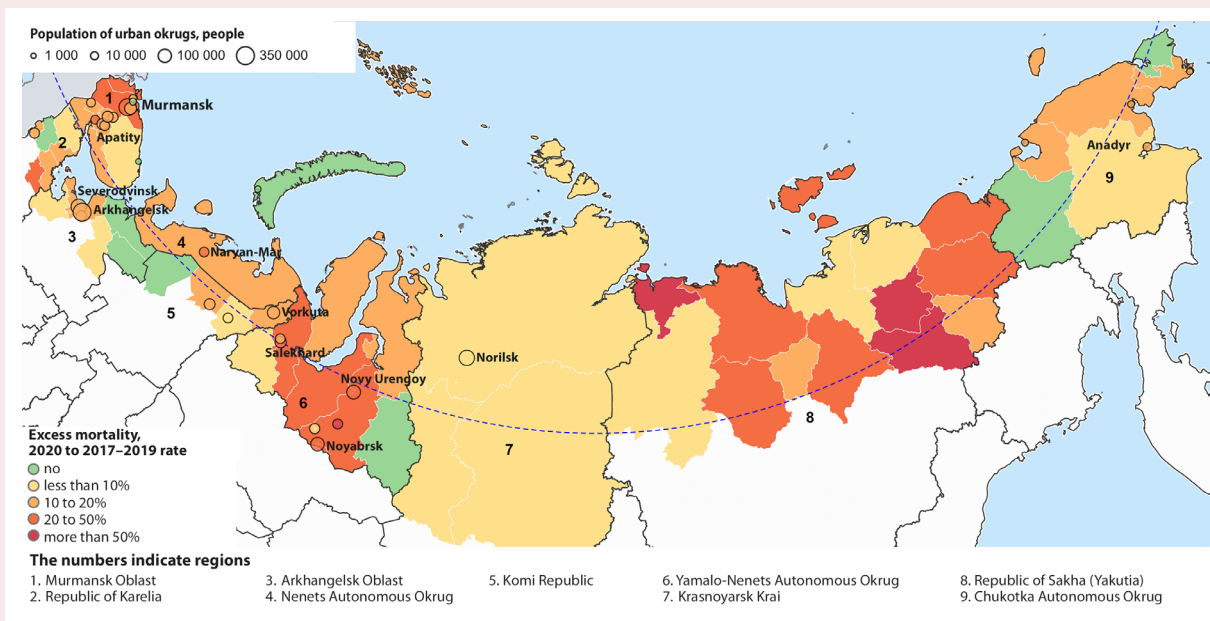
Source: compiled according to the Database of indicators of municipalities. *Rosstat.* Available at: https://www.gks.ru/dbscripts/munst

Table 4. Change in the human mobility in the Arctic zone of the Russian Federation in 2020 to the average level of 2017–2019 by constituent entities of the Russian Federation, %

Territory	Total	Type of migration		
		intraregional	interregional	intercountry
Russian Arctic zone	**-18.3**	**-26.9**	**-18.6**	**-7.9**
Chukotka AO	-1.6	11.0	-12.6	136.9
Republic of Sakha (Yakutia)	-6.4	-7.7	-11.1	113.4
Krasnoyarsk Krai	-11.5	-2.7	-15.7	-0.3
Komi Republic	-15.2	-17.0	-22.7	56.9
Nenets AO	-16.1	-22.6	-14.9	19.6
Republic of Karelia	-18.2	-19.6	-16.8	-16.0
Murmansk Oblast	-20.4	-43.5	-18.3	-23.4
Yamalo-Nenets AO	-21.2	-17.5	-23.7	-15.6
Archangelsk Oblast excluding AO	-23.3	-32.1	-12.9	-25.0
For reference: RF	**-13.4**	**-16.4**	**-15.0**	**5.3**
Source: Database of indicators of municipalities. *Rosstat*. Available at: https://www.gks.ru/dbscripts/munst				

as a whole, and the decrease has hardly affected the most remote territories: Chukotka AO, Yakutia and Norilsk, whose dependence on migration movements of labor resources is particularly high due to the extreme natural and climatic conditions. Although migration between countries became more difficult as a result of the restrictions [41], international migration mobility in Chukotka and Nenets Autonomous okrugs, as well as in the Komi and Yakutia republics, even increased. The frequency of movements decreased primarily within the region (everywhere except for Chukotka Autonomous Okrug).

Vaccination campaigns are underway to fight the pandemic on a global scale. In Russia, 32% of the population was vaccinated with at least one dose of vaccine as of mid-September 2021. By comparison, Iceland has 79% vaccinated, the Faroe Islands — 77%, Canada — 76%, Norway — 75%, Finland — 74%, Greenland — 72%, Sweden — 69%, and Alaska (USA) — 56%. Thus, Russia is inferior to all other Arctic territories. If we look broken down by Arctic region of Russia *(Fig. 5)*, Chukotka AO stands out, with 45% of the population vaccinated. The other Arctic regions show values in the range of 28−34%. We should note that the Murmansk Oblast has a developed network of settlements associated with

the functioning of the Northern Fleet of the Russian Navy. According to the Ministry of Defense of the Russian Federation, 98% of the military personnel of the Northern Fleet were vaccinated with the two-component vaccine as of October 2021, and about a quarter of the planned number have already been revaccinated[14].

What is the outlook for the pandemic? In 2021, we can expect excess mortality rates comparable to or even higher than in 2020[15]. Based on the low rates of vaccination in Russia, it is also very likely that significant excess mortality will persist in 2022. The future situation is difficult to forecast. Mortality, on the one hand, will be determined by the rate of vaccination and revaccination; on the other hand, it will depend on the appearance of new, more dangerous variants of coronavirus. The most widespread vaccine in Russia, Sputnik V,

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[14] Servicemen of the Northern Fleet vaccinated against coronavirus. *Ministry of Defence of the Russian Federation.* Available at: https://structure.mil.ru/structure/okruga/north/news/more.htm?id=12388177

[15] In the Yamalo-Nenets and Chukotka Autonomous okrugs, the mortality rate in the first half of 2021 almost corresponds to the indicators for the first half of 2020, but in the Arkhangelsk and Murmansk oblasts its value is higher than in the previous year, by 22 and 18% respectively, in the Nenets Autonomous Okrug — by 11%. Source: Natural population change for January − June 2021. Rosstat. Available at: https://rosstat.gov.ru/storage/mediabank/edn06-2021ut.xlsx

Figure 5. Proportion of the population who received at least one component of the vaccine, by RF constituent entities, January – September 2021, %
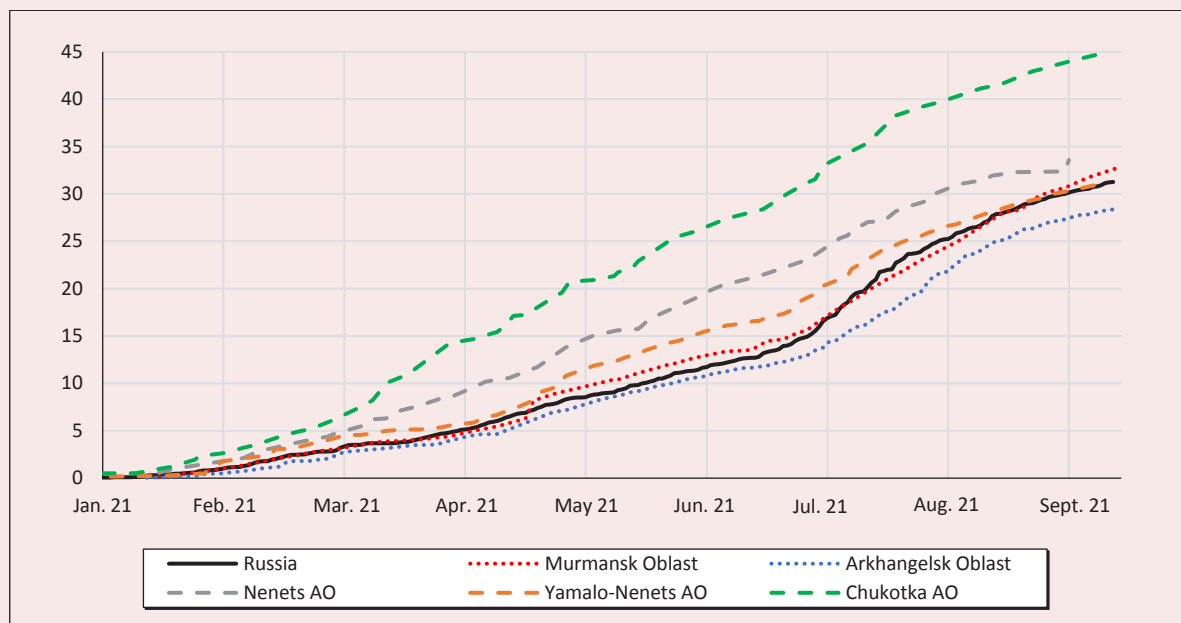
has shown high efficiency in clinical trials [42] and has been approved and successfully used in almost 70 countries [43]. Other vaccines are being developed and tested, so a reduction in mortality can be expected in the long term. In the short term, nationwide, the pandemic will intensify the downward demographic dynamics that have begun again [44], and in the Russian Arctic it has already led to the replacement of natural increase by natural decrease in population in 2020.

Conclusion

The study shows that the combined use of traditional demographic statistics with new data accumulated in a digital environment allows conducting detailed and rapid analysis of the demographic situation. There is no doubt that in the future the digitalization of various spheres of human life will only intensify, enabling researchers to obtain even more data about the population. At the same time, the risks of misuse of the data and violation of privacy will increase, so the ethics of research in the digital environment will become important.

We can see that features of the Arctic territories, on the one hand, make their population more vulnerable to epidemics, on the other hand, contribute to a lower mortality rate. In 2020, excess mortality was 4.2 thousand people, which led to a natural decrease in the population of the Russian Arctic. Human mobility has been greatly reduced in most regions except for the very remote ones, where it determines the resilience of settlements. The pandemic has affected the behavior of the Arctic population, as captured by searches and the intensity of population movements on city streets. We identified the most problematic areas of the Arctic during the pandemic in terms of mortality and population vaccination rates.

The practical significance of the results obtained is that they can be used in the development of population policy measures under conditions of high uncertainty and variability of the situation. As the experience of pandemic control has shown, the effect of measures comes with a time lag, so decisions should be made

quickly, as well as take into account the local specifics of territories and populations.

Further research should apply the considered approach to the formation of a demographic knowledge base for forecasting the demographic development of the Arctic zone of the Russian Federation. This will allow taking into account detailed migration routes, as well as differences in the composition of the population and economic specialization of the territories. Combined with the results of the 2021 census, the new data will make it possible to see the contours of the future settlement system of the Russian Arctic and to predict demographic trends in the coming decades.

References

1. Torkunov A.V., Ryazantsev S.V., Levashov V.K. et al. *Pandemiya COVID-19: Vyzovy, posledstviya, protivodeistvie* [COVID-19 Pandemic: Challenges, Consequences, Countermeasures]. Moscow: Aspekt Press, 2021. 248 p.

2. Spence J. et al. *Covid-19 in the Arctic: Briefing document for senior Arctic officials.* Senior Arctic Officials' executive meeting, Iceland, 24–25 June 2020. Iceland: Arctic Council, 2020. 83 p.

3. Petrov A.N., Welford M., Golosov N. et al. Spatiotemporal dynamics of the COVID-19 pandemic in the Arctic: Early data and emerging trends. *International Journal of Circumpolar Health*, 2020, vol. 79(1), pp. 1–9. DOI: 10.1080/22423982.2020.1835251

4. Petrov A.N., Welford M., Golosov N. et al. The "second wave" of the COVID-19 pandemic in the Arctic: Regional and temporal dynamics, *International Journal of Circumpolar Health*, 2021, vol. 80(1), pp. 1–12. DOI: 10.1080/22423982.2021.1925446.

5. Katzenbach C., Bächle T.C. Defining concepts of the digital society. *Internet Policy Review*, 2019, vol. 8 (4), pp. 1–6 DOI: 10.14763/2019.4.1430

6. Smirnov A.V. Digital society: Theoretical model and Russian reality. *Monitoring obshchestvennogo mneniya: ekonomicheskie i sotsial'nye peremeny=Monitoring of Public Opinion: Economic and Social Changes,* 2021, no. 1, pp. 129–153. DOI: 10.14515/monitoring.2021.1.1790 (in Russian).

7. Lundgren A., Randall L., Norlén G. et al. *State of the Nordic Region 2020. Wellbeing, health and digitalisation edition.* Copenhagen, Nordic Council of Ministers, 2020. 71 p. DOI: 10.6027/nord2020-052

8. Shabunova A.A., Gruzdeva M.A., Kalachikova O.N. Settlement aspect of digital inequality in modern Russia. *Problemy razvitiya territorii=Problems of Territory's Development,* 2020, no. 4, pp. 7–19. DOI: 10.15838/ptd.2020.4.108.1 (in Russian).

9. Golder S.A., Macy M.W. Digital footprints: Opportunities and challenges for online social research. *Annual Review of Sociology*, 2014, vol. 40 (1), pp. 129–152. DOI: 10.1146/annurev-soc-071913-043145

10. Billari F., Zagheni E. Big data and population processes: A revolution? In: *SIS 2017. Statistics and Data Science: New Challenges, New Generations*. Florence: Firenze University Press, 2017, pp. 167–178. DOI: 10.36253/978-88-6453-521-0

11. Srnicek N. *Kapitalizm platform* [Platform Capitalism]. 2nd edition. Moscow: Izd. dom Vysshei shkoly ekonomiki, 2020. 128 p.

12. Kotyrlo E. Impact of modern information and communication tools on international migration. *International Migration*, 2019, article number 12677, pp. 1–19. DOI: 10.1111/imig.12677

13. Glushchenko G.I. Development of virtual migration in the context of the ongoing digitalization. *DEMIS. Demograficheskie issledovaniya=DEMIS. Demographic Research,* 2021, vol. 1, no. 2, pp. 57–64. DOI: 10.19181/demis.2021.1.2.4 (in Russian).

14. Alburez-Gutierrez D., Aref S., Gil-Clavel S. et al. Demography in the Digital Era: New data sources for population research. In: *SIS2019. Smart Statistics for Smart Applications*. Milano: Pearson, 2019. Pp. 1–8. DOI: 10.31235/osf.io/24jp7.

15. Ruggles S. Big microdata for population research. *Demography*, 2014, vol. 51 (1), pp. 287–297. DOI: 10.1007/s13524-013-0240-2

16. Bohon S.A. Demography in the big data revolution: Changing the culture to forge new frontiers. *Population Research and Policy Review*, 2018, vol. 37 (3), pp. 323–341. DOI: 10.1007/s11113-018-9464-6

17. Smirnov A.V. Human development and prospects for the knowledge economy formation. *Arktika: ekologiya i ekonomika=Arctic: Ecology and Economy,* 2020, no. 2 (38), pp. 18–30. DOI: 10.25283/2223-4594-2020-2-18-30 (in Russian).

18. Dmitrieva T.E., Buryi O.V. Arctic supporting zones: the Ranks and the Projects. *EKO,* 2019, no. 1, pp. 41–59. DOI: 10.30680/ECO0131-7652-2019-1-41-59 (in Russian).

19. Fauzer V.V., Smirnov A.V. Migration of the Russian arctic population: Models, routes, results. *Arktika: ekologiya i ekonomika=Arctic: Ecology and Economy,* 2020, no. 4 (40), pp. 4–18. DOI: 10.25283/2223-4594-2020-4-4-18 (in Russian).

20. Hughes C., Zagheni E., Abel G. et al. *Inferring Migrations: Traditional Methods and New Approaches Based on Mobile Phone, Social Media, and Other Big Data.* Brussels: European Commission, 2016. 41 p. DOI: 10.2767/61617

21. Bogdanov M.B., Smirnov I.B. Opportunities and limitations of digital traces and machine learning methods in sociology. *Monitoring obshchestvennogo mneniya: ekonomicheskie i sotsial'nye peremeny=Monitoring of Public Opinion: Economic and Social Changes,* 2021, no. 1, pp. 304–328. DOI: 10.14515/monitoring.2021.1.1760 (in Russian).

22. Zamyatina N., Yashunsky A. Migration cycles, social capital and networks. A new way to look at Arctic mobility. In: *New Mobilities and Social Changes in Russia's Arctic Regions.* London and New York: Routledge, 2017. Pp. 59–84. DOI: 10.4324/9781315640471

23. Smirnov A.V. The Arctic population: Dynamics and centers of the settlement system. *Arktika i Sever=Arctic and North,* 2020, no. 40, pp. 270–290. DOI: 10.37482/issn2221-2698.2020.40.270 (in Russia).

24. Skuf'ina T.P., Baranov S.V. Specific of population's consumption: The trail of arctic residents in Sberbank big data. *Problemy razvitiya territorii=Problems of Territory's Development,* 2020, no. 6(110), pp. 21–34. DOI: 10.15838/ptd.2020.6.110.2 (in Russia).

25. Lazer D., Radford J. Data ex Machina: Introduction to big data. *Annual Review of Sociology*, 2017, vol. 43(1), pp. 19–39. DOI: 10.1146/annurev-soc-060116-053457

26. Kitchin R. Big Data, new epistemologies and paradigm shifts. *Big Data & Society*, 2014, vol. 1(1), pp. 1–12. DOI: 10.1177/2053951714528481

27. Zamyatina N.Yu., Pilyasov A.N. *Rossiiskaya Arktika: K novomu ponimaniyu protsessov osvoeniya* [The Russian Arctic: Toward a New Understanding of Development Processes]. Moscow: LENAND, 2018. 400 p.

28. Leksin V.N. Systemic causes and consequences of spatially mediated depopulation. *Region: ekonomika i sotsiologiya=Region: Economics and Sociology,* 2021, no. 2(110), pp. 101–134. DOI: 10.15372/REG20210205 (in Russian).

29. Fauzer V.V., Lytkina T.S., Fauzer G.N. Features of population settlement in the arctic zone of Russia. *Arktika: ekologiya i ekonomika=Arctic: Ecology and Economy,* 2016, no. 2 (22), pp. 40–50 (in Russian).

30. Stjernberg M., Penje O. *Population Change Dynamics in Nordic Municipalities – Grid Data as a Tool for Studying Residential Change at Local Level.* Stockholm: Nordregio, 2019. 44 p. DOI: 10.30689/R2019:1.1403-2503

31. Ahmad I., Flanagan R., Staller K. Increased internet search interest for GI symptoms may predict COVID-19 cases in US hotspots. *Clinical Gastroenterology and Hepatology*, 2020, vol. 18, issue 12, pp. 2833–2834. DOI: 10.1016/j.cgh.2020.06.058

32. Mathieu E., Ritchie H., Ortiz-Ospina E. et al. A global database of COVID-19 vaccinations. *Nature Human Behaviour*, 2021, vol. 5, pp. 947–953. DOI: 10.1038/s41562-021-01122-8

33. Vishnevskii A.G. *Demograficheskaya istoriya i demograficheskaya teoriya* [Demographic History and Demographic Theory]. Moscow: Izd. dom Vysshei shkoly ekonomiki, 2019. 368 p.

34. Jungsberg L., Turunen E., Heleniak T. et al. *Atlas of Population, Society and Economy in the Arctic*. Stockholm: Nordregio, 2019. 80 p. DOI: 10.30689/WP2019:3.1403-2511.

35. Zamyatina N.Yu., Pilyasov A.N. A new interdisciplinary area of study: Arctic regional science. *Region: ekonomika i sotsiologiya=Region: Ekonomika i Sotsiologiya,* 2017, no. 3(95), pp. 3−30. DOI: 10.15372/REG20170301 (in Russian).

36. Aburto J.M., Schöley J., Kashnitsky I. et al. Quantifying impacts of the COVID-19 pandemic through life-expectancy losses: A population-level study of 29 countries. *International Journal of Epidemiology*, 2021, pp. 1−12. DOI: 10.1093/ije/dyab207

37. Sleptsov A.N., Potravnaya E.V. Impact of the coronavirus pandemic on the life of Arctic regions in population estimates. *Sotsiologicheskie issledovaniya=Sociological Studies,* 2020, no. 7, pp. 144−147. DOI: 10.31857/S013216250009621-6 (in Russian).

38. Danilova I.A. Morbidity and mortality from COVID-19. The problem of data comparability. *Demograficheskoe obozrenie=Demographic Review,* 2020, no. 7 (1), pp. 6−26. DOI: 10.17323/demreview.v7i1.10818 (in Russian).

39. Shabunova A.A., Natsun L.N. Children of the pandemic: Health of infants born in 2020. *Sotsial'noe prostranstvo=Social Area,* 2020, vol. 6, no. 5. DOI: 10.15838/sa.2020.5.27.1 (in Russian).

40. Fauzer V.V., Lytkina T.S. Migration processes in the Russian North. *Sotsial'naya politika i sotsiologiya=Social Policy and Sociology,* 2017, vol. 16, no. 1(120), pp. 141−149. DOI: 10.17922/2071-3665-2017-16-1-141-149 (in Russian).

41. Ryazantsev S.V., Molodikova I.N., Bragin A.D. The effect of Covid-19 on labour migration in the CIS. *Baltiiskii region=Baltijskij Region,* 2020, vol. 12, no. 4, pp. 10−38. DOI: 10.5922/2079-8555-2020-3-2 (in Russian).

42. Logunov D. et al. Safety and efficacy of an rAd26 and rAd5 vector-based heterologous prime-boost COVID-19 vaccine: An interim analysis of a randomised controlled phase 3 trial in Russia. *The Lancet*, 2021, vol. 397 (10275), pp. 671−681. DOI: 10.1016/S0140-6736(21)00234-8

43. Nogrady B. Mounting evidence suggests Sputnik COVID vaccine is safe and effective. *Nature*, 2021, vol. 595, pp. 339−340. DOI: 10.1038/d41586-021-01813-2

44. Rybakovskii L.L., Savinkov V.I., Kozhevnikova N.I. Features of demographic development in Russia: Past, present, future. *Sotsial'no-trudovye issledovaniya=Social and Labor Research,* 2021, no. 43(2), pp. 132−143. DOI: 10.34022/2658-3712-2021-43-2-132-143

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GLOBAL EXPERIENCE

The Institutional Aspect of German Family Policy: Lessons for Russia in the Context of National Projects*

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Abstract. Breaking out of a demographic trap is a priority of national policy in Russia. To achieve this goal, the national project "Demography" was adopted. The purpose of our study is to review current trends in European family policy in the case of Germany and to identify opportunities for applying foreign experience in improving the provision of institutional support to family policy in the Russian Federation. In our work, we use methods of institutional and statistical analysis. Unlike the studies of other authors, our own assessment of the effectiveness and sufficiency of expensive measures being developed in Russia is based on an institutional analysis that we conduct so as to reveal trends in European family policy on the example of Germany, which is characterized by an institutional logic of family policy similar to Russia. Family policy in Germany is based on increasing public spending on the creation of a developed system of social infrastructure. Both countries focus on increasing the birth rate and the development of social infrastructure that allows women not to abandon their career; but it is assumed that for Russia, the relevant implications will be more significant. As a result of accelerated construction of kindergartens in major agglomerations of Germany, an increase in the birth rate is demonstrated. However, this effect is mostly caused by the migration wave of 2015, while immigrants are insensitive to the measures being implemented. In addition, this leads to an outflow of population from other regions. The significance of the article lies in the fact that the consideration of the contradictions between various courses of family policy in Germany over the past 20 years has revealed the possibilities of using foreign experience in improving the institutional support of family policy in Russia. Based on the analysis we carried out, and taking into consideration the experience of Germany, we propose recommendations in the field of socio-economic policy that can specify the parameters of the national project "Demography" in terms of taking into account regional demographic situation.

Key words: family policy, birth rates, institutional birth control, discrete institutional alternatives, national project "Demography".

Introduction

One of the key strategic goals of Russia's national development, announced by the President of the Russian Federation during his Address to the Federal Assembly in 2020, is to get out of the "demographic trap"[1]. For its implementation, the Russian Federation has adopted the national project "Demography", designed to ensure "saving the population" and give a long-term impetus to economic development through investments in human capital. But, according to V.K. Faltsman: "The national project "Demography" provides for an expensive set of measures to stimulate the birth rate and the duration of active life in the period through to 2024. But only these measures are not enough to contain depopulation" [1, p. 7].

For instance, already in October 2020, the Government of the Russian Federation has updated the population forecast. According to it, by 2024, the number of Russians is expected to decrease by 1.2 million people[2]. Such a decline, according to Russian scientists, has both a purely demographic [2] and an institutional basis [3]. The latter was defined in January 2021 by Vladimir Putin at the World Economic Forum in Davos as a "value

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[1] Address of the President of the Russian Federation to the Federal Assembly. Official website of the President of Russia. Available at: http://kremlin.ru/events/president/news/62582 (accessed: April 22, 2020).

[2] The government has worsened the forecast for the decline of the Russian population. *Interfaks*. Available at: https://www.interfax.ru/russia/731734 (accessed: October 16, 2020).

crisis", which turns into negative demographic consequences, due to which humanity risks losing entire civilizational and cultural continents"[3].

Currently, non-traditional family relationships are indeed gaining popularity in the world; there is a gradual deinstitutionalization of marriage [4]. Broadly speaking, deinstitutionalization means the stratification of an institution [5], in which the erosion of norms and rules is fixed in terms of their impact on various social strata. The deinstitutionalization of marriage in European countries has led to the fact that the "old" forms of family relations have lost their dominant positions and uncompromising directives.

In this regard, the Russian Federation remains a "reserve" of old family values [6], but continues experiencing threats of depopulation[4]. The pandemic of the new coronavirus infection COVID-19 has exposed the problems of the family institute in Russia especially acutely. As O.G. Isupova notes, in the light of a sharp change in the "daily routine", Russian families may face many problems, which can aggravate the already unstable demographic situation [7].

Against the background of familiar and new challenges to the reproduction of the Russian population, the authorities are converting the institution of marriage in constitutional amendments, taking unprecedented measures in recent history to support families and fertility [8]. At the same time, in a number of European countries with demographic problems similar to Russia, many of the measures, proposed by the President and the Government of the Russian Federation to support marriage and fertility, have already been implemented, and have led to contradictory results.

For example, in Germany, where family care is laid down in Article 6.1 of the Constitution, since the beginning of the 21st century, an almost complete list of family policy measures, proposed by the Russian government, has been implemented [9], but already in 2019 there was a significant decrease in the fertility rate (the increase was only 0.6%). Also in 2020, there was a decline in the number of working-age population by 0.9%, in particular, in Thuringia, Saxony, Saxony-Anhalt, Brandenburg, Mecklenburg-Vorpommern, every fifth employee was over 55 years old[5].

The purpose of the research is to review the current trends of European family policy in the case of Germany, and identify opportunities to use foreign experience in improving the institutional support of family policy in Russia. Based on this goal, the objectives of the study are: 1) to review the specifics of the German version of implementing family policy in the context of the household economic theory from the standpoint of institutional strengthening of infrastructural and financial support for families with children; 2) to consider the results of the demographic transition in German family policy; 3) to disclose contradictions and possible lessons of the German experience for Russian family policy.

Methodological foundations of institutional analysis of family policy

The fundamental foundations of the family policy are based on two concepts existing within the framework of the new economics of the family: traditional (Beckerian [10]) and transactional approaches [11].

The traditional approach does not look inside the "black box" of intra-family relations allowing for the absolute rationality of demographic behavior.

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[3] Vladimir Putin's speech at the Davos Forum. Full text. *Vesti*. Available at: https://www.vesti.ru/article/2515983 (accessed: January 27, 2021).

[4] Demographic crisis is an obstacle to Russia's modernization. *Golos Ameriki*. Available at: https://www.golos-ameriki.ru/a/russia-demografics-2010-08-13-100662344/187369.html (accessed: April 22, 2020).

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[5] So gefährlich ist der demografische Wandel für Deutschland. *WELT*. Available at: https://www.welt.de/wirtschaft/video205270927/Sinkende-Geburtenrate-So-gefaehrlich-ist-der-demografische-Wandel-fuer-Deutschland.html (accessed: January 20, 2020).

In this context, the family policy should not restrict the freedoms of the marriage market, as well as the households' rights to childlessness. With the transactional approach, in turn, family and marriage become an institutionalized form of a "relational" contract with characteristic features: regular interaction of partners in marriage and the presence of family capital (marital-specific capital), which reduces the risks of divorce. Therefore, the transactional approach has more explanatory power, allows considering the transformation processes of family relations [12] and the emergence, in addition to traditional marital relations, of marriage-like unions (cohabitation or "civil marriages") [13].

Many of these forms find their place in the institutional environment of European countries. Thus, the "value crisis" in recent history is associated with the emergence of new discrete institutional alternatives [14] to family policy. If in Russia and a number of Eastern European states there are no marriage rights and obligations, established by law, then in France and Germany such unions have received a legal status. In particular, in Germany, since 2005, the norm of the Social Code (Zweite Buch Sozialgesetzbuch) has been in force, according to which members of marriage-like unions forming "consumer communities" (Bedarfsgemeinschaft) can enter into partnership agreements on the use of property. In terms of this, the main alternative to the family policy is associated with "defamilization" [15].

One of the key signs of defamilization was the adoption in 2008 of a special law on demographic support − Kinderförderungsgesetz 2008 [16; 17], which aims to open women's access to the labor market through the development of various organizational forms of child rearing and caring for them (designated as "Kita"). We are talking primarily about investments in the construction of kindergartens (Kindergarten) and the development of other institutional forms that implement the functions of supervision (Aufpassung) and care (Betreuung) [18]

for children. For instance, according to the German statistical office, 93% of children aged 3 to 5 years receive some kind of supervision in Kita, and the number of such structures is 56,700[6].

According to the data of the Federal Ministry for Family Affairs, senior citizens, women and youth of Germany, in the period from 2007 to 2014, about 5.4 billion euros were financed for the construction and maintenance of child care infrastructure [19], which led to the creation of 780 thousand places in kindergartens [20, p. 92].

Despite a number of efforts to expand the role of "fatherhood" in the upbringing of children, as well as the existence of legislative and institutional incentives to participate in the upbringing of children, in Germany, there are not enough conditions that let men combine fatherhood and career. According to a study by C. Zerle and I. Krok, 68% of young fathers are still unable to take advantage of parental leave due to difficulties with reducing the number of working hours, although the willingness not only to bear financial responsibility for the family well-being, but also to pay more attention to communicating with children is rated quite high [21].

From the point of view of the "Eurosceptics", the neoliberal-feminist concept of "an educated and career-oriented woman with great employment", which opposes "the image of a woman as a mother and keeper of the hearth", is negative for high-quality family policy: it leads to the fact that young girls begin looking at children as a "dead weight" that hinders career growth. This is explained, in particular, by the reaction of "Eurosceptics" to the transformation of family policy in Germany: from a conservative model to a more sustainability-oriented and inclusive (in the "Scandinavian style"), which is characterized as "egalitarian and gender-sensitive".

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[6] Kindertagesbetreuung. *Statistisches Bundesamt*. Available at: https://www.destatis.de/DE/Themen/Gesellschaft-Umwelt/Soziales/Kindertagesbetreuung/_inhalt.html (accessed: April 13, 2020).

As a result of the "value crisis", mother's age at the birth of the first child is constantly increasing; every fifth woman refuses to have children; the number of young children brought up with minimal mother's participation is constantly growing; the number of single mothers is increasing; large families are socially unprotected, parents of newborn children are forced to take "an additional burden to feed the family" [22, p. 54].

Despite the signs of the "value crisis" in Germany [23], family policy, according to German scientists, can be considered as real practices of supporting the traditional family [24]. For example, structural alternatives to family policy in Germany may be associated with "refamilization", when a woman implements the traditional priority family function of a mother associated with the principle of "three K" (Kinder, Küche, Kirche – children, kitchen, church), receiving through social policy measures the opportunity to engage in a household in a market environment and provide effective socialization for children. Also, we should note that the emphasis on "child production" contradicts the value-cultural attitudes and practices of developed countries [25]. This casts doubt on the possibility of realizing the goal of increasing the total birth rates, creating opportunities only to maintain them in certain countries, in particular France, Sweden, Finland and others [26, p. 119].

The results of the analysis of the demographic change in Germany family policy

According to the Esping-Andersen approach, variations of family policy, as a component of variations of welfare states, are divided into three types: liberal, conservative and social democratic (Scandinavian) [27]. M. Bujard noted: "Family policy for welfare states will play a key role in the next decade, since its instruments such as child benefits (Kindergeld), benefits for parents (Elterngeld), infrastructural measures (Kinder-betreuung) simultaneously support different goals, namely the fight against poverty, education, justice,

participation in the labor market and birth rate growth" [25].

The discussion about the complementarity of the goals of family policy in a number of European countries indicates the inconsistency of the results. Some authors adhere to a skeptical position [28], others note a positive relationship between family policy and childbearing [29]; a number of authors [24; 30] testify to the ambiguity of such relationships. In our opinion, in addition to the factors of contributing the "value crisis" affecting the falling birth rates in Western countries, we can note the specific factors that have arisen in the last decade that cause additional difficulties in implementing family policy, in particular, refamilization, political and migration factors.

Refamilization is primarily explained by the negative dynamics of the indicators of the total fertility rates (TFR) over the previous 50 years. The relationship between family policy and the TFR allowed talking about "demographic change", in which the largest increase in the birth rate is typical of large cities. This conclusion contradicts the traditional notions of a high birth rate in rural areas in relation to urban agglomerations. Its highest level is demonstrated by Frankfurt am Main, Munich and Berlin, where the TFR values are higher than the national average (amounting to 22.8 children per 1000 women[7]). The birth rates of East German Leipzig are so high that they allow talking about a "new style" of urban life, where children have also become natural for urban identity[8].

The conservative family policy of the right-wing political forces is connected with two circumstances. First, we are talking about the growing Islamic

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[7] Hohe Geburtenrate: Warum unsere Großstädte einen Babyboom erleben, in: Die Welt vom 2.5.2016. *WELT*. Available at: www.welt.de/vermischtes/article154937473/Warum-unsere-Grossstaedte-einen-Babyboom-erleben.html (accessed: April 21, 2020).

[8] New Berlin'or Not, Leipzig Has New Life, in: New York Times published 2.9.2014. *The New York Time*s. Available at: www.nytimes.com/2014//07/travel/new-berlin-or-not-leipzighas-new-life.html (accessed: April 21, 2020).

immigration to Europe. The number of Muslims in the period from 2011 to the end of 2016 increased by 1.2 million people and amounted to 4.4 to 4.7 million people, or approximately 5.4 to 5.7% of the German population. According to demographers' estimates, which are given in the documents of the political party "Alternative for Germany" (AfD), by 2060 the population of the country will decrease from 81 to 65−70 million people. Second, the concern is connected with the understanding that the indigenous population of the continent at the moment can hardly compete with the Muslim community in terms of the birth rate even on its own territory. So, in modern Europe (EU, Norway, Switzerland), the proportion of Muslims is about 4.9% of the population. By 2050, it may increase to 11%, and in Germany the number of Muslims

may reach 16−18 million people and lead to the existence of a "parallel" Muslim society [31, p. 113].

This increase in the share of the Muslim population is explained by two circumstances: a) the relative youth of the average age of Muslims (31 years compared to 47 years for the non-Muslim population); b) the difference in total fertility rates between "traditional" German and Muslim families: on average, the ratio of coefficients is 1.4 to 1.9 in favor of German residents of Muslim origin[9].

The dynamics of total birth rates in Germany is shown in *Figure 1*.

This situation is typical for many other Western European countries. For example, in the UK, the ratio gap in birth rates is more noticeable: the average Muslim woman has 2.9 children at the fertile age, and the British woman has 1.8.

Figure 1. Dynamics of total birth rates in Germany for the indigenous population and immigrants in 1991–2019, births per woman of fertile age

According to to: Federal Statistical Office data, Wiesbaden 2020.

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9 Anteil der Muslime in Deutschland steigt auch ohne Migration. *Der Spiegel*. Available at: https://www.spiegel.de/politik/ausland/deutschland-anteil-der-muslime-steigt-laut-pew-studie-auch-ohne-migration-a-1181018.html (accessed: April 12, 2020).

Estimated differences in birth rates between the conventionally Islamic and traditionally European part of the German population contribute to the aggravation of the ideological contradictions of the "Eurosceptics" with the policy of multiculturalism, which has become widespread among the neoliberal part of the German socio-political elite.

It is worth noting that the measures of the 2008 law did not fully manifest themselves also due to the financial and economic crisis of 2008–2009, which primarily affected youth unemployment and, thereby, the life plans of some households. In general, according to M. Klein and his co-authors, it is still too early to state unequivocally "the causal relationship between the turn in family policy and the demographic turn". Moreover, birth rates in Germany are still lower than in other European countries, among which the UK stands out as the leader, where the number of births per thousand inhabitants ranged from 11.5 to 13 from 2000 to 2014 (in Germany during the same period, the value was in the range from 8 to 9 newborns per thousand inhabitants) [17, p. 689].

Can Russia learn a lesson?

Thus, as the article shows, the existing mechanisms of family policy in Germany poorly correlate with the mechanisms of institutional strengthening of the traditional family and are largely determined by exogenous factors. The German authorities declare support for traditional family values, but at the same time, implement a costly gender-sensitive model of family policy, aimed at creating favorable conditions for marriage-like unions. Moreover, the support of traditional families demonstrating a high birth rate has faded into the background. In view of this, the increase in government spending on the creation of a developed system of social infrastructure Kita does not lead to demographic growth and is political in nature.

The actual drivers of natural population growth in Germany today are migration processes and a high birth rate among the Islamic population.

However, focusing on the overall increase in total fertility rates leads to the conclusion of a "demographic transition", the characteristic of which is the relative increase in fertility in urban agglomerations in relation to rural areas. This contradicts scientifically established patterns causing the German authorities to lose sight of the real demographic situation.

Russia repeats the German mistake with regard to the lack of consideration of regional specifics and orientation toward increasing quantitative indicators of fertility. The target indicators, provided for in the national project "Demography", assume an increase in total fertility rates. However, the documents do not take into account the institutional features of birth control in the entities of the Russian Federation, as well as interregional migration processes. At the same time, as the analysis, carried out by the authors in another article, shows, in response to the "Beckerian" family reacting to the economic incentives of demographic policy, it is advantageous for the state from a pro-natalist position to bet on increasing income and reducing poverty for all types of households; in the case of the predominance of traditional families, to focus on values at the birth of children [32].

The creation of the social infrastructure, envisaged by the national project in the regions of the Russian Federation, will not be able to eliminate differences in the socio-economic conditions of the birth and upbringing of children, which is manifested, in particular, in significant differences in measures to support families with children in the Russian regions [33]. For instance, the creation of kindergartens and their maintenance in the Russian Federation refers to issues of local importance, which implies inequality in the opportunities of rural territories and urban agglomerations. This basis is an important factor in strengthening intramigration processes. As a result, there are demographic risks similar to Germany of depopulation of individual territories, as well as an

increase in the birth rate in large agglomerations. In turn, the growth of urban agglomerations leads to the complication of the marriage market and the stratification of the institution of marriage under the influence of the intersection of many cultural and value norms. In such conditions, modern forms of family relations are spreading offering simpler and faster ways to create and build a family that differs from the traditional one. Consequently, the Russian "reserve" of traditional family values risks getting provincial status according to the German scenario.

Summing up, we should note: in our opinion, from an institutional point of view, in order to increase the effectiveness of family policy, both in the direction of increasing the Russians' incomes and reducing poverty, and increasing the birth rate, a "fine-tuning" of regional demographic development programs is necessary, since at the moment there is virtually no regional policy [32]. At the same time, development policy should not be limited exclusively to measures to stimulate fertility (including without taking into account the marriage factor), the ambiguity of which is emphasized in modern studies [34], a broader comprehensive view of demographic processes is required, consisting in a greater targeting of support for families with children from the point of view of human capital development in family households [35]. In this regard, the scientific support of family policy from the position of an evidence-based approach is seen as promising, which allows identifying both the shortcomings of the existing policy and justifying potential management decisions through the use of tools such as "big data" and machine learning.

References

1. Faltsman V.K. Russia: Growth factors in the framework of the global economy. *Sovremennaya Evropa= Contemporary Europe*, 2020, no. 1, pp. 5−13 (in Russian).

2. Rybakovsky O.L. Russian population reproduction: Challenges, trends, factors and possible results by 2024. *Narodonaselenie=Population*, 2020, no. 1 (23), pp. 53−66 (in Russian).

3. Kapoguzov E.A., Chupin R.I., Kharlamova M.S. Russian constitutional conversion in the context of deinstitutionalization of marriage in the USA. *Journal of Institutional Studies*, 2020, no. 2 (12), pp. 86−99 (in Russian).

4. Kapoguzov E.A., Chupin R.I., Kharlamova M.S. Institutionalized arenas of marriage games. *Journal of Institutional Studies*, 2019, no. 4 (11), pp. 26−39 (in Russian).

5. Cherlin A.J. The deinstitutionalization of American marriage. *Journal of Marriage and Family*, 2004, no. 4 (66), pp. 848−861.

6. Mironova A.A., Prokofieva L.M. Family and household in Russia: The demographic aspect. *Demograficheskoe obozrenie=Demographic Review*, 2018, no. 2 (5), pp. 103−121 (in Russian).

7. Isupova O.H. New problems of Russian families in the context of the COVID-19 pandemic. *Population and Economics,* 2020, no. 2(4), pp. 81−83.

8. Kapoguzov E.A., Chupin R.I. Economic mechanisms of family policy in Russia in the context of the COVID-19 pandemic. *Voprosy regulirovaniya ekonomiki=Journal of Economic Regulation*, 2021, no. 12 (3), pp. 26−43. DOI: 10.17835/2078-5429.2021.12.3.026-043 (in Russian).

9. Demkina E.V. Family and child support programs in Germany. *Science of Europe*, 2019, no. 35, pp. 72−75 (in Russian).

10. Becker G.S. *A Treatise on the Family*. London: Harvard University Press, 1993. 304 p.

11. Pollak R.A. A transactional cost approach to families and households. *Journal of Economic Literature,* 1985, no. 2 (23), pp. 581−605.

12. Cherlin A.J. Degrees of change: An assessment of the deinstitutionalization of marriage thesis. *Journal of Marriage and Family,* 2020, no. 1 (82), pp. 62−80.

13. Bumpass L.L., Raley R.K. Redefining single-parent families: Cohabitation and changing family reality. *Demography,* 1995, no. 1 (32), pp. 97–109.

14. Shastitko A.E. Choosing between discrete institutional alternatives: What do we compare? *Obshchestvennye nauki i sovremennost'=Social Science and Contemporary World*, 2016, no. 4, pp. 134–145 (in Russian).

15. Noskova A.V. Family policies in Europe: Evolving models, discourses and practices. *Sotsiologicheskie issledovaniya=Sociological Studies*, 2014, no. 5, pp. 56–67 (in Russian).

16. Del Boca D., Flinn C., Wiswall M. Household choices and child development. *The Review of Economic Studies,* 2014, no. 1 (81), pp. 137–185.

17. Klein M., Weirowski T., Künkele R. Geburtenwende in Deutschland – was ist dran und was sind die Ursachen? *Wirtschaftsdienst,* 2016, vol. 96, pp. 682–689.

18. Huesken K. *Kita vor Ort: Betreuungsatlas auf Ebene der Jugendamtsbezirke 2010.* Munich: Deutsches Jugendinstitut eV Abteilung Kinder und Kindertagesbetreuung, 2011. 29 p.

19. *BMFSFJ Erster bis Vierter Zwischenbericht zur Evaluation des Kinderförderungsgesetzes, Bundesministerium für Familie, Senioren, Frauen und Jugend.* Berlin: 2013. 49 p.

20. Sazonova P.V. Seeking a balance: The transformation of gender as a response to the shifts in the state family policy (a case of Germany). *Vestnik Tomskogo gosudarstvennogo universiteta=Tomsk State University Journal*, 2015, no. 400, pp. 88–99 (in Russian).

21. Zerle C., Krok I. Fathers put to the test. Family experiment. In: *Deutsches Jugendinstitut Bulletin*. München, 2010. 24 p.

22. Gribovskii V.S. German, Austrian and Swiss eurosceptics' views on family issues. *Nauchno-analiticheskii vestnik Instituta Evropy RAN=Scientific and Analytical Herald of the Institute of Europe RAS*, 2019, no. 3(9), pp. 54–58 (in Russian).

23. Noskova A.V. Choice as a new principle of family policy in the context of pluralization of family practices. *Materialy Afanas'evskikh chtenii=Materials of the Afanasiev Readings*, 2015, no. 13, pp. 307–312 (in Russian).

24. Kaufmann F-X. *Schrumpfende Gesellschaft. Vom Bevölkerungsrückgang und seinen Folgen.* Frankfurt/Main: Suhrkamp, 2005. 270 p.

25. Bujard M. *Familienpolitik und Geburtenrate: Ein internationaler Vergleich, Bundesinstitut für Bevölkerungsforschung.* Wiesbaden, 2011. 46 p.

26. Noskova A.V. New approaches in family policy in the context of changing social realities. *Sotsial'naya politika i sotsiologiya=Social Policy and Sociology*, 2016, no. 5 (118), pp. 117–126 (in Russian).

27. Esping-Andersen G. *Why We Need a New Welfare State*. Oxford University Press, 2002. 244 p.

28. Höhn Ch., Ette A., Ruckdeschel K. *Kinderwünsche in Deutschland. Konsequenzen für eine nachhaltige Familienpolitik*. Stuttgart: Robert Bosch Stiftung & BIB, 2006. 86 p.

29. Rürup B., Schmidt R. *Nachhaltige Familienpolitik im Interesse einer aktiven Bevölkerungspolitik*. Berlin: BMFSFJ, 2003. 66 p.

30. Gauthier A.H. The impact of family policies on fertility in industrialized countries: A review of the literature. *Population Research and Policy Review,* 2007, no. 3 (26), pp. 323–346.

31. Andreeva L.A. Islamization of Germany: "Parallel" Muslim society vs. secular state. *Sovremennaya Evropa=Contemporary Europe*, 2019, no. 5, pp. 110–121 (in Russian).

32. Kapoguzov E.A., Chupin R.I., Kharlamova M.S. Assessment of family policy achievements in income increase and poverty decrease in Russia. *Voprosy upravleniya=Management Issues*, 2021, no. 4, pp. 108–122 (in Russian).

33. Kapoguzov E.A., Chupin R.I., Kharlamova M.S. Family policy narratives in Russia: Focus on regions. *Journal of Economic Regulation,* 2020, vol. 11, no. 3, pp. 6–20 (in Russian).

34. Latov Yu.V. (2021). Human capital growth contra birth rate growth. *Journal of Institutional Studies,* 2021, vol. 13 (2), pp. 82–99 (in Russian).

35. Kapoguzov E.A., Chupin R.I. Effectiveness of family policy in Russia: Evidence-based approach. *Terra Economicus*, 2021, no. 19 (3), pp. 20–36 (in Russian).

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Public Opinion Monitoring
of the State of the Russian Society

As in the previous issues, we publish the results of the monitoring of public opinion concerning the state of the Russian society. The monitoring is conducted by VolRC RAS in the Vologda Oblast[1].

The following tables and graphs show the dynamics of several parameters of social well-being and socio-political sentiment of the region's population according to the results of the latest "wave" of the monitoring (December 2021) and for the period from February to December 2021 (the latest six polls, that is, almost a year).

We compare the results of the surveys with the average annual data for 2000 (the first year of Vladimir Putin's first presidential term), 2007 (the last year of Vladimir Putin's second presidential term, when the assessment of the President's work was the highest), 2011 (the last year of Dmitri Medvedev's presidency), and 2012 (the first year of V. Putin's third presidential term).

We also provide yearly dynamics of the data for 2018−2020[2].

In October − December 2021, the level of approval of the RF President's work did not change significantly. The share of positive assessments is 51−52%. The proportion of negative assessments is 33−34%.

Over the latest six polls (February − December 2021), the share of negative judgments about the work of the head of state has slightly increased (by 3 p.p., from 31 to 34%)[3]. The proportion of positive assessments has not changed (50−51%).

The level of approval of the work of the Chairman of the RF Government in February − December 2021 was 38%; the level of approval of the work of the head of the region − 36%.

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[1] The polls are held six times a year in Vologda, Cherepovets, and in eight districts of the oblast (Babayevsky District, Velikoustyugsky District, Vozhegodsky District, Gryazovetsky District, Kirillovsky District, Nikolsky District, Tarnogsky District and Sheksninsky District). The method of the survey is a questionnaire poll by place of residence of respondents. The volume of a sample population is 1,500 people 18 years of age and older. The sample is purposeful and quoted. The representativeness of the sample is ensured by the observance of the proportions between the urban and rural population, the proportions between the inhabitants of settlements of various types (rural communities, small and medium-sized cities), age and sex structure of the Oblast's adult population. Sampling error does not exceed 3%.

More information on the results of VolRC RAS polls is available at http://www.vscc.ac.ru/.

[2] In 2020, four "waves" of the monitoring were conducted. Surveys in April and June 2020 were not conducted due to quarantine restrictions during the spread of COVID-19.

[3] Hereinafter, the results of a comparative analysis of the data from the survey conducted in December 2021, and the results of a last-year monitoring "wave", conducted in February 2021, are given in the frame.

How do you assess the current performance of..? (% of respondents)

Answer option	Dynamics of average annual data								Dynamics of the data for the latest 6 surveys						Dynamics (+/–), Dec. 2021 to Feb. 2021
	2000	2007	2011	2012	2018	2019	2020	2021	Feb. 2021	Apr. 2021	June 2021	Авг. 2021	Oct. 2021	Dec. 2021	
RF President															
I approve	66.0	75.3	58.7	51.7	66.4	55.6	52.3	51.5	50.1	52.1	52.5	51.6	51.9	50.6	+1
I disapprove	14.8	11.5	25.5	32.6	21.7	29.8	32.6	32.0	30.9	31.1	30.3	32.5	33.1	33.8	+3
Chairman of the RF Government*															
I approve	-*	-*	59.3	49.6	48.0	41.1	38.7	39.9	37.6	38.8	42.2	42.7	39.7	38.3	+1
I disapprove	-	-	24.7	33.3	31.6	38.4	40.4	37.6	38.8	38.3	35.1	36.0	38.3	38.9	0
Governor															
I approve	56.1	55.8	45.7	41.9	38.4	35.7	35.0	36.7	33.9	36.3	37.8	38.6	37.5	35.9	+2
I disapprove	19.3	22.2	30.5	33.3	37.6	40.2	42.5	40.5	42.4	41.3	38.4	38.5	40.7	41.9	−1

The wording of the question: "How do you assess the current work of ...?" According to the survey technique, sampling error does not exceed 3%, so hereinafter changes with a difference of 2 p.p. are not taken into account or are considered insignificant; they are highlighted in blue in the tables. Positive changes are highlighted in green, negative changes are highlighted in red
*Included in the survey since 2008.

How do you assess the current work of the RF President?
(% of respondents, VolRC RAS data)
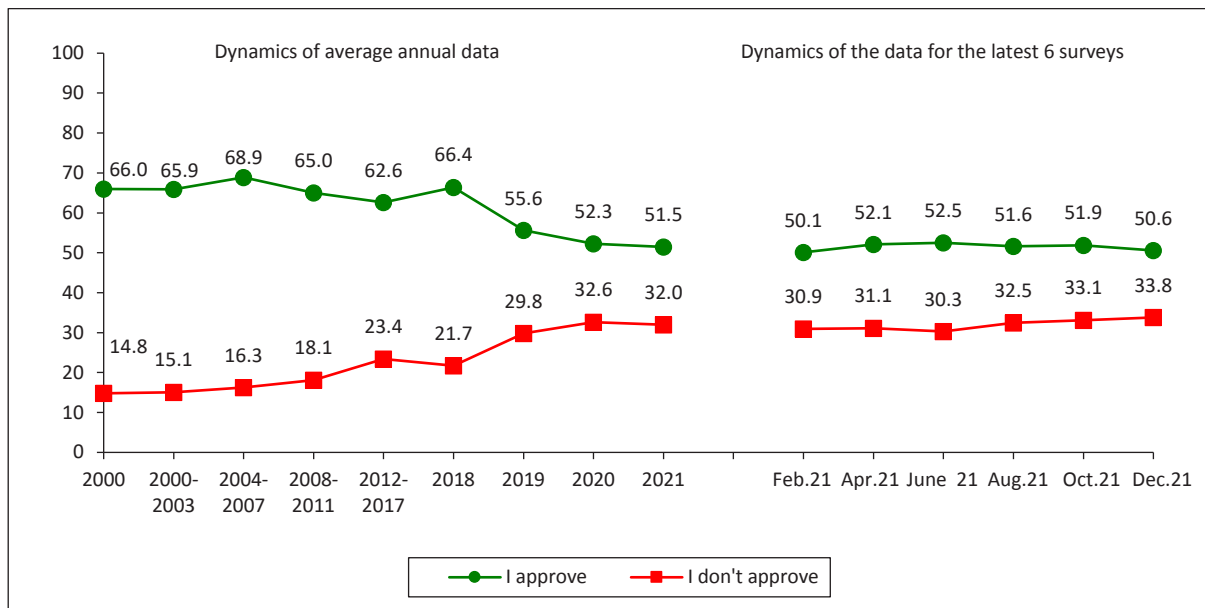
Hereinafter, all graphs show the average annual data for 2000, 2018, 2019, 2020, 2021, as well as the average annual data for the periods 2000–2003, 2004–2007, 2008–2011, 2012–2017, corresponding to the periods of presidential terms.

For reference:

According to VTsIOM, the level of approval of the RF President's work for the period from October to early December 2021 and in comparison with the beginning of the year (February) decreased by 2 p.p. (from 61 to 59%).

According to the latest data from Levada-Center*, the share of positive assessments of the President's work from October to November 2021 has decreased by 4 p.p. (from 67 to 63%); the share of negative assessments has increased by 2 p.p. (from 33 to 35%). For almost a year (from February to November 2021), the share of positive assessments of the work of the President of the Russian Federation has decreased by 2 p.p. (from 65 to 63%), the proportion of negative assessments has not changed significantly (29−30%).

In general, do you approve or disapprove of the work of the RF President? (% of respondents; VTsIOM data)
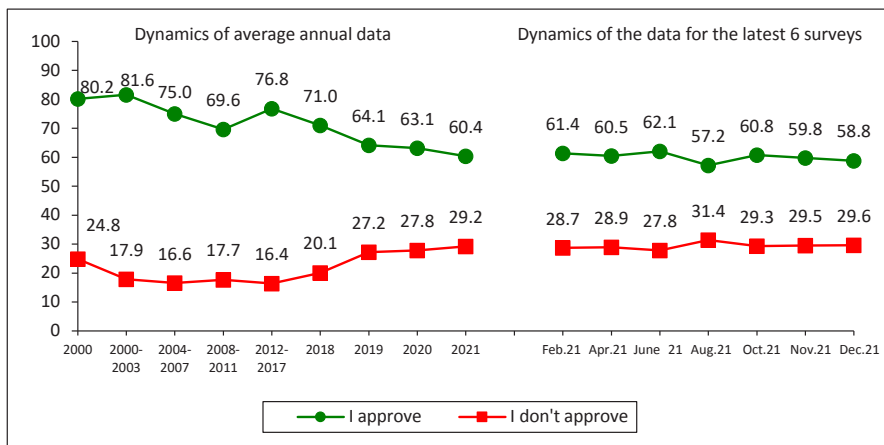
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
I approve	-2
I don't approve	+1

Question: "In general, do you approve or disapprove of the work of the President of the Russian Federation?"
Data for December 2021 – as of December 5, 2021.
Source: VTsIOM data. Available at: https://wciom.ru/

In general, do you approve or disapprove of the work of Vladimir Putin as
President of Russia? (% of respondents; Levada-Center data*)
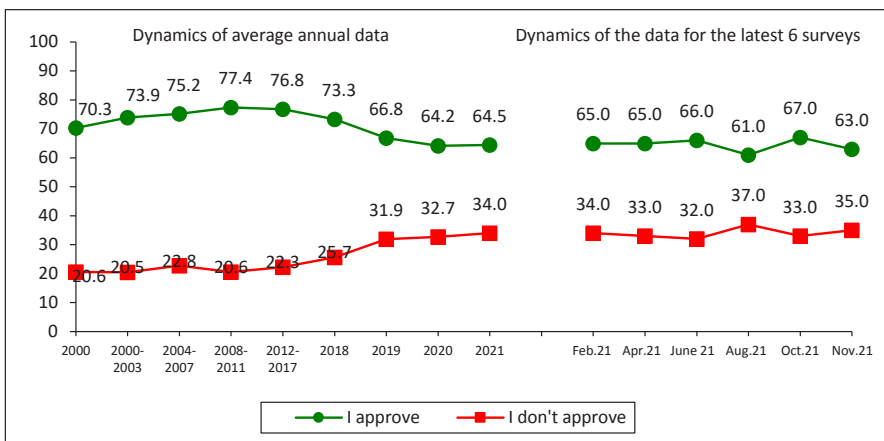
Annual dynamics (November 2021 to February 2021)	
Answer option	Dynamics (+ / −)
I approve	-2
I don't approve	+1

Question: "In general, do you approve or disapprove of the work of Vladimir Putin as President of Russia?"
Latest data – November 2021. Source: Levada-Center*. Indicators. Available at: https://www.levada.ru/indikatory/

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*   Included in the register of foreign agents.

Over the past two months, there have been no significant changes in the dynamics of assessments of the President's success in solving the country's key problems. As in October 2021:

✓ 45–46% of Vologda Oblast residents positively assess the President's efforts to strengthen Russia's international positions;
✓ 41–43% support his work aimed at restoring order in the country;
✓ 33–35% consider the President's actions to protect democracy and strengthen citizens' freedoms as successful;
✓ 27% positively assess his work to boost the economy and increase the welfare of citizens.

We should note that in October – December 2021, the share of negative judgments about Vladimir Putin's work aimed at improving the financial situation of the population decreased by 3 p.p. (from 63 to 60%). However, the proportion of those who share this opinion is still significantly higher than the share of Vologda Oblast residents who positively assess the work of the head of state in this direction (60% vs. 27).

From February to December 2021, there have been no significant changes in the dynamics of assessments of the success of the Russian President's addressing the country's key problems.

In your opinion, how successful is the RF President in coping with challenging issues?
(% of respondents; VolRC RAS data)

Strengthening Russia's international position
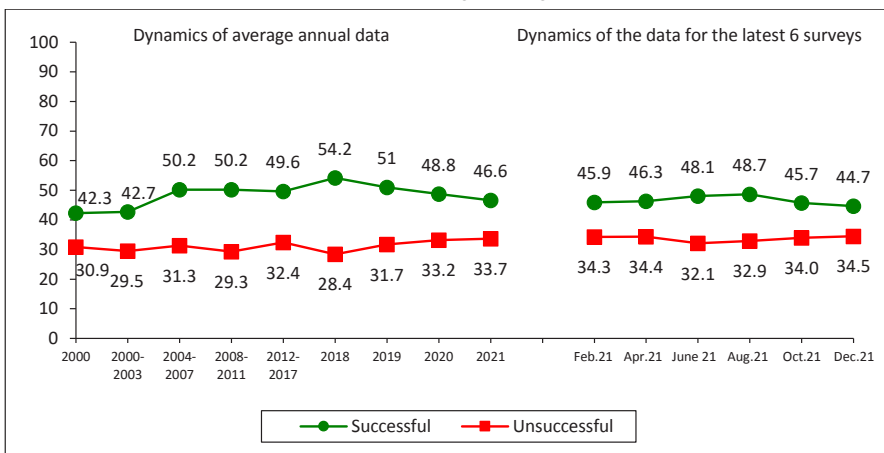
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Successful	-1
Unsuccessful	0

Imposing order in the country
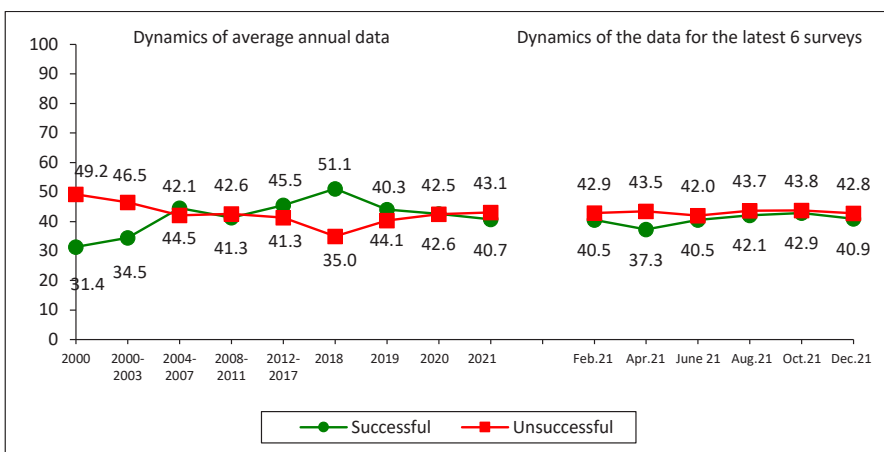
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Successful	0
Unsuccessful	0

Protecting democracy and strengthening citizens' freedoms
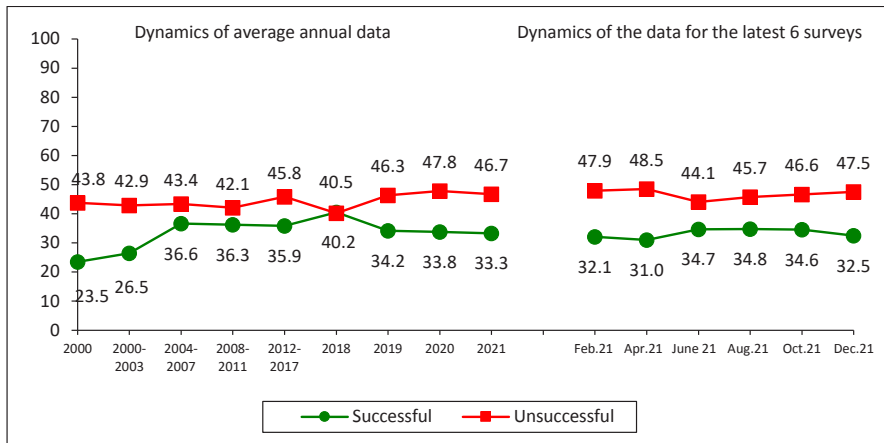
Dynamics of average annual data

Dynamics of the data for the latest 6 surveys

Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Successful	0
Unsuccessful	0

Economic recovery and increase in citizens' welfare

Dynamics of average annual data

Dynamics of the data for the latest 6 surveys
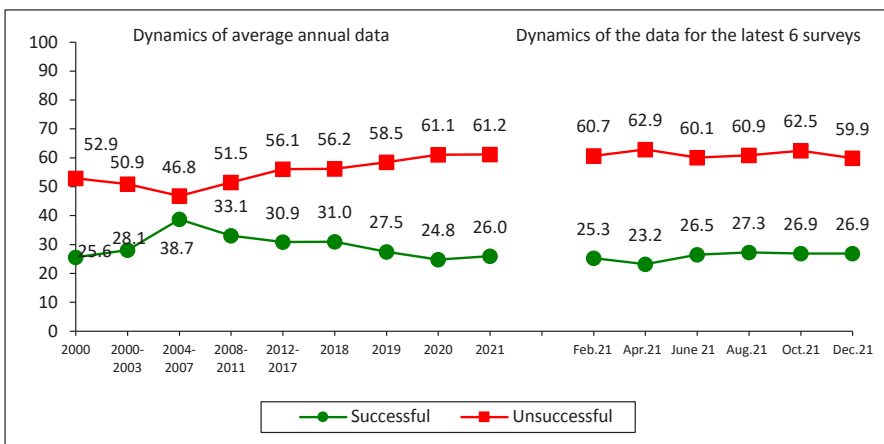
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Successful	+2
Unsuccessful	−1

There have been no changes in the structure of political preferences of the region's residents for the period from October to December 2021: the share of those whose interests are expressed by United Russia is 32−33%, KPRF and LDPR − 10−11% each, "Just Russia" − 6%.

Compared with the beginning of the year, in December we observe a slight increase in the share of Vologda Oblast residents whose interests are expressed by the Communist Party (by 3 p.p., from 8 to 11%).

Besides, from February to December 2021, the proportion of those who believe that none of the parties represented in parliament expresses their interests has significantly decreased (by 6 p.p., from 36 to 30%).

Which party expresses your interests? (% of respondents; VolRC RAS data)

Party	Dynamics of average annual data												Data dynamics for the latest 6 polls						Dynamics (+/−)
	2000	2007	2011	Election to the RF State Duma 2011, fact	2012	2016	Election to the RF State Duma 2016, fact	2018	2019	2020	2021	Election to the RF State Duma 2021, fact	Feb. 2021	Apr. 2021	June2021	Aug. 2021	Cct. 2021	Dec. 2021	Dec. 2021 to Feb. 2021
United Russia	18.5	30.2	31.1	33.4	29.1	35.4	38.0	37.9	33.8	31.5	31.7	49.8	30.5	31.5	32.1	31.7	32.7	31.9	+1
KPRF	11.5	7.0	10.3	16.8	10.6	8.3	14.2	9.2	8.8	8.4	9.3	18.9	8.3	8.7	8.1	9.3	11.1	10.5	+3
LDPR	4.8	7.5	7.8	15.4	7.8	10.4	21.9	9.6	9.1	9.5	9.9	7.6	10.1	9.9	8.5	9.9	11.2	9.9	0
Just Russia – Patriots for the Truth	-	7.8	5.6	27.2	6.6	4.2	10.8	2.9	3.4	4.7	4.7	7.5	3.6	2.6	4.1	5.3	6.3	6.0	+2
New People*	–	–	–	–	–	–	–	–	–	–	2.3	5.3	–	–	–	–	–	2.3	–
Other	0.9	1.8	1.9	–	2.1	0.3	–	0.7	0.3	0.5	0.2	–	0.2	0.1	0.1	0.2	0.5	0.2	0
None	29.6	17.8	29.4	–	31.3	29.4	–	28.5	33.7	34.2	33.9	–	35.9	36.4	35.4	34.1	31.7	29.6	-6
I find it difficult to answer	20.3	21.2	13.2	–	11.7	12.0	–	11.2	11.0	11.1	10.0	–	11.3	10.9	11.8	9.6	6.6	9.7	-2

* The New People party was elected to the State Duma of the Russian Federation for the first time following the results of the election held on September 17–19, 2021.

Over the past two months, the proportion of Vologda Oblast residents who assess their daily emotional state as positive has not changed significantly (71−72%). Meanwhile, the proportion of those who believe that "everything is not so bad and it is possible to live, it is difficult to live, but it is possible to stand it" has increased by 3 p.p. (from 77 to 80%).

In general, there has been a steady upward trend in the assessments of the social status over the year. The share of people who characterize their mood as positive increased by 12 p.p. (from 60 to 72%) from February to December. The proportion of Vologda Oblast residents with a high potential for patience has increased by 10 p.p. (from 70 to 80%).

At the same time, we do not observe any positive changes in the dynamics of self-assessments of the financial situation ether over the past two months or over the past year. The share of the region's residents who consider themselves "poor and extremely poor" is 48−50%, which is significantly higher than the proportion of those who describe themselves as having an "average income" (40%).

The consumer sentiment index also remained virtually unchanged from February to December 2021 (85−86 points). At the same time, we should note that the index value below 100 points means the predominance of pessimistic forecasts in the assessments of the region's residents regarding the prospects for the development of the economy and their personal financial situation in the future.

For reference: According to the latest data from Levada-Center* the nationwide consumer sentiment index from August to October 2021 decreased by 3 points (from 75 to 72 p.); compared to the beginning of the year — by 2 points (from 74 to 72 p.).

*   Included in the register of foreign agents.

Estimation of social condition (% of respondents; VolRC RAS data)

Social mood
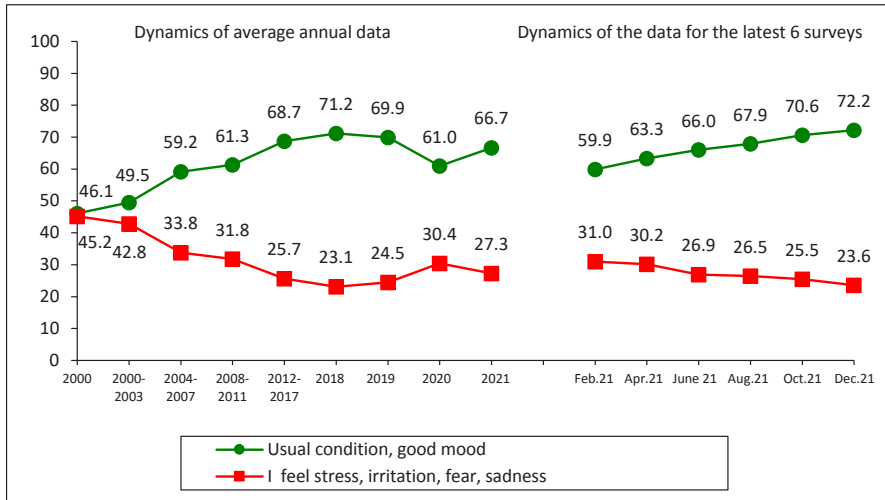
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Usual condition, good mood	+12
I feel stress, irritation, fear, sadness	-7

Stock of patience
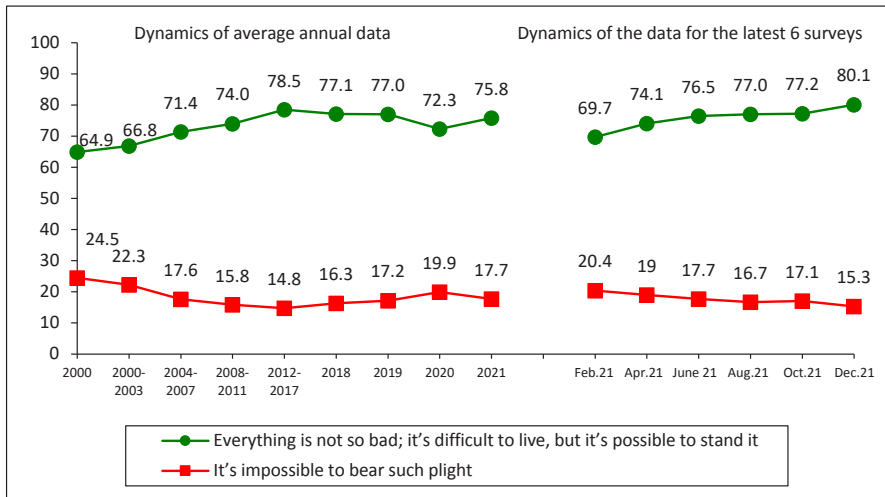
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
Everything is not so bad; it's difficult to live, but it's possible to stand it	+10
It's impossible to bear such plight	-5

Social self-identification
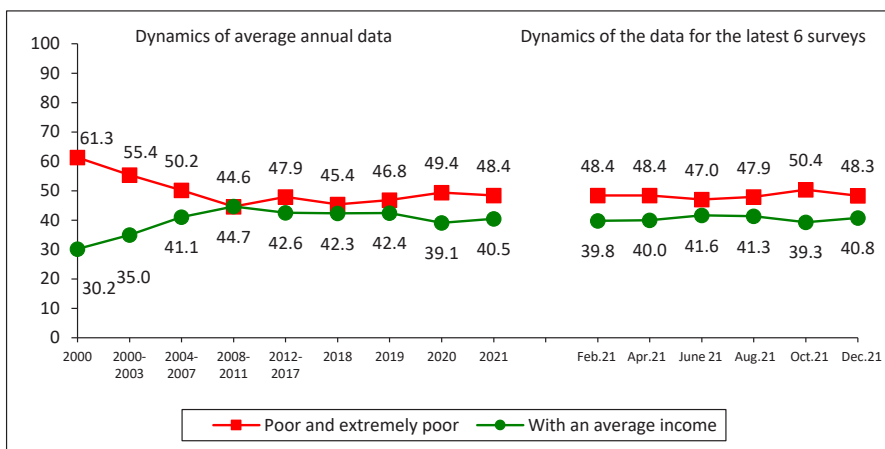
Annual dynamics (December 2021 to February 2021)	
Answer option	Dynamics (+ / −)
People with average income	+1
Poor and extremely poor	0

Question: "Which category do you belong to, in your opinion?"

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*   Included in the register of foreign agents.

Consumer sentiment index (CSI, points; data of VolRC RAS for the Vologda Oblast)
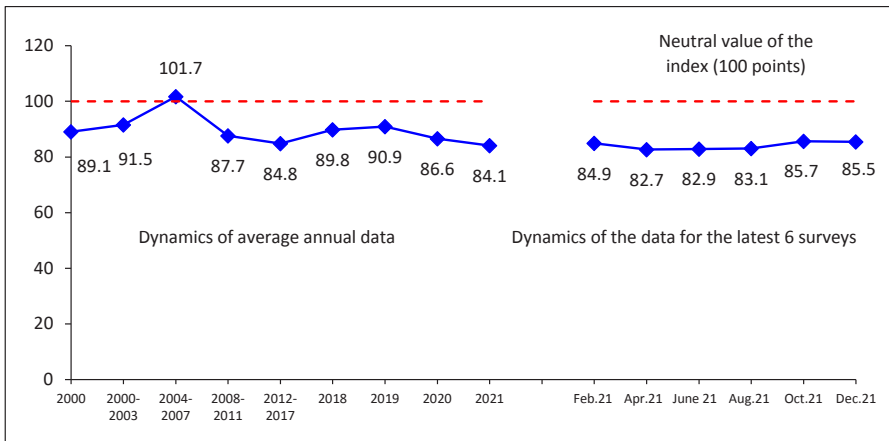
Annual dynamics (December 2021 to February 2021)	
CSI	Dynamics (+ / −)
Index value, points	+1

Consumer sentiment index (CSI; Levada-Center data* for Russia)
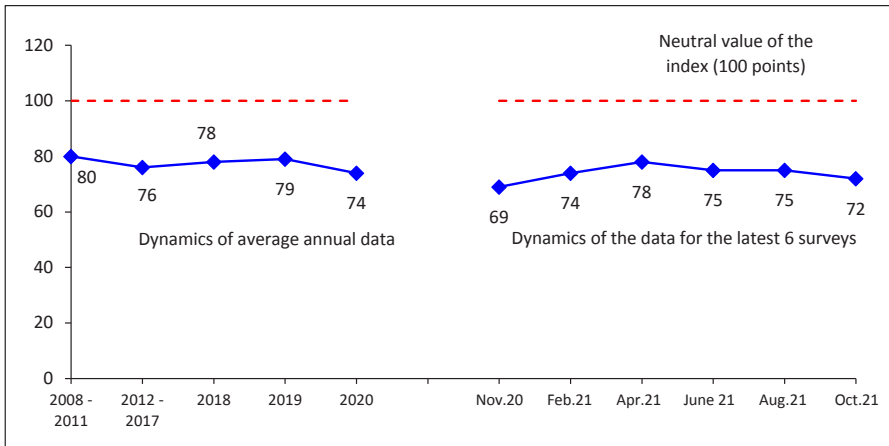
Annual dynamics (October 2021 to February 2021)	
CSI	Dynamics (+ / −)
Index value, points	-2

The index is calculated since 2008.

Latest data are as of October 2021. There are no data for the period from April to August 2020.

Source: Levada-Center* data. Available at: https://www.levada.ru/indikatory/sotsialno-ekonomicheskie-indikatory/

Over the past two months, the proportion of people who positively characterize their daily mood has increased in 4 out of 14 socio-demographic groups: among people under the age of 30 (by 6 p.p., from 75 to 81%) and those aged 30—55 (by 4 p.p., from 71 to 75%), in the group of people with secondary and incomplete secondary education (by 6 p.p., from 64 to 70%), as well as among people who, according to self-estimates of their own income, belong to the category of 20% of the least affluent residents of the region (by 4 p.p., from 60 to 64%).

Negative changes in social mood for the period from October to December 2021 are noted only in one group – among people over the age of 60 (the share of positive assessments decreased by 3 p.p., from 68 to 65%).

In general, over the past year (from February to December 2021), positive changes in social mood are observed in all major socio-demographic groups, especially among people under the age of 30 (the share of positive assessments increased by 21 p.p., from 61 to 82%) and among people who, according to self-estimates of their own income, belong to the category of 20% of the least affluent citizens (by 20 p.p., from 44 to 64%).

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* Included in the register of foreign agents.

Social mood in different social groups (respond option "Wonderful mood, normal, stable condition", % of respondents; VolRC RAS data)

Population group	Dynamics of average annual data								Dynamics of the data for the last 6 polls						Dynamics (+/–), Dec. 2021 to Feb. 2021
	2000	2007	2011	2012	2018	2019	2020	2021	Feb. 2021	Apr. 2021	June 2021	Aug. 2021	Oct. 2021	Dec. 2021	
Sex															
Men	50.1	65.9	64.5	69.1	72.8	70.1	60.8	65.7	60.8	61.3	65.1	65.6	70.0	71.5	+11
Women	43.3	61.7	62.0	65.8	69.8	69.6	61.2	67.4	59.2	64.9	66.7	69.8	70.9	72.8	+14
Age															
Under 30	59.1	71.3	70.0	72.3	80.0	81.1	67.6	73.5	60.9	67.4	73.0	82.3	75.3	81.9	+21
30–55	44.2	64.8	62.5	67.9	72.6	71.2	61.8	69.5	64.4	65.5	70.0	71.4	70.8	75.1	+11
Over 55	37.4	54.8	58.3	62.1	65.2	63.3	57.4	60.5	54.1	59.1	58.3	58.1	68.3	65.2	+11
Education															
Secondary and incomplete secondary	41.7	58.4	57.4	57.2	64.8	63.2	56.1	62.1	56.2	56.9	62.5	63.2	64.1	69.7	+14
Secondary vocational	46.4	64.6	63.6	66.7	72.2	72.7	63.5	66.7	60.9	64.3	66.1	68.5	70.4	70.1	+9
Higher and incomplete higher	53.3	68.6	68.3	77.0	76.8	73.4	63.3	71.5	62.7	68.7	69.7	73.0	77.1	77.6	+15
Income groups															
Bottom 20%	28.4	51.6	45.3	51.5	57.3	53.2	43.4	54.6	44.3	49.8	54.2	55.0	60.4	64.0	+20
Middle 60%	45.5	62.9	65.3	68.7	71.9	71.4	62.6	67.3	60.1	65.8	67.0	68.9	70.9	71.1	+11
Top 20%	64.6	74.9	75.3	81.1	82.9	81.8	75.6	79.9	76.0	70.8	76.5	86.7	84.2	85.3	+9
Territories															
Vologda	49.2	63.1	67.1	73.6	71.0	68.6	60.9	60.3	55.8	57.0	59.4	59.7	64.0	65.7	+10
Cherepovets	50.8	68.1	71.2	76.2	75.8	71.2	60.4	71.0	64.4	68.1	70.8	72.3	75.2	75.1	+11
Districts	42.2	61.6	57.1	59.8	68.7	69.8	61.4	67.8	59.7	64.0	67.1	70.1	71.5	74.2	+15
Oblast	46.2	63.6	63.1	67.3	71.2	69.9	61.0	66.6	59.9	63.3	66.0	67.9	70.5	72.2	+12

RESUME

The results of the monitoring for 2021 as a whole (from February to December) demonstrate rather contradictory dynamics of public opinion assessments.

On the one hand, there is an obvious tendency toward improving the characteristics of the emotional state and psychological climate. Moreover, we should note that this applies not only to people with a high level of welfare or representatives of young age groups; the same can be said about socially vulnerable groups: pensioners, people with low incomes.

On the other hand, the improvement of the emotional state in society does not seem to be associated with any changes in the dynamics of the standard of living and quality of life. The results of our study indicate the following:

✓ The proportion of people considering themselves "poor and extremely poor" remains stable and very high (almost half of Vologda Oblast population of the region, 48%);

✓ The consumer sentiment index remains below 100 points (83−85 p.), which indicates the predominance of negative forecasts in people's assessments of the future of the Russian economy and their personal financial situation;

✓ The share of Vologda Oblast residents who believe that the President of the Russian Federation is not very successful in coping with the problem of economic recovery and with enhancing the welfare of citizens is twice as high as the proportion of those who share the opposite viewpoint (60% vs. 27).

Perhaps the contradiction that has developed (between the positive trend of improving the characteristics of the emotional state and the lack of positive changes in the dynamics of assessments of the standard of living and quality of life) explains the fact that people's opinion about the work of the authorities themselves is wary, for the time being.

There are no significant changes in the assessments of the work of federal and regional government bodies for the period from February to December 2021. However, a slight increase in the share of negative judgments concerning the President's work (by 4 p.p., from 30 to 34%) still hints that the stability that has developed in people's estimates is more of a negative and tense nature.

Level of approval of the RF President's work according to various research centers (proportion of positive assessments, % of respondents)

Research centers	Data dynamics in 2021			Dynamics (+ / −)	
	February	June	December	June to February	December to June
VolRC RAS	50.1	52.5	50.6	+3	−2
VTsIOM*	61.4	62.1	58.8	+1	−3
Levada-Center**	65	66	63	+1	−3
* The latest data are as of December 5, 2021. ** Included in the register of foreign agents. The latest data are as of November 2021.					

We should note that some decline in the dynamics of the level of approval of the President's work (both according to VolRC RAS regional monitoring and according to the results of all-Russian studies of VTsIOM and Levada-Center*) is observed in the second half of the year (from June − August). Perhaps the seasonal factor makes its "contribution" to this trend, when alongside the end of summer vacation and the increase in utility tariffs, people face the seasonal growth of viral diseases, including a new wave of the COVID-19 epidemic, as well as the widespread introduction of QR codes that, in a sense, limit (for the prevention of morbidity) the freedom of citizens.

However, official statistics convincingly prove that the ongoing tense situation concerning coronavirus and the quarantine restrictions imposed out of necessity cannot be considered the only reason for people's negative perceptions of the dynamics of the standard of living and quality of life and for the lack of positive trends in the assessment of the work of the authorities.

According to the results of the third quarter of 2021, the level of real wages decreased by 4.8% compared to the second quarter. The real disposable income of Vologda Oblast residents decreased by 1.4% in January − September 2021 compared to the corresponding period of 2020. At the same time, the consumer price index in the fourth quarter increased by 2.2% compared to the third quarter of 2021, in October 2021 − by 8.6% compared to October 2020[4].

These data suggest that against the background of coronavirus infection, which is a relatively new and still unfamiliar enemy, it is "the low incomes of our citizens that were and remain the main enemy and threat to stable development"[5] (as the President of the Russian Federation pointed out); and the further dynamics of public sentiment, including people's attitude toward the work of the authorities, will depend on the effectiveness of management decisions in this field.

Materials were prepared by M.V. Morev, E.E. Leonidova, I.M. Bakhvalova

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[*] Included in the register of foreign agents.

[4] *Socio-Economic Situation in the Vologda Oblast in January − October 2021: Report.* Vologdastat. Vologda, 2021. Pp. 53, 76.

[5] Vladimir Putin's speech at a meeting with deputies of the State Duma of the eighth convocation. *Official Website of the President of the Russian Federation.* October 12, 2021. Available at: http://www.kremlin.ru/events/president/transcripts/66905

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[1] Information about the modified Harvard standard is given in the book: Kirillova O.V. *Redaktsionnaya podgotovka nauchnykh zhurnalov po mezhdunarodnym standartam: rekomendatsii eksperta BD Scopus* [Editorial Preparation of Scientific Journals according to International Standards: Recommendations of a Scopus Expert]. Moscow, 2013. Part 1. 90 p.

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